

POST-CINEMA & DIGITAL CULTURES

MATTEO BITTANTI, PAOLO RUFFINO AND VALENTINO CATRICALÀ

GAME ENGINE CULTURE(S)

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GAME ENGINE CULTURE(S)

Edited by
Matteo Bittanti, Paolo Ruffino and Valentino Catricalà

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MATTEO BITTANTI
INTRODUCTION

Game engines have become ambient infrastructure for contemporary digital production. Once treated as specialist software for building videogames, they now underpin work in art galleries, university classrooms, film studios, architectural visualisation, military simulation, platform economies, and even cars.¹ They travel, too, as ideas: distilled into buzzwords such as real-time rendering and proceduralism (often sold under the banner of immersion), translated into professional imperatives around optimisation and modular pipelines, and absorbed into aesthetic norms that prize photoreal polish, responsiveness, and the slippery demand for ‘feel’.²

Game Engine Culture(s) begins with a straightforward premise: if engines have become general-purpose technologies for world-making, they require humanistic inquiry commensurate with their technical reach, institutional influence, and ideological effects.

This anthology proposes ‘engine culture(s)’ in the plural for several related reasons. Engines are internally heterogeneous: assemblages of rendering pipelines, physics solvers, scripting interfaces, asset pipelines, and versioned codebases that accumulate technical debt as well as design decisions across decades of development. They are also socially differentiated: encountered in sharply different ways by programmers balancing performance budgets, artists sculpting virtual wetlands, educators negotiating classroom licences, modders reverse-engineering proprietary formats, students decoding error logs, curators commissioning

1 Jay Peters, ‘Toyota Made a Game Engine’, *The Verge*, 9 February 2026.

2 Anna Wiener, ‘How Perfectly Can Reality Be Simulated?’, *The New Yorker*, 26 August 2024.

installations, and platform owners extracting rent from marketplace transactions.

The chapters, finally, work across methods. They do not force a single definition of ‘the engine’; they follow engines in practice, asking what they do. They track how engines distribute agency between humans and nonhumans, how defaults pre-format perception, how claims of ‘ease of use’ package labour relations, how asset libraries and tutorial economies reorganise cultural production, how engines train bodies and attention, and how they enter contemporary art as both material and constraint.

Game engine studies takes shape at the intersection of game studies, platform studies, software studies, and science and technology studies (STS). It inherits from platform studies — most influentially Nick Montfort and Ian Bogost’s *Racing the Beam* (2009) — a commitment to analysing the enabling and limiting force of computational systems while refusing the assumption that ‘content’ floats free of its technical substrate. The key difference lies in scale and object of study. Where platform studies has often concentrated on hardware platforms (the Atari VCS, the Commodore 64) or tightly bounded software environments, engine studies confronts software systems that function simultaneously as toolkits, runtimes, business models, pedagogical standards, and de facto ‘operating environments’ for creative work across multiple industries. Engines are platforms, yet they are also meta-platforms: environments that host other environments, standardising production through asset pipelines, scripting conventions, render settings, physics assumptions, animation retargeting schemas, and publishing workflows that span desktop, mobile, console, and web deployment targets. With that shift in view — from platform as object to engine as operating *milieu* — the next section turns to the practical consequences: how these meta-platforms organise production, training, and constraint through their defaults and economies.

Several works anchor this anthology. Benjamin Nicoll and Brendan Keogh’s *The Unity Game Engine and the Circuits of Cultural Software* (2019) positions engines as ‘cultural software’ — frameworks that coordinate labour while their defaults settle into aesthetic norms — and introduces the metaphor of engine ‘grain’: the directional pull of protocols and standards, together

with affordances, that guide makers towards particular design methodologies. Eric Freedman's *The Persistence of Code in Game Engine Culture* (2020) treats engines as persistent infrastructures that stabilise relations between pipelines and convention across long durations, giving them historical consequence beyond the technical. Stefan Werning's *Making Games: The Politics and Poetics of Game Creation Tools* (2021) approaches engines as socio-technical dispositifs — contingent assemblages of code and interface, shaped by community practice — where politics registers in their 'poetics', cultivating habits of thinking and making while generating cultures of support and pedagogy, with porous borders between amateur and professional work. James Malazita's *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (2024) draws on feminist STS to describe engines as 'multiply enacted', held together in practice through discourse and material work, as these take form within infrastructural arrangements rather than as a single, stable object; in this account, engines co-produce knowledge and embodied orientations rather than neutrally representing them.

At the same time, engine studies reorients game studies by pushing beyond interpretive habits formed around text, representation, genre, and narrative. Those frameworks remain valuable; this volume argues, however, that they falter once engines begin to set the terms on which representation can be made, circulated, and read. Engines make certain actions computationally cheap and others expensive; they normalise camera grammars; they encourage modular thinking; they define what 'counts' as smooth movement, plausible lighting, and even convincing AI behaviour; they also encode institutional assumptions about audiences, markets, and 'best practices'.

Engine studies therefore redirects attention to engines as infrastructural systems. They organise both making and looking, and they govern by design. Power travels through their architectures and default settings, reinforced by licensing, marketplaces, and related business arrangements.

Game Engine Culture(s) does not force these perspectives into a single doctrine. It treats them as a shared vocabulary, usable across very different sites: autonomous simulations that play themselves in galleries; RPG Maker productions that turn engine grain into

a cinematic resource; asset marketplaces that convert historical imagination into tradable form. It also follows engine-driven pedagogies that reproduce (and sometimes interrupt) labour cultures, decompiled code that makes colonial logics computationally explicit, and tactical modding as infrastructural critique.

The conceptual richness of this emerging field — its insistence that engines coordinate labour, stabilise conventions, cultivate poetics, and co-produce knowledge — makes clear that no single methodology can adequately capture their operations. This recognition grounds the anthology's commitment to plural 'culture(s)' rather than unified theory. Three arguments recur across the chapters without hardening into doctrine. First, engines operate as *governance by design*: their constraints encode structured choices that sort actions into smooth, awkward, prohibited, or unthinkable through defaults (template projects, prefab libraries, asset store 'starter packs', standard lighting rigs). Second, engines function as *cultural marketplaces* where asset stores, plugin ecosystems, and tutorial platforms bind creation to consumption in circuits that are simultaneously economic and epistemic, actively mediating which fragments of history, identity, and experience become purchasable, searchable, and therefore imaginable. Third, engines are *historical media* carrying sedimented assumptions — about bodies, space, interaction, realism, and 'good practice' — that survive across versions and migrate across industries, shaping what makers inherit, resist, and accidentally reproduce.

Assembling this anthology has demanded curatorial choices that double as method: deciding what belongs under 'engine culture', calibrating technical specificity against conceptual ambition, and ordering chapters so arguments build rather than merely sit side by side. The chapters selected focus on moments when engines become readable as infrastructure. Breakdowns (e.g., glitch and ferality) make defaults legible. Refusal, including live simulations and radical passivity, brings background assumptions into view. Several contributions track how inherited histories become operational as harm, whether through colonial code, asset marketplaces, or geopolitical representation. Pedagogy appears as routine training that fixes expectations about what competent making should look like. The

resulting structure, moving from theory into practice, and ending with institutional and geopolitical critique, puts the book's argument into effect: engines warrant inquiry commensurate with their ubiquity.

Paolo Ruffino and Valentino Catricalà open by theorising the passage from game art to engine art, marking a shift from artists treating games as texts and apparatuses to appropriate or subvert (JODI's *Untitled Game*, Cory Arcangel's *Super Mario Clouds*)³ towards confronting engines as infrastructural cores of contemporary visual culture. Their chapter situates this transformation within the transition from 1960s counterculture to cyberculture,⁴ tracing how DIY ethos and modding practices were folded into platformisation: Unity and Unreal's rhetoric of 'democratising' game development operates alongside asset stores and subscription models that capture creative labour. The key tension they identify — engines expand access to worldmaking while simultaneously standardising it — establishes the anthology's central concern.

Teodora Sinziana Alata extends this frame by proposing 'speculative drift' as a method for inhabiting engine infrastructures differently. Drawing on feminist technoscience (Rosi Braidotti, Wendy Hui Kyong Chun, Luciana Parisi, Ruha Benjamin), Alata argues that artists must work *within* platform logics to gently reorient their operations rather than frontally opposing them. Through case studies of Alice Bucknell's *The Martian Word for World is Mother*, Pete Jiadong Qiang's *Queer Maximalism HyperBody*, and Theo Triantafyllidis's *Feral Metaverse*,⁵ she demonstrates how *drift* operates at multiple scales: from micro-temporal instabilities in real-time rendering to macro-level refusals of optimisation imperatives and player-centric narratives. Alata's chap-

3 JODI, *Untitled Game*, modifications of videogame (*Quake 1*) (1996–2001), sound, CD-ROM; Cory Arcangel, *Super Mario Clouds* (2002), handmade hacked *Super Mario Brothers* cartridge and Nintendo NES video game system, dimensions variable.

4 Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006).

5 Alice Bucknell, *The Martian Word for World is Mother* (2022), moving-image work; Pete Jiadong Qiang, *Queer Maximalism HyperBody* (2018–19), VR game; Theo Triantafyllidis, *Feral Metaverse* (2024), videogame/interactive work.

ter provides a conceptual framework for understanding engines as ‘infrastructural apparatuses that determine workflows, temporalities, and epistemic conditions’.

Luke Caspar Pearson complements these readings with a formal account of game engines as producers of *irony*. Engines enable ‘ironic computation’: the systematic detachment of signifier from signified, where treasure chests bite, pizzas heal, and deaths fail to ‘count’ narratively. By analysing Unreal Engine’s object ontology (the Actor class system), coordinate space conventions (borrowed from architectural CAD software), and Blueprint visual scripting (which materialises code as spatial diagrams), Pearson argues that engines manufacture ontological instability as routine operational condition. This ‘discrepancy’ is a formal property that artists like Keiken and Bucknell mobilise to challenge social constructs around gender, ecology, and colonial space. These three chapters establish that engine art is neither straightforward appropriation nor mere technical virtuosity, but engagement with *the politics encoded in defaults and the possibilities opened by ironic reconfiguration*.

Eddie Lohmeyer’s ‘Animal Engines and the Fertility of Glitch’ reframes glitch as ‘unruly relation’ between bodies, code, hardware, and extraction. Beginning with Jamie Faye Fenton’s embodied interventions (pounding the Astrocade, yanking cartridges mid-play) and moving through Brent Watanabe’s *San Andreas Deer Cam* (a procedurally misbehaving deer in *GTA V*) and Alice Bucknell’s *The Alluvials* (modded Los Santos as ecological speculation),⁶ Lohmeyer theorises fertility as engines’ refusal of complete domestication. This chapter refuses the familiar binary between ‘pure system’ and ‘human expressive misuse’, instead foregrounding how glitch reveals the agential capacity of non-human actors that exceed programmatic intention. Fertility, Lohmeyer argues via Karen Barad’s agential realism and Akira Mizuta Lippit’s ‘animetaphor’, names engines’ capacity to generate affects and configurations that surprise even their operators, revealing how trans and queer histories of glitch art are insepa-

6 Brent Watanabe, *San Andreas Deer Cam* (2015–16), software-based video work/online stream; Alice Bucknell, *The Alluvials* (2023–24), videogame/interactive project (online documentation).

rable from engine histories and opening spaces for ecological critique through what makers cannot fully control.

Logan Davis and James Malazita approach engine grain from an opposite direction: rather than breakdown, they trace how constrained engines become *cinematic practice*. *Felvidek* (2023),⁷ a Slovak medieval JRPG made in RPG Maker, mobilises the engine's rigid turn-based combat, tile-based movement, and pixel-art defaults as expressive resources rather than deficits. By reading *Felvidek* through Czechoslovak New Wave cinema, Davis and Malazita argue for replacing the 'wood grain' metaphor with 'film grain': engines possess 'character and texture' that developers inherit, leverage, run from, and exaggerate through practices that are 'individual, expressive, idiosyncratic, cultural, and experiential'. This chapter refuses the prestige hierarchy treating 'serious' engine work as synonymous with high-fidelity 3D pipelines, instead demonstrating how craft emerges through negotiation *with* — not *against* — material constraint.

Together, Lohmeyer and Davis/Malazita establish that engine studies requires attending to *practices of making*: the embodied, iterative, often frustrating labour of coaxing systems to behave unexpectedly (ferality) or making virtue of their limits (grain-as-cinema). Both reject the notion that engines are neutral vessels awaiting content, insisting instead that engines are *participants* in meaning-making whose agencies must be reckoned with.

Serafin Álvarez defines live simulations — autonomous engine worlds unfolding without player input — as instantiating 'radical inaction', a deliberate aesthetic and political refusal of player-centric paradigms. Through analysis of Jakob Kudsk Steensen's *Berl-Berl* (digitally reconstructed Berlin wetlands) and Xenoangel's *Supreme* (autonomous 'World Beast' ecosystem),⁸ Álvarez argues that excluding human control is not withdrawal but *reorganisation of attention, time, and responsibility*: learning to watch systems run, degrade, loop, and persist. Drawing on Sonia Fizek's notion of 'playing at a distance' and Ruffino's cri-

7 Jozef Pavelka and Vlado Ganaj, *Felvidek* (Tutto Passa, 2024), videogame.

8 Kudsk Steensen, *Berl-Berl* (2021), immersive installation/live simulation (online documentation); Xenoangel, *Supreme* (2021–23), real-time animation/simulated ecosystem.

tique of the human-system divide, Álvarez positions live simulations as posthumanist art that foregrounds nonhuman agency, ecological temporalities beyond human lifespans, and contemplative aesthetics rejecting instrumental mastery.

Doug Stark's 'On Simema' provides a phenomenological complement through the concept of *simema* (simulation + cinema): self-playing games where NPC becomes actor, videogame becomes movie, cinema becomes ceaseless simulation. Analysing Ian Cheng's *Emissaries* trilogy and Will Freudenheim's *Schema*,⁹ Stark argues, via Gilles Deleuze's cinema theory, that radical passivity constitutes a 'neurological gym' where confronting alien AI patterns forces cognitive accommodation, rewiring habitual thought. Where traditional games celebrate human mastery, *simema* stages our submission to 'spiritual automatons' that think differently. Stark refuses the easy equation of passivity with political impotence: against Alexander Galloway's call for 'radical action' through transformative gameplay, he proposes that *passivity itself can be radical when it subjects us to genuinely foreign patterns*, a necessary condition for posthumanist encounter.

These chapters demonstrate engines' capacity to produce experiences antithetical to gaming's dominant player-agency paradigm. In doing so, they clarify a tension: if engines govern through defaults that encourage certain interactions, practices that deliberately *refuse* interaction operate as engine critique, revealing how thoroughly player control has been naturalised.

John Healy's chapter on engines in higher education exposes how technical tools function as ideological transmission belts. Drawing on interviews with game design educators and observational study of students using Unity, Healy demonstrates that learning an engine means acquiring not just technical competency but *professional habitus*: what counts as 'good workflow', how constraints are naturalised as realism, when ambition becomes 'poor scope management'. Educators report students rushing to

9 Ian Cheng, *Emissaries* (2015–17), trilogy of 'live simulation' works created using a video-game engine: *Emissary in the Squat of Gods* (2015), *Emissary Forks at Perfection* (2015–16), *Emissary Sunsets the Self* (2017); Will Freudenheim, *Schema* (2023), interactive work/livestreamed performance (online documentation), Caldo Worldwide.

implement designs in-engine prematurely, designing *for* rather than *through* constraints, and reproducing ‘cookie cutter, derivative’ games that mimic mainstream genres because their imaginaries have been shaped by what Unity’s defaults make frictionless. The chapter’s significance lies in exposing engine literacy as a double bind: simultaneously enabling creation and constraining imagination, preparing students for industry while potentially limiting critical capacity.

Healy’s intervention connects directly to Nicoll and Keogh’s argument about Unity producing ‘entrepreneurial subjects’ who internalise platform logics, in dialogue with Werning on tool-mediated epistemic conditioning. By situating engines within Paulo Freire’s ‘reproduction of work cultures’ framework, Healy clarifies that pedagogical spaces are arenas where industry norms, labour expectations, and aesthetic standards are *naturalised through technical training*. The chapter’s sobering conclusion — that educators struggle to balance teaching employable skills against fostering critical distance — makes plain engines’ role in perpetuating what Eddie Lohmeyer calls the ‘hegemonic pursuit’ of seamless, optimised creative labour.

Kevin Wong’s examination of asset marketplaces reveals how engines platformise historical imagination. Rather than asking how games *represent* ancient Greece and Rome, Wong asks how the Unity Asset Store and Unreal Engine Marketplace *pre-format what counts as classical* through availability, tagging, pricing, and template logic. His analysis uncovers stark gendered asymmetries: abundant gladiators, legionaries, and marble statues versus scarce female deities; Demeter nearly absent while Ares proliferates. These patterns are not neutral reflections of developer interest but effects of platformised cultural production: search algorithms reward assets that fit existing popular imaginaries, asset creators respond to sales metrics, educators use easily-found assets in tutorials, students reproduce those patterns, reinforcing the cycle. Wong’s contribution to platform studies and classical reception studies alike shows that ‘antiquity’ becomes an *effect of infrastructural distribution*, shaped by what is computationally cheap to acquire, deploy, and monetise.

Chris Kerich extends this infrastructural critique by decompiling *Minecraft*’s Java Edition using community tools (Mod

Coder Pack, Minecraft Forge), making the game's AI behaviour trees legible as colonial code. His analysis reveals colonial logics embedded at computational level: Villagers, Illagers, and Piglins procedurally instantiate discursive resources for Indigenous representation ('violent-violence', 'primitive-emotional', 'savage — noble and ignoble'). Pillagers' goal-priority systems code them for violence almost exclusively, their 'mansions' lack functional affordances (beds that cannot be used, domestic spaces without purpose), and their raids extract nothing: performing colonial violence as aesthetic rather than systemic logic. Kerich argues that postcolonial game critique cannot remain at representation's surface when engines *computationally encode terra nullius*, extraction economics, and racial stereotypes through procedural generation parameters, behaviour trees, and reward structures.

Sandra Youkhana completes this trilogy by confronting 'Default Iraq', the cumulative effect of decades of games depicting Iraq almost exclusively as a war zone, an archaeological plunder site, or an apocalyptic future. Examining multiple titles across two decades, Youkhana demonstrates how engines encode worldviews through their operational priorities: combat loop refinements, full-spectrum dominance camera switches (ground to missile to gunship), respawn mechanics that collapse historical sites into 'tactical repetition', FPS templates, and military asset marketplaces that make creating *Default Iraq* 'too easy, almost trivial'. Youkhana's experimental game *Default Iraq* (2023)¹⁰ demonstrates these automated violences by assembling a 'most default version of Iraq' from engine templates, fog parameters (tinted yellow per Hollywood convention), and marketplace gun assets, revealing how 'the engine is eager to support this mode of play'. Her chapter's power lies in refusing to separate representation from infrastructure: Iraq's mediatised image is inseparable from the technical affordances, economic incentives, and aesthetic defaults that make certain depictions frictionless.

These three chapters constitute the anthology's most sustained engagement with how engines function as *colonial and imperial infrastructure*, through accumulated technical decisions, market

10 Sandra Youkhana, *Default Iraq* (2023), experimental videogame developed in Unreal Engine.

incentives, and sedimented histories that encode power asymmetries as defaults.

Finally, Matteo Bittanti's 'RAGE Against the Machine' provides the anthology's methodological capstone by presenting engine analysis as synthesis of theoretical frameworks, technical archaeology, and artistic practice. After surveying critical engine studies literature to establish analytical vocabulary — engines as ideological infrastructure, workflow coordinators, aesthetic filters, and governance systems — the chapter narrows to Rockstar Games's RAGE (Rockstar Advanced Game Engine), *GTA V*'s substrate, analysing how its technical architecture encodes worldviews through operational priorities.

What distinguishes this chapter is its extended analysis of 2girls1comp's *GTA V* mods as engine-level critique interventions targeting RAGE's procedural control, embodied norms, and visual sovereignty. Projects like *Every Thing* (replacing human models with furniture), *Dancing Plague* (forcing NPCs into involuntary choreography), and *Sightjacking* (redistributing camera control) expose how RAGE governs through defaults: standardised body types, gendered animation sets, pre-scripted NPC behaviours, player-centric viewpoint hierarchy. Bittanti argues these mods operate as 'infrastructural critique', making visible the regulatory mechanisms usually naturalised as technical necessity.

Ending the anthology with RAGE and its subversions suggests that critique can operate *through* engines, returning readers to the opening provocation: engines are sites where power relations become computationally instantiated, and therefore sites where those relations can be contested.

The urgency of engine studies extends well beyond games criticism or media theory. As Tim Sweeney, Epic's CEO, puts it, "These little "game engines," as we called them at the time, are becoming simulation engines for reality."¹¹ They have been used to render Weather Channel disaster scenarios, support U.S. Navy pilot training in virtual Corpus Christi, model Francis Ford Coppola's unrealised New York, archive threatened Ukrainian antiquities, monuments, churches, and everyday artefacts, and

11 Wiener, 'How Perfectly Can Reality Be Simulated?.'

visualise BMW's autonomous vehicles navigating virtual cities. *Arma 3* footage circulates online as purported 'evidence' from the battlefields of Ukraine and Gaza; military personnel can develop PTSD in combat and later encounter related VR environments in treatment; architects pitch libertarian charter cities in Honduras through Unreal mock-ups. In cases like these, engines do more than depict the world: they participate in the evidentiary regimes, training protocols, and speculative proposals through which 'reality' is produced and acted upon.

No metaphor is required. Game engines increasingly set thresholds for what counts as photographically 'real' in Hollywood blockbusters, what Afghanistan 'looks like' inside military simulations, how airport authorities rehearse disaster scenarios, and what workers see through Tesla windscreens. They train perception, consolidate aesthetic norms, and narrow the gap between rehearsal and deployment, model and world. Engine governance is therefore not a niche concern limited to games: these systems now mediate knowledge production and geopolitical imagination, reshape labour training, and condition sensory experience across military, entertainment, architectural, and scientific domains.

Engines also govern through their quieter mechanisms, such as marketplace ranking, template economies, and 'best practice' toolchains. Asset marketplace algorithms can encode gendered and racialised historical imaginaries; AI behaviour trees can proceduralise colonial stereotypes; FPS templates can automate inherited imperial aesthetics. In classrooms, licensing regimes and tutorial cultures often recast precarious labour as entrepreneurial opportunity. Across these settings, engines smooth some worlds, bodies, and actions into easy execution while making others costly or hard to articulate. Yet, as the artists, modders, and critical practitioners assembled in this anthology demonstrate, engines remain sites of contestation. Their structures can be bent; glitches can be read as *symptoms* rather than noise; *constraints* can be repurposed; *defaults* can be surfaced, audited, and rewritten.

Understanding how engines distribute power — through technical architectures and commercial arrangements, as well as aesthetic defaults — is a condition of understanding how twenty-first-century reality is assembled, who controls its parameters,

and what alternatives remain imaginable. As these chapters demonstrate, that work is already underway: in galleries, classrooms, modding communities, and experimental studios where makers refuse engine defaults and imagine engine culture(s) yet to come.

Los Angeles, December 2025

Bibliography

- Barad, Karen, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, North Carolina: Duke University Press, 2007)
- Benjamin, Ruha, *Race After Technology: Abolitionist Tools for the New Jim Code* (Cambridge: Polity, 2019)
- Braidotti, Rosi, *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory*, 2nd edn (New York: Columbia University Press, 2011)
- Chun, Wendy Hui Kyong, *Updating to Remain the Same: Habitual New Media* (Cambridge, Massachusetts: MIT Press, 2016)
- Deleuze, Gilles, *Cinema 1: The Movement-Image*, trans. by Hugh Tomlinson and Barbara Habberjam (Minneapolis: University of Minnesota Press, 1986)
- , *Cinema 2: The Time-Image*, trans. by Hugh Tomlinson and Robert Galeta (Minneapolis: University of Minnesota Press, 1989)
- Fizek, Sonia, *Playing at a Distance: Borderlands of Video Game Aesthetic* (Cambridge, Massachusetts: MIT Press, 2022)
- Freedman, Eric, *The Persistence of Code in Game Engine Culture* (New York: Routledge, 2020)
- Freire, Paulo, *Pedagogy of the Oppressed*, trans. by Myra Bergman Ramos (New York: Continuum, 1970)
- Galloway, Alexander R., *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006)
- Lippit, Akira Mizuta, *Electric Animal: Toward a Rhetoric of Wildlife* (Minneapolis: University of Minnesota Press, 2000)
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Mol, Annemarie, *The Body Multiple: Ontology in Medical Practice* (Durham, North Carolina: Duke University Press, 2002)
- Montfort, Nick and Ian Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, Massachusetts: MIT Press, 2009)

- Nairn, Raymond, Tim McCreanor, and Angela Moewaka Barnes, *Mass Media Representations of Indigenous Peoples* (Auckland, New Zealand: Shore and Whariki Research Centre, 2017) <https://www.trc.org.nz/sites/trc.org.nz/files/Mass-media-representations-indigenous-peoples.pdf> [accessed 4 November 2025]
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019)
- Parisi, Luciana, *Contagious Architecture: Computation, Aesthetics, and Space* (Cambridge, Massachusetts: MIT Press, 2013)
- Peters, Jay, 'Toyota Made a Game Engine', *The Verge*, 9 February 2026, <https://www.theverge.com/games/875995/toyota-fluorite-game-engine> [accessed 9 February 2026]
- Turner, Fred, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006)
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- Wiener, Anna, 'How Perfectly Can Reality Be Simulated?', *The New Yorker*, 15 April 2024, <https://www.newyorker.com/magazine/2024/04/22/can-the-world-be-simulated> [accessed 1 September 2025]

Artworks

- Arcangel, Cory, *Super Mario Clouds* (2002), handmade hacked *Super Mario Brothers* cartridge and Nintendo NES video game system, dimensions variable.
- Bucknell, Alice, *The Martian Word for World is Mother* (2022), moving-image work.
- , *The Alluvials* (2024), videogame/interactive project (online documentation), <https://alicebucknell.com/projects/the-alluvials-the-game-2024>
- Cheng, Ian, *Emissaries* (2015–17), trilogy of 'live simulation' works created using a game engine: *Emissary in the Squat of Gods* (2015), *Emissary Forks at Perfection* (2015–16), *Emissary Sunsets the Self* (2017)
- Freudenheim, Will, *Schema* (2023), interactive work/livestreamed performance (online documentation), Caldo Worldwide, <https://caldo-worldwide.com/pages/will-freudenheim-schema-sub>
- JODI, *Untitled Game: Modifications of Video Game (Quake 1)* (1996–2001), sound, CD-ROM
- Pavelka, Jozef, and Vlado Ganaj, *Felvidek* (Tutto Passa, 2024), videogame.
- Qiang, Pete Jiadong, *Queer Maximalism: HyperBody*, 1e9.community, 31 December 2019, VR game, itch.io

<https://fschool.itch.io/queer-maximalism-hyperbody>

Steensen, Jakob Kudsk, *Berl-Berl* (2021), immersive installation / live simulation (online documentation), <https://www.jakobsteensen.com/berlberl>

Triantafyllidis, Theo, *Feral Metaverse* (2024), videogame/interactive work (online documentation), <https://slimetechnology.org/works/feralmetaverse>

Watanabe, Brent, *San Andreas Deer Cam* (2015–16), software-based video work/online stream,

https://bwatanabe.com/GTA_V_WanderingDeer.html

Xenoangel (Marija Avramovic and Sam Twidale), *Supreme* (2021–23), real-time animation/simulated ecosystem.

Youkhana, Sandra, *Default Iraq* (2023), experimental videogame developed in Unreal Engine

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TOWARDS ENGINE ART: OPENINGS AND CLOSURES IN GAME ENGINE CULTURE

In this chapter, we identify some of the key trends that situate *engine art* in the broader history of game art and contemporary media arts. We explore some of the ways in which artists engaging with video games and gaming technologies have approached these texts and tools, examining the different gestures, questions and concerns involved. These approaches have changed in response to transformations in the technological landscapes in which artists operate and the ideologies associated with available technologies. From such a perspective, we speculate that we are now seeing a passage from game art to *engine art*. We define engine art as any artistic intervention which engages with the technological affordances and limitations of game engines, and the values and meanings associated with these technologies.

The passage to engine art is symbolic and symptomatic of a broader transformation in our visual culture. Technologies and processes associated with game-making tools are now used across a broad range of creative sectors, at both the macro level (for example, cinema post-production and architectural visualisation) and the micro level (for example, the creation of images and videos for social media). Engine art captures a new aesthetic which is now becoming dominant and pervasive, de facto constituting a *game engine culture*. As video game engines become the primary tools for producing 3D imagery and immersive environments, they also mediate the practice of many contemporary artists. Through a partial and (intentionally) limited historical reconstruction, we argue that the shift from game art to engine art signifies a different perception of how games can be open or closed to their audi-

ences, viewers, and creators. In particular, we focus on how early game artists have considered video games to be open (or closed) to modification and external intervention. Narratives of participation and the democratisation of access were prominent in early discourses surrounding game art and net art from the early 1990s until the mid-2010s, as exemplified by the practice of *modding*. Following this initial period, we argue that we are now seeing the emergence of a range of diverse approaches.

The popularisation of game engines such as *Unity* and *Unreal Engine* offers new opportunities and capabilities to users, thus rendering previous approaches less relevant. We review some of the underlying ideologies of production and consumption that shape both *Unity* and *Unreal Engine*: we explore the narrative of democratisation of access to game making, and how it goes hand in hand with an attempt to capture users' activities through the platformisation of cultural production. In the final section, we present a number of contemporary case studies through the work of Ian Cheng, Ed Atkins, Lu Yang and Danielle Brathwaite-Shirley. These examples show how engine artists increasingly engage automated creation, such as the use of AI and procedural content generation, as well as audience participation through interactive experiences. While these approaches are not new *per se*, we interpret them as stemming from what video game engines foreclose (the uncontrolled generation of assets and content) and what they facilitate (the creation of interactive experiences). Through the definition of engine art, we highlight how a new generation of artists substantially differentiate their work from that of earlier practitioners.

Narratives of participation in game art: from counterculture to modding

As with other art forms based on complex technologies, the definition, origin and development of game art remain ambiguous. These practices are shaped by complex technical infrastructures. Should we trace the origins of game art back to the advent of technology for producing graphic images, whether still or animated, such as computer graphics? Or should we trace its origins

to the birth of the first interactive systems? Or perhaps to the creation of the first video game, or even earlier still, to the aesthetics of early computer art? The complexity stems from the fact that these forms are not easily categorised.¹ While these questions may seem trivial, they highlight the profound difficulty of naming something so elusive and constantly in flux. This difficulty arises from the fact that game art cannot be fully contained within the structures of art history, since it is continually reshaped by technological change. In these contexts, technology is an integral part of the aesthetic — an aesthetic that resists stable definitions and is structured across multiple areas of technological intervention, both macro and micro. This aesthetic can only be fully understood by placing art history in dialogue with adjacent fields, including media studies, innovation studies, and, in this case, game studies. In this section, we will propose a possible approach to unravelling the history of game art, tracing its origins back to the narratives surrounding the cyberculture that emerged from the counterculture of the 1960s.

Critics and scholars have situated game art within a limited historical window, starting in the late 1990s and concluding shortly after the turn of the millennium. This period coincided with a particular ethos surrounding computer technologies that idealised digital tools as a means of achieving the utopia previously envisaged by the hippie movements of the 1960s. Fred Turner defined this as the transition from counterculture to cyberculture: a period during which the popular perception of computers in the Western world shifted radically.² Once seen as the tools of the military-industrial complex, computers became associated with the collaborative and anti-authoritarian spirit of the emerging cyberculture. This cultural shift helped establish Silicon Valley as a leading centre for digital

1 In the last two decades, game art has come to be broadly defined as art made with, inspired by, or created in response to video games. Many exhibitions around the world have helped to consolidate it as a field, although its boundaries remain largely undefined. For an early analysis of game art, see Matteo Bittanti and Domenico Quaranta's edited collection *Gamescenes: Art in the Age of Videogames* (Monza: Johan & Levi, 2006).

2 Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006).

innovation. These tools were understood as technologies with the potential to transform society as a whole.³ As part of the emerging cyberculture, digital technologies were seen as enabling participatory, bottom-up processes for producing knowledge. This culture has its roots in the political and cultural attitudes of the 1960s counterculture, which viewed technology as a means of fostering interactive, grassroots communities. This spirit later underpinned the technological counterculture of Silicon Valley. Alongside this well-known history, there is a latent and highly experimental culture, exemplified by the Whole Earth Catalog (WEC). Conceived by Stewart Brand, the WEC was an iconic US publication that profoundly influenced counterculture, technology, and environmental thought from the late 1960s to the 1970s. Often dubbed 'Google in paper format' or 'the internet before the internet',⁴ it was far more than a mere product catalogue and broadly comparable to the maker culture that developed later.

The early history of the net art movement of the 1990s, which predates the emergence of game art, is deeply rooted in this cultural landscape, incorporating its initial critiques. Both net art and early forms of game art are characterised by a spirit of participation. Openness, accessibility and a do-it-yourself (DIY) approach are also evident in early game culture. The practice of game modification, or modding, emerged in the early years of the medium and inspired numerous experimental projects. In 1993, the small Texan company id Software released the video game *Doom* as shareware, and in 1997 its source code was released to the public as open source, enabling users to modify the game for non-commercial purposes.⁵ It stands as one of the earliest and most significant instances in which original developers treated openness to modification as a promotional asset.

The concept of modding inspired many artists to transition from net art to game art, and vice versa. Fast forward to the 2004 Whitney Biennial, curated by Chrissie Iles, Shamim M. Momin

3 Richard Barbrook and Andy Cameron, 'The Californian Ideology', *Mute*, 1.3 (1995).

4 Turner, *From Counterculture to Cyberculture*.

5 To be precise, in 1997, the games was released with restricted non-commercial licence; it was only in 1999 (upon re-release under GNU GPL) that it became true open source.

and Debra Singer. One of the artworks featured a *Super Mario Bros.* cartridge repurposed to create an unusual context for play: a setting devoid of elements or enemies, with only a sky full of clouds. Created by Cory Arcangel in 2002, this piece is titled *Super Mario Clouds* and reimagines the celebrated video game in a radically new way. Arcangel removed most of the visual elements, leaving only the floating clouds against a blue background. This foregrounded representation and pictorial space within video games in a new way. More significantly, the artist revived the critical attitude towards mainstream media culture typical of net art through a form of hacking not tied to the web, but to the manipulation of 3D images. Remarkably, the artist shared the instructions and source code, enabling anyone to modify their own copy of the video game and embracing the DIY ethos prevalent in digital counterculture. In this way, software becomes the raw material to be shaped, generating a new understanding of the ludic image.

The ethos of participation was so prevalent at that time that it influenced the narratives through which artworks were conceived and presented to audiences, despite some obvious distortions. The reception of *Super Mario Clouds* is emblematic of this cultural transformation. Initially praised by art critics for modifying the original *Super Mario Bros.* by Nintendo, Cory Arcangel's approach was later challenged by Patrick LeMieux in the 2017 video essay *Everything but the Clouds*.⁶ Here, LeMieux debunks Arcangel's claim to have modified a Nintendo *Super Mario Bros.* cartridge and erased all visual elements except the clouds. By reverse-engineering Arcangel's work and analysing the code he published, LeMieux reveals that it contains no Nintendo code. Narratives surrounding DIY and counterculture were particularly popular at the time. Despite the discrepancies that become apparent on closer inspection, the artist's work circulated for many years based on this narrative.

Although many artists in the 1970s and 1980s explored the relationship between art and computerised images, it was not until the early 2000s that this relationship truly solidified, exploiting

6 Patrick LeMieux, *Everything but the Clouds* (2017), single-channel digital video essay (colour, sound), 19 min 44 sec (United States).

the aforementioned practices of modification. This consolidation occurred through the modification of existing images, as demonstrated in Arcangel's work, and through the development of affordable software for computer graphics and the growth of computer vision. The collective JODI (Joan Heemskerk and Dirk Paesmans), for example, started using images from video games in their work in the mid-to-late 1990s. They were invited to CADRE (Computers in Art, Design, Research, and Education) at San Jose State University for a residency, where they experimented with advanced technologies of the time. It was in this context that JODI created influential works such as *SOD* (1999), which abstracted images from the video game *Wolfenstein 3D* (id Software, 1992) into simple black-and-white geometric as well as *Untitled Game* (1996–2001), which appeared in multiple iterations, presenting a 'broken version' of Quake (Id Software).

With game art, and more broadly with works based on video game technologies, we encounter a new stage of representation that both reclaims and extends the practices discussed thus far. We are, in fact, talking about an 'evolving and mutating field', an inevitable factor given that 'it is not built on one dominant application, programming language, medium or aesthetic, nor does it consist of a single, homogeneous, community. But this also means that the work is very diverse and cannot therefore be easily or rigidly defined in terms of its themes, technology and techniques.'⁷ In this section we have illustrated how the early history of game art can be discussed through the lens of the narratives of openness and DIY that defined the transition from counterculture to cyberculture. Practices of modding are particularly emblematic of such an approach to artistic creation. This is only one of many possible interpretations of the history of game art, but one that allows us to situate these early experiments within the following narratives of democratisation and platformisation of game-making that currently define the cultures surrounding video game engines.

7 Andy Clarke and Grethe Mitchell, *Videogames and Art* (London: Intellect Books, 2006), p. 24.

Game engines as cultural software: the democratisation and platformisation of game making

Since the mid-2010s, video game development tools, also known as ‘game engines’, have played a prominent role in the culture of game creation. There has always been a diversity of game engines in the history of video game culture, and this section will discuss some of these earlier experiments. However, more recent engines have entered the market by promoting themselves as all-encompassing platforms for game development, extending their reach into a range of fields that rely on 3D image production. The popularisation of these tools has had a significant impact on all creative sectors, including media arts. In this section, we will discuss how game engines — particularly Epic Games’ Unreal Engine and Unity Technologies’ Unity — expand the narratives of openness and participation in the cultures surrounding modding. These companies promote the democratisation of game development. According to the promotional material and online presence of Epic Games and Unity Technologies, game engines should facilitate access to game creation for non-professionals and amateurs, reminiscent of the DIY culture of the 1960s and in line with later experimentation in game art. However, the democratisation of access is now filtered by a fundamental difference pertaining to the politics and ideologies surrounding the capture of contemporary digital technologies. Game engines intersect with the platformisation of cultural production, which aims to control users’ activities by directing their workflows and shaping a default aesthetic.⁸ Artistic practices that engage with digital image-making are currently confronted with this new technological and economic paradigm.

Game engines have long transcended their role as mere technical components in video game development, evolving into multifaceted tools that influence the feasibility of game creation and define its cultural value and significance. They embody the ideologies associated with cultural production in the video game industry: the various approaches, beliefs and attitudes that shape

8 Anne Mette Thorhauge, *Games in the Platform Economy: Steam’s Tangled Markets* (Bristol: Bristol University Press, 2023).

how game makers understand their own practice. Engines have a variety of uses, stemming from different production and consumption approaches. They have also embodied an ethic of independence and autonomy by providing tools for hobbyist game makers and by enabling players to use commercial games as sandboxes for unauthorised modification. However, game engines have also been used as tools of control, capturing the desires and pleasures surrounding digital play while 'locking in' industry ideologies.⁹ Platforms and metaverse environments, for example, tend to store and manage users' work, granting ease of access and interoperability while imposing predetermined pathways for creative production.¹⁰ As sophisticated software and cultural artefacts, game engines are now fundamental gateways to game creation and distribution. Their core logic is now extending into fields that depend on 3D imagery, carrying with it the symbolic and ideological assumptions embedded in these tools.

In their 2019 work, *The Unity Game Engine and the Circuits of Cultural Software*, Benjamin Nicoll and Brendan Keogh introduce the concept of 'cultural software' as 'software that provides code frameworks for actions we normally associate with cultural production'.¹¹ The production of cultural texts, mediated by software, adapts to the affordances and limits of these tools. Cultural software, such as the Unity game engine that the authors examine in their work, exerts its influence by organising both workflows and aesthetics. First, these platforms dictate a particular sequence of operations, guiding users through predefined stages of creation. For instance, game engines inherently structure the development process into logical steps like asset creation, scene building, scripting, and testing. This pre-established pipeline, while promising efficiency, can superimpose a game development methodology onto other, potentially disparate, creative fields. A filmmaker using Unity for virtual production might find their

9 Maxwell Foxman, 'United We Stand: Platforms, Tools and Innovation with the Unity Game Engine', *Social Media + Society*, 5.4 (2019), 1–10.

10 Aleena Chia, 'The Metaverse, but Not the Way You Think: Game Engines and Automation Beyond Game Development', *Critical Studies in Media Communication*, 39.3 (2022), pp. 191–200.

11 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019).

artistic process subtly reoriented to align with the engine's inherent logic for constructing interactive environments.

Secondly, cultural software establishes and reinforces a type of *engine aesthetic*. In the case of Unity and Unreal Engine, this is largely due to the widespread availability and reuse of assets and ready-made functions within these ecosystems. Game engines, for example, offer vast libraries of pre-built models, textures, animations, and scripts. While these resources might accelerate production and lower the barrier to entry, they also contribute to a homogenisation of visual styles and interactive experiences. When numerous creators draw from the same pool of standardised assets and utilise similar built-in functionalities, a discernible engine aesthetic can emerge across diverse projects. Cultural software, by streamlining and facilitating cultural production, establishes certain norms and expectations that can lead to both a standardisation of the production workflows and a degree of aesthetic conformity.

In recent years, Unity and Unreal Engine have become dominant tools in the creative sector. Their widespread adoption has led to the creation of a predefined approach to the generation of 3D imagery, resulting in a shared aesthetic that is now becoming visible across visual projects from a variety of fields. In this chapter, we observe that these production methods and the aesthetics of game engines are embedded in a set of values associated with contemporary visual and software culture, and that artists can challenge and critique these values through their work. A brief historical overview of how game engines have invited users to engage with game creation reveals how values associated with democratising access have changed over time.

Unity and *Unreal Engine* embrace a rhetoric of democratisation of game production, and in doing so, they also reinforce a particular perspective on how access to cultural and artistic production should be understood. This view is not fixed in the history of game engines, but is continuously renegotiated. The history of game engines is characterised by a conflict between openness and closure, accessibility and appropriation, and democratisation and control. While it is difficult to pinpoint the origins of this dual nature, significant examples can be traced back to the home computing and independent scenes. Software such as the *Shoot*

'Em Up Construction Kit (SEUCK), released by British company Sensible Software in 1987, exemplifies this trend. *SEUCK* was a creative sandbox that enabled players to design and build their own shoot 'em up video games. The tool accessible enough to encourage many aspiring game makers to experiment with its tools, while also offering precise boundaries and limits. Users would find it difficult to use *SEUCK* for anything other than facilitating the design of shoot 'em ups. This ethos is further evident in more recent engines such as *Twine*, an open-source game development platform used by amateurs, independent game makers, artists, and experimenters since the early 2010s. *Twine* embraces a diverse community of users by facilitating those without programming skills. However, its fundamental functions are intentionally limited. *Twine* is primarily a tool for creating story-based video games. By restricting options rather than expanding them, *Twine* encourages its users to experiment with its limitations. By emulating the structure of writing in its game design, *Twine* has been adopted by a large community of developers as it is better suited to their needs, easier to access and an ideal tool for creating story-based titles that do not require hyper-realistic imagery.

Other approaches to the organisation of game-making highlight different understandings of openness, accessibility and democratisation. Tim Sweeney's *ZZT*, released in 1991, exemplifies this trend. An adventure game, *ZZT* was famously bundled with its own development tool, explicitly inviting players to take on the role of game creators with its World Editor. As Anna Anthropy has noted, *ZZT* is a significant early example of a game that fostered a DIY spirit and provided easy-to-access tools for a generation of aspiring developers.¹² Beyond its democratising approach, *ZZT* laid out in principle the notion of the uber-engine: a tool sufficiently flexible to enable the creation of any sort of video game experience. Its object-oriented structure allowed users to create titles of different types and genres. Its author, Tim Sweeney, would later expand on this approach by creating the Unreal Engine, which is to this day the most popular platform for video game development.

12 Anna Anthropy, *ZZT* (Los Angeles, CA: Boss Fight Books, 2014).

Beyond these tools for hobbyists, the instrumental use of video games as engines themselves became a hallmark of pioneers such as id Software. Titles such as *Doom* (1993) and *Quake* (1996) demonstrated that the technology powering a video game could be licensed and reused, effectively transforming games into platforms on which new creations could be built. The development of first-person shooters, such as the titles just mentioned, became for many companies an opportunity to develop an engine for multiple applications. id Software's approach was later expanded by Valve's Source, released in 2004. Source, primarily used by Valve for popular titles such as *Half-Life 2*, *Portal*, *Dota 2*, and *Counter-Strike: Global Offensive*, became a widely used engine for a number of projects, not limited to the first-person genre. At this stage, the model of the uber-platform started to become prominent in the video game industry, paving the way for the current landscape in which a small number of competing platforms attempt to control game development in all its forms.

The success of tools such as Source laid the groundwork for the exploitation and commercialisation of game engines. This culminated in what scholars Aleena Chia, Brendan Keogh, Dale Leorke, and Benjamin Nicoll describe as the platformisation tendencies of game development.¹³ The authors highlight how certain companies and their technologies become central infrastructures upon which other developers build their titles. Unity, for instance, exemplifies how a narrative of democratisation of game production can be exploited to attract and capture users' activities. As the authors argue, Unity is a platform which 'seeks to mediate, govern, and monopolise videogame production processes, developer identities, and career aspirations'.¹⁴ In their work, Chia and colleagues observe how even within these platformisation tendencies we can find diverse and sometimes opposing approaches. They cite *Twine*, already discussed in this chapter, as an example of a platform that resists monopolising tendencies.

¹³ Aleena Chia, Brendan Keogh, Dale Leorke, and Benjamin Nicoll, 'Platformisation in Game Development', *Internet Policy Review*, 9.4 (2020).

¹⁴ *Ibid.*, p. 10.

These initial examples show how the principle of facilitating game development and democratising its access can take different, if not opposite, meanings. Openness, accessibility and democratisation of game making can translate into specialised tools for the creation of specific titles, but can also pave the way for broader software packages that facilitate the production of a range of interactive experiences. The latter approach has proved to be most popular in contemporary game production culture, since it has embraced the principles of control and capture of creative production of the platform economy. Thus, game engines bring to the fore the underlying ideologies associated with production that the development team and the community of users tend to embrace. In this regard, Unity and Unreal Engine represent the pinnacle of a way of understanding game making as the dominant modality of creative production. These are not simply tools for creating games; they are comprehensive ecosystems designed to facilitate the creation of virtually any 3D imagery. Unity and Unreal have fully embraced the platformisation trend, aiming to be the go-to uber-tools for all forms of interactive 3D content, far beyond video games. They offer extensive asset stores, integrated development environments, and vibrant communities, effectively establishing themselves as indispensable platforms that dictate workflows and opportunities for countless developers worldwide. Their dominance signals a profound shift: game engines are entering our contemporary culture as pervasive platforms shaping the creative output and economic realities of the digital entertainment industry, as well as the creative industries more broadly. As forms of cultural software, they shape how cultural products come into being, and how they look.

Engine art: new openings

Unity and *Unreal Engine* have promoted a narrative of democratisation of game making, which has in its own turn inspired many artists to take on these tools. Some of the approaches of the previous generation of game artists are still present, although the ways in which the openness and closure of these systems are approached have shifted. Manipulating the code of video games is now less

significant and critical than it was in early game art, considering that game engines present themselves as open tool toolboxes to be modified and played with. In this section, we attempt to offer a minimal mapping of how some of the themes previously discussed still resonate among contemporary artists who engage with game engines. In particular, we identify in art made with video game engines a tendency to explore two new and different kinds of openings: the possibility of automated and generative creation (an opening from *within* the engine) and the participation of the user/player in the interactive and world-building experience.

We refer to this field of creative production as engine art in order to distinguish it more clearly from the earlier category of game art. Opening and closures are still present in such a new wave of art, although their main reason for existence has now changed. Engine art is defined not only by the use of game engines (of which Unity and Unreal Engine are only the two most prominent), but by engaging with the aesthetics and the production workflows of these tools. Engine art explores and challenges what Benjamin Nicoll and Brendan Keogh call the 'grain' of game engines.¹⁵ Drawing on terminology used in woodworking, the authors identify in the 'grain' a way of naming the otherwise nebulous design processes and methodologies that game engines tend to favour over others, giving their products a certain 'look and feel' which distinguishes, for instance, a project made with Unreal Engine from one made with Unity. Moreover, engine art investigates and speculates on the politics and ideologies underlying game engines, for instance in the ways in which data is created and managed by their proprietary companies, and how users' productions are captured by these digital platforms.

Engine art tends to reveal some of the limitations of game engines, which are now more subtle than before — particularly when considering how Unity and Unreal Engine are marketed to their audiences as open and accessible to all. These restrictions are found in systems that are supposedly accessible to everyone and presented as customisable toolboxes with a variety of features, assets, and visual effects available to users. The closures in

15 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*, pp. 63–80.

Unity and Unreal Engine relate to how these software packages operate as platforms, controlling the generation and sharing of assets and content. In response to this sense of closure, artists have speculated about the potential of these tools to generate endless combinations of new content. Procedural content generation is widely used by engine artists, and we argue here that this can be interpreted as a reaction to the restrictions imposed by game engines as platforms and the implied foreclosure of users' ownership of their own assets. In these works, content generation becomes lively and largely unpredictable.

Consider the work of Ian Cheng, and the artist's use of Unity to create 3D simulations which remain open to the automated generation of content and the users' modification. In Ian Cheng's *Emissaries* trilogy, composed of *Emissary in the Squat of Gods*, *Emissary Forks at Perfection*, and *Emissary Sunsets the Self*, produced between 2015 and 2017, the simulations presented on screen imagine the life of an emissary who moves across two worlds: the present world in which we live, and a new one created by an artificial intelligence. The trilogy is presented by the artist as a videogame that plays itself. The characters on screen move and react to each other following a generative pattern, which is left open to fairly unpredictable sequences of movement. In Ian Cheng's works, we encounter a different kind of opening: one oriented towards procedural content generation and user interaction. We also see a reflection of the artist's interest and preoccupation towards the ecological crisis we are currently witnessing. The *Emissaries* trilogy imagines how artificial life, imagination and world-building could prosper after the demise of all forms of organic life from planet Earth. Game engines, and the whole video game industry, have a strong impact on our ecology, by contributing to the creation of CO₂ and the overconsumption of energy resources.¹⁶ Ian Cheng's work highlights one of the aspects which are most often kept opaque by video game companies, and that is how digital simulations (even those who expose and discuss our contemporary environmental crisis) contribute to the planet's overheating.

16 Benjamin Abraham, *Digital Games After Climate Change* (Cham, Switzerland: Palgrave Macmillan, 2022).

Several artists have been experimenting with the automated generation of objects and animations in game engines. The work *Refuse.exe* by Ed Atkins (2019), for instance, is a two-channel video installation made with *Unreal Engine*, which plays with the unpredictability of automated content generation. It is a real-time 3D simulation, in which the viewer can see various types of objects falling to a stage and piling up as trash. Citing the text produced as part of Ed Atkins' solo show at TANK in Shanghai in 2022, in *Refuse.exe* '[t]he fall, the collisions and the accumulated heap are randomised by the live, simulated physics, so that every performance — every run-through of the programme — is unique'. Atkins conceives *Refuse.exe* as 'a play about unwanted things returning, performed by a sprawling catalogue of Computer Generated objects and phenomena, whose only direction is down, and whose only motivation is gravity'.¹⁷

With this work, the artist intends to engage the viewer with a performance enacted by a nonhuman agent — a modified version of the Unreal Engine — in all its weirdness and unpredictability. According to the artist, the uniqueness of each performance invites the spectator to reflect on how the work is produced and how it continually regenerates itself.¹⁸ We also see a timid return of the modding spirit that characterised earlier artworks in game art. Atkins appears to have modified Unreal Engine, although in numerous interviews and publications on his work we cannot find further information on this gesture. The modification is only mentioned by the artist, and scarcely explored by critics and curators. There is continuity with the gesture of opening up the cartridge of *Super Mario Bros.* enacted by Cory Arcangel in *Super Mario Clouds* (2002). However, the opening is less prominent in the way the artwork is presented and discussed, signalling that the fascination for the act of modifying a closed system is less relevant in the age of engine art.

In other examples of engine art we can see how the gesture of inviting the viewers to become players as a form of audience

17 TANK Shanghai (2022–23), 'Ed Atkins: Refuse.exe', *TANK Shanghai*, 8 July 2022–8 January 2023.

18 The artist reflects on his approach in an online interview produced to coincide with the opening of his exhibition at TANK Shanghai. See bibliography for URL.

participation is becoming more prominent. Because Unity and Unreal Engine make it relatively easy to produce interactive 3D simulations, many artists have adopted this possibility in their own projects. One of the artists who has most explored this opportunity is Lu Yang, who has produced a corpus of artworks that can be played as part of her exhibition. Lu Yang draws heavily on the aesthetics of video games and anime. Her artworks often feature 3D graphics, hyperrealistic animations, characters that seem to come straight out of a video game, and a sense of immersion reminiscent of video game experiences. She uses game engines as the primary creative medium for her animations and video installations. In Lu Yang's work, the narrative of access and participation is still present, but translated in a new technological paradigm. Many of her works are not just videos to watch, but immersive video game installations, sometimes including virtual reality (VR). This allows the viewer to be more than a simple observer; they can 'enter' the world created by the artist, experiencing a more participatory and multisensory engagement. An emblematic example of her relationship with video game imagery is the creation of *DOKU*, a hyperrealistic, non-binary digital avatar that represents a kind of digital reincarnation of the artist. The name *DOKU* comes from the Buddhist phrase 'Dokusho Dokushi,' meaning 'we are born alone and die alone'. *DOKU* is the protagonist of many of her video works and installations, and through it, Lu Yang explores concepts of fluid identity, mortality, cycles of life and death, and the search for enlightenment in a post-human, digital world. *DOKU* appears in various forms, from Buddhist deities to video game characters, travelling through the six realms of Buddhist reincarnation. At her solo show at the Zabłudowicz Collection in London in 2022, titled *NetiNeti*, the artist dedicated an entire room to the exhibition of a series of artworks presented as coin-op video games.¹⁹ The room replicated the style and imagery of a video game arcade, populated with interactive artworks that explored various characters and aspects of their video installations.

19 Zabłudowicz Collection (2022–23), 'Lu Yang: NetiNeti', *Zabłudowicz Collection*, 22 September 2022–12 March 2023.

Another artist who has embraced the possibilities offered by video game engines is Danielle Brathwaite-Shirley. On their website, the artist has a dedicated section to ‘playable games’, and a good part of their production is dedicated to the creation of interactive experiences and VR simulations.²⁰ Those works concern the lived experience of Black trans people and communities, and they intend to involve the audience through complex choices, actions, and narrative nodes. Much of Danielle Brathwaite-Shirley’s work is intentionally difficult to navigate and assimilate as a spectator. Brathwaite-Shirley’s work directly challenges the idea that we should simply observe art from a distance. In their 2022 exhibition at Arebyte gallery in London, *She Keeps Me Damn Alive*, viewers were invited to become players of the artist’s game. The viewers had to protect Black trans people with a virtual gun, but were also told not to ‘shoot Black trans people’. In this double gesture, the participants were held accountable for their actions and responsible for drawing the line between black and non-black, trans and non-trans. This was all part of a scenario that required violence while also condemning it. By inviting participants to take part in this scenario, the artist makes them accountable for the choices they are asked to make, which are not easily resolved. In an interview with curator Rebecca Edwards, the artist claims:

I want people to feel uncomfortable about using a gun as a controller, feeling as though the choice you make cannot be hidden from the world but instead must be made in public for all to watch. It is about showing you care or lack of care so everyone knows who you are. It’s about taking action publicly.²¹

The complexities and contradictions of this type of participation can only be realised by embracing the affordances of the game engine while also manipulating their mechanics. Brathwaite-Shirley’s interactive games deviate from standard design patterns and escape the predefined workflows of game-making typically incentivised by Unity and Unreal Engine. For example, the artist adopts a lo-fi aesthetic in which the shapes of the characters are often difficult to recognise and they appear nebulous to

20 Brathwaite-Shirley, Danielle. [n.d.]. Danielle Brathwaite-Shirley, website.

21 Arebyte. [n.d.]. *She Keeps Me Damn Alive*.

the viewer. Much of Brathwaite-Shirley's work conveys a sense of obsolescence. Viewers move through an environment populated by objects and figures that remain active and present, yet seem to belong to a world we no longer know how to categorise. Although the artist has rarely spoken about their work in relation to the aesthetics of the game engine, we can see how the tendency to capture creative work within predetermined pathways — a feature of the platformisation of cultural production — is challenged here.

Conclusion: from engine art to game engine culture

In this chapter, we have attempted to contextualise the contemporary wave of engine artists both aesthetically and historically by offering a reconstruction of the transition from game art to engine art. Our reconstruction is intentionally limited and partial, focusing on a selection of gestures and approaches that help elucidate the specific features of some of the most prominent artworks in this field. We have summarised some of the defining features of game art, particularly in relation to pre-existing modding practices. We have explored how game art opened the supposedly closed system of the video game and the significance of this development in relation to existing narratives surrounding participation and DIY in digital culture. The current technological landscape is dominated by video game engines such as *Unity* and *Unreal Engine*, which now mediate most creative productions involving 3D imagery. These engines operate as cultural software, directing the workflows and aesthetics of a wide variety of videos, images and interactive texts created using them. We have coined the term *engine art* to describe art that engages with these technologies by exploiting their features and challenging some of their predetermined components. We have provided an overview of pieces by acclaimed artists such as Ian Cheng, Ed Atkins, Lu Yang, and Danielle Brathwaite-Shirley. We have examined how these artists mobilise automated content generation and viewer participation in ways that respond directly to the challenges game engines pose for cultural production. To conclude, we maintain that engine art responds to a broader transformation in our contemporary visual culture. As game engines become dominant

tools in the generation of digital images in a variety of fields and consumption practices, we are now witnessing the emergence of game engine culture. Engine art captures these cultural, technical, and aesthetic transformations.

Bibliography

- Abraham, Benjamin J., *Digital Games After Climate Change* (Cham, Switzerland: Palgrave Macmillan, 2022)
- Anthropy, Anna, *ZZT* (Los Angeles: Boss Fight Books, 2014)
- Arebyte, 'She Keeps Me Damn Alive' [n.d.], <https://www.arebyte.com/she-keeps-me-damn-alive-interview> [accessed 20 July 2025]
- Barbrook, Richard, and Andy Cameron, 'The Californian Ideology', *Mute*, 1.3 (1995), <https://www.metamute.org/editorial/articles/californian-ideology> [accessed 20 July 2025]
- Bittanti, Matteo, and Domenico Quaranta, eds, *Gamescenes: Art in the Age of Videogames* (Milan: Johan & Levi, 2006)
- Brathwaite-Shirley, Danielle, Danielle Brathwaite-Shirley, n.d., <https://www.daniellebrathwaiteshirley.com/home> [accessed 20 July 2025]
- Chia, Aleena, 'The Metaverse, but Not the Way You Think: Game Engines and Automation Beyond Game Development', *Critical Studies in Media Communication*, 39.3 (2022), 191–200 <https://doi.org/10.1080/15295036.2022.2080850> [accessed 20 July 2025]
- Chia, Aleena, and others, 'Platformisation in Game Development', *Internet Policy Review*, 9.4 (2020) <https://doi.org/10.14763/2020.4.1515> [accessed 20 July 2025]
- Clarke, Andy, and Grethe Mitchell, *Videogames and Art* (London: Intellect Books, 2006)
- Foxman, Maxwell, 'United We Stand: Platforms, Tools and Innovation with the Unity Game Engine', *Social Media + Society*, 5.4 (2019), 1–10 <https://doi.org/10.1177/2056305119880177> [accessed 20 July 2025]
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019)
- TANK Shanghai, 'Ed Atkins in Conversation', online video recording, YouTube, 24 May 2022 <https://www.youtube.com/watch?v=lpLWtBzzzDI> [accessed 20 July 2025]
- , 'Ed Atkins: Refuse.exe', TANK Shanghai, 8 July 2022–8 January 2023 <http://tankshanghai.com/exhibition/refuse/> [accessed 20 July 2025]
- Thorhauge, Anne Mette, *Games in the Platform Economy: Steam's Tangled Markets* (Bristol: Bristol University Press, 2023)

- Turner, Fred, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006)
- Zabludowicz Collection, 'Lu Yang: NetiNeti', Zabludowicz Collection, 22 September 2022–12 March 2023, <https://www.zabludowiczcollection.com/exhibitions/view/luyang-netineti> [accessed 20 July 2025]

Artworks

- Arcangel, Cory, *Super Mario Clouds* (2002; video installation; modified Nintendo Entertainment System cartridge)
- Cheng, Ian, *Emissaries* (2015–17), live simulation trilogy, comprising *Emissary in the Squat of Gods* (2015), *Emissary Forks at Perfection* (2015–16), and *Emissary Sunsets the Self* (2017)
- JODI, *SOD* (1999; game modification of *Wolfenstein 3D* (id Software, 1992))
- LeMieux, Patrick, *Everything but the Clouds* (2017; single-channel digital video essay, colour, sound, 19 min 44 sec), Vimeo <https://vimeo.com/241966869> [accessed 20 July 2025]

Ludography

- Epic Games, *Unreal Engine* (game engine, 1998–; first deployed with *Unreal* (Epic Games, 1998))
- id Software, *Quake* (PC; GT Interactive, 1996)
- , *Wolfenstein 3D* (MS-DOS; Apogee Software, 1992)
- Sensible Software, *Shoot-'Em-Up Construction Kit* (Commodore 64/Amiga/Atari ST; Outlaw, 1987)
- Sweeney, Tim, *ZZT* (MS-DOS; Potomac Computer Systems, 1991)
- Unity Technologies, *Unity* (game engine, 2005–)
- Valve, *Counter-Strike: Global Offensive* (PC; Valve, 2012)
- , *Dota 2* (PC; Valve, 2013)
- , *Half-Life 2* (PC; Valve, 2004)
- , *Portal* (PC; Valve, 2007)
- , *Source* (game engine, 2004–; debuted with *Half-Life 2* (Valve, 2004))

TEODORA SINZIANA ALATA

GAME ENGINES, CONTEMPORARY ART, AND THE SPECULATIVE DRIFT AWAY FROM PLATFORM LOGICS

Game engines have become influential infrastructures in contemporary digital artistic practice. Moving beyond their origins in entertainment, they now shape how digital environments are assembled and experienced across a variety of contexts. Highly optimised for efficiency and seamless interactivity, they encode implicit norms about realism, agency, and user behaviour, producing design logics that influence how virtual space is rendered, how digital time unfolds, and what forms of interaction are legible. As they enter experimental art-making contexts, these design protocols of modularity and control shape creative possibility, raising urgent questions about how artists might inhabit, reroute, or resist them.

Yet despite this growing centrality, game engines remain undertheorised as infrastructures, particularly in relation to how their design logics intersect with creative practices that sit outside established game design patterns. This chapter contributes to an emerging conversation at the intersection of platform studies, software aesthetics, and contemporary digital art by proposing the concept of 'speculative drift' as a framework for understanding how experimental artistic practices engage the engine as a production platform. In contrast to accounts that privilege visual outputs or treat game engines primarily as representational media, this framework attends to how artists embed themselves within the infrastructural logic of these systems and gently reorient their operations. Speculative drift offers a way to conceptualise practices that are not oppositional but immanent: situated

within the pipeline, responsive to its points of friction, and capable of generating alternative forms of worlding.

Rather than directly confronting or dismantling these platforms, artists who engage in speculative drift work within the computational frameworks of the engine even as they diverge from its default operations and representational paradigms. Speculative drift unfolds through the entanglement of aesthetic and procedural intervention: it reorients visual tropes and representational conventions while simultaneously inhabiting the temporal instabilities and logical excesses of real-time systems; it operates at the level of narrative and visual form, as well as within the rendering pipeline and logic loops that govern how digital reality unfolds. Together, these gestures reveal how artists make space for ambiguity within tightly regulated infrastructures.

Emerging from a lineage of feminist technoscience, posthumanist theory, and critical media studies, speculative drift foregrounds a mode of engagement attuned to instability and opacity in systems typically structured around precision and optimisation. It draws on relational ontologies that emphasise the entanglement of human and non-human agencies, as well as on speculative practices that reorient systems from within. This perspective is indebted to works such as Rosi Braidotti's posthuman ethics of immanence and generative resistance;¹ Wendy Hui Kyong Chun's account of the temporal decay of computation;² Luciana Parisi's theorisation of algorithmic indeterminacy and excess;³ Ruha Benjamin's critique of default logics drifting towards exclusion unless reworked from within;⁴ Shintaro Miyazaki's analyses of "algorhythms" and microtemporal instability⁵; and Erin Manning's notion of the minor gesture as a deviation within dominant structures, which shifts the system's trajectory without fully

1 Rosi Braidotti, *The Posthuman* (Cambridge: Polity, 2013).

2 Wendy Hui Kyong Chun, *Updating to Remain the Same: Habitual New Media* (Cambridge, Massachusetts: MIT Press, 2016).

3 Luciana Parisi, *Contagious Architecture: Computation, Aesthetics, and Space* (Cambridge, Massachusetts: MIT Press, 2013).

4 Ruha Benjamin, *Race After Technology: Abolitionist Tools for the New Jim Code* (Cambridge: Polity, 2019).

5 Shintaro Miyazaki, 'Algorhythmics: Understanding Micro-Temporality in Computational Cultures', *Computational Culture*, 2 (2012).

detaching from it.⁶ Together, these critical strands help situate speculative drift as a method of inhabiting platforms differently, through subtle deviations from their intended uses.

From the perspective of platform studies, game engines emerge as technical-cultural systems that encode assumptions about usability, performance, and visibility, and whose constraints become legible through close attention to their technical form.⁷ Speculative drift offers a way of engaging these logics from within: a method of inhabiting the pipeline differently and foregrounding the minor deviations that accumulate into alternate forms of worlding.

Speculative drift operates across multiple levels, from situated artistic interventions to broader infrastructural operations: rather than offering a fixed aesthetic strategy, it provides a conceptual orientation towards computational media that embraces indeterminacy and the refusal of closure. Such interventions take shape across the layers of the game engine pipeline, from the modulation of assets and storytelling architectures to the exposure of governance structures and algorithmic constraints. At a more localised level, speculative drift involves deliberate manipulations of rendering techniques and behaviours that interrupt default dynamics. At a broader level, it operates as a form of infrastructural speculation: a reorientation of the pipeline's purpose away from optimisation and towards aesthetic ambiguity.

To examine how speculative drift functions in practice, this chapter draws on three key case studies: Pete Jiadong Qiang's *Queer Maximalism HyperBody* (2017-24),⁸ Alice Bucknell's *The Martian Word for World is Mother* (2022),⁹ and Theo Triantafyllidis's *Feral Metaverse* (2024).¹⁰ These artists each offer distinct engagements with the aesthetic, technical, and ideological conditions of game engine infrastructures. Qiang's maximalist strate-

6 Erin Manning, *The Minor Gesture* (Durham, North Carolina: Duke University Press, 2016).

7 Nick Montfort and Ian Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, Massachusetts: MIT Press, 2009); Søren Bro Pold and Christian Ulrik Andersen, *The Metainterface: The Art of Platforms, Cities, and Clouds* (Cambridge, Massachusetts: MIT Press, 2018).

8 Pete Jiadong Qiang, *Queer Maximalism HyperBody* (2017-24).

9 Alice Bucknell, *The Martian Word for World is Mother* (2022).

10 Theo Triantafyllidis, *Feral Metaverse* (2024; prototyped and exhibited in 2023).

gies challenge the optimisation imperatives of real-time rendering, rejecting the demand for efficiency and modular coherence. Bucknell's work resists the narrative constraints of game engines by rejecting player-centric storytelling in favour of non-linear, speculative worlding. Meanwhile, Triantafyllidis leverages absurdity to reveal the affective possibilities of the simulated engine environment. Across these practices, speculative drift emerges not as a breakdown of the infrastructure, but as a way of inhabiting its margins, opening up space for different temporalities, aesthetics, and modes of relation.

Platformisation and the Engine as Infrastructure

Game engines have undergone a significant shift from specialised tools for game development to general-purpose platforms underpinning a vast array of creative, commercial, and industrial applications. Unity and Unreal Engine, in particular, are no longer niche software environments; they now operate as infrastructural technologies whose influence extends across sectors, from digital twins and automotive design to film production, architecture, and immersive art. Their increasing integration into contemporary artistic practices invites a deeper examination of how these engines function not just as tools for image-making but as governing platforms that shape what can be made, how, and by whom.

This expansion of game engines beyond the realm of entertainment into broader domains of virtual production and simulation illustrates their influence far beyond their initial design: today, game engines operate as infrastructural platforms that shape digital creativity through regulatory mechanisms, economic imperatives, and aesthetic standardisation. This section examines the platformisation of game engines, focusing on how their embedded workflows enforce modularity and standardisation while positioning them as controlled ecosystems that structure digital production, shaping both the aesthetics of virtual worlds and the economic models through which they are created and distributed.

The increasing dominance of specific engines like Unity and Unreal is emblematic of a shift towards platform-based digital

production, wherein creative labour is channelled through pre-defined pipelines that prioritise efficiency and scalability.¹¹ Chia *et al.* highlight how game engines function as infrastructural assemblages, regulating access to tools, assets, and workflows while embedding assumptions about optimised performance and economic viability.¹² James Malazita extends this argument by demonstrating how the Unreal Engine encodes specific ideological biases, privileging realism, high-fidelity rendering, and technical mastery.¹³ This structuring of creative practice through game engines situates them as more than neutral mediators; they actively condition how artistic production unfolds within digital environments.

Understanding the game engine as infrastructure involves attending to the technical, aesthetic, and epistemic conditions embedded in its logic. This includes the procedural organisation of content, modular asset pipelines, and a host of ‘invisible’ defaults that govern interactivity and visual coherence. Scholars in platform and software studies have long emphasised the embeddedness of platforms in political and economic systems.¹⁴ Within game engines, these embedded conditions manifest as implicit norms around efficiency, usability, realism, and control. Artists who engage with these systems must navigate an infrastructure that is not passive, but performative, one that anticipates certain behaviours, aesthetics, and user roles while rendering others invisible or non-viable.

Game engines do not simply mediate visual culture; they govern through logic, through code, and through tightly structured pipe-

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- 11 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019).
 - 12 Aleena Chia, Brendan Keogh, Dale Leorke and Benjamin Nicoll, ‘Platformisation in Game Development’, *Internet Policy Review*, 9.4 (2020).
 - 13 James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024).
 - 14 Tarleton Gillespie, *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions That Shape Social Media* (New Haven: Yale University Press, 2018); Thomas Poell, David Nieborg and José van Dijck, *Platforms and Cultural Production* (Cambridge: Polity, 2021); Anne Helmond, ‘The Platformization of the Web: Making Web Data Platform Ready’, *Social Media + Society*, 1.2 (2015), 1–11.

lines that segment and optimise production.¹⁵ They determine the protocols through which assets can be made interoperable, and they condition how spatiality, temporality, and interaction are rendered thinkable. In this sense, the engine functions not only as a technical framework but as a diagram of power, embedded with normative assumptions about usability and efficiency.

As platformised infrastructures, game engines facilitate a standardisation of content creation that aligns with industry-driven imperatives. Gillespie describes platforms as sites of governance that regulate not only access but also the terms of participation, constraining the creative agency of users.¹⁶ In the context of game engines, this governance manifests in the form of asset stores, licensing agreements, and optimised pipelines that favour monetisable outputs over experimental or speculative artistic engagements. Artists must therefore navigate these constraints, manipulating the game engine's parameters towards unintended results.

This regulation is further reinforced through asset marketplaces and subscription-based licensing structures that entrench economic dependencies between creatives and platform owners. The shift from perpetual software ownership to subscription models mirrors broader trends in platform economies, where access to creative tools is contingent on continuous financial investment rather than outright ownership. Such economic structuring shapes the conditions under which independent artistic production takes place, while consolidating infrastructural control within a limited number of corporate actors. As Nick Seaver argues, platforms generate the economic and epistemic conditions under which creative work becomes possible.¹⁷ This means that the affordances available to artists are shaped in advance by logics of optimisation and monetisation. Consequently, experimental or critical uses of game engines emerge through subtle

15 Eric Freedman, *The Persistence of Code in Game Engine Culture* (London: Routledge, 2020).

16 Tarleton Gillespie, "The Politics of "Platforms"", *New Media & Society*, 12.3 (2010), 347–64.

17 Nick Seaver, *Computing Taste: Algorithms and the Makers of Music Recommendation* (Chicago: University of Chicago Press, 2022).

manoeuvres within these constraints, setting the stage for the speculative reorientations explored in the following sections.

Control within engine infrastructures is not only economic but also deeply procedural. Recent writing in software and infrastructure studies has emphasised the importance of computational rhythm and infrastructural timing.¹⁸ These perspectives shift attention from the visual and spatial dimensions of engines to their temporal architectures: frame rates, update loops, buffering, latency. Such temporalities are not neutral or purely technical; they shape the aesthetic and affective conditions of real-time media, structuring how presence, responsiveness, and causality are rendered perceptible. Game engines, therefore, do not just simulate space; they organise time, enacting a mode of control that operates at the level of systemic coherence.

Alongside this, the modular design of game engines, often celebrated for its accessibility, reinforces forms of aesthetic standardisation and procedural predictability. The proliferation of prebuilt assets and optimised pipelines may accelerate production, but they also promote homogeneity across artistic outputs.¹⁹ Matteo Pasquinelli characterises this as computational governance, where efficiency and instrumental logic suppress the potential for indeterminacy or deviation.²⁰ Within this logic, unpredictability becomes something to be managed, not cultivated.

Nevertheless, artists working with engines speculatively frequently pursue alternative temporalities, affects, and relations. Rather than rejecting the engine outright, they engage it obliquely by reconfiguring pipelines, introducing instability, or foregrounding elements the system was designed to smooth over. As such, authorship and resistance become entangled with the very parameters of the engine itself. How can artists reorient platforms optimised for standardisation? What gestures emerge when engines are not used to simulate a coherent world, but to speculate otherwise?

18 Chun, *Updating to Remain the Same*; Miyazaki, 'Algorhythmics'.

19 Maxwell Foxman, 'United We Stand: Platforms, Tools and Innovation With the Unity Game Engine', *Social Media + Society*, 5.4 (2019).

20 Matteo Pasquinelli, 'Three Thousand Years of Algorithmic Rituals: The Emergence of AI from the Computation of Space', *e-flux journal*, 101 (2019).

In this context, positioning the game engine as infrastructure is a way of making visible the technical, economic, and affective logics that prefigure digital creativity. To work with a game engine is to engage a deeply layered apparatus, shaped by platform conventions, yet not entirely closed: it is precisely within these seams and latencies, these minor misalignments and performative breakdowns, that an alternative approach becomes possible. The following section proposes speculative drift as a conceptual framework for inhabiting engine infrastructures differently, not by escaping their constraints, but by working through the possibilities embedded within them.

Speculative Drift: A Feminist Reorientation of Engine Logics

The increasing integration of game engines into contemporary artistic practice signals a reconfiguration of the epistemic, aesthetic, and infrastructural conditions through which digital worlds are composed. These real-time procedural systems shape how causality is staged, how agency is rendered, and how environments unfold in time. As infrastructures, they encode economic priorities and visual norms while governing production through pipelines designed for efficiency and scalability. It is within these logics that artists begin to probe for other rhythms and orientations. This section develops tactic for inhabiting game engines differently, sensing where their structures open to variation and working with those tensions as generative.

While glitch aesthetics often draw attention to rupture and the spectacle of systems breaking down, drift operates more slowly and remains entangled with the system's own logics. In a technical sense, 'drift' names the incremental loss of synchronisation in real-time systems: a delay between audio and image, a positional offset, a loop that no longer aligns. In game design culture, it can refer to a stylised form of control-through-instability, most famously in racing games, where 'drifting' describes the moment a vehicle slides laterally through a curve, traction suspended, control deferred. This performance of near-loss is not accidental but cultivated, a technique that demands close attention to phys-

ics and friction, and results in a distinctive aesthetic of suspension: the car in motion, moving sideways but forward, skimming the edge of catastrophe. Such moments stage a dynamic between intention and system response, an embodied negotiation with instability. In aesthetic terms, it marks a space between function and malfunction, a kind of speculative non-alignment, where something else can begin to happen.

This approach does not simply name the occurrence of these misalignments but treats them as an opening: a site of potential for critically engaging infrastructures from within. It is both method and affect, an orientation that foregrounds minor variation over coherence, instability over mastery. It acknowledges artists who engage systems that were not built for them, and who use those constraints to recompose experience without claiming to reinvent the structure altogether. This is not about error, nor resistance in the classical sense, but a slower, negotiation of constraint.

While the concept of drift has circulated in other fields — as a loss of calibration in cybernetic control systems, or as a process of deterritorialisation in Deleuzian theory — speculative drift departs from these traditions by foregrounding creative inhabitation over systemic collapse. In cybernetics, drift often refers to a system's deviation from equilibrium, typically interpreted as a fault requiring correction.²¹ Here, however, that deviation becomes compositional: not a bug, but a site of potential. Similarly, Deleuze and Guattari's concept of deterritorialisation foregrounds how systems may be internally disoriented, giving rise to new lines of flight and alternative becomings.²² Speculative drift echoes this movement: not towards chaos, but towards lateral transformation, towards what Deleuze might call the minor or the molecular.²³ These ideas resonate with compositional meth-

21 Norbert Wiener, *Cybernetics: Or Control and Communication in the Animal and the Machine*, 2nd edn (Cambridge, Massachusetts: MIT Press, 1961).

22 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. by Brian Massumi (Minneapolis: University of Minnesota Press, 1987).

23 Gilles Deleuze and Félix Guattari, *Kafka: Toward a Minor Literature*, trans. by Dana Polan (Minneapolis: University of Minnesota Press, 1986).

ods that do not challenge the infrastructure head-on, but gently reorient its affects, rhythms, and defaults.

This mode of engagement draws from the feminist and posthumanist turn towards immanent critique and situated practice yet emerges from within the specific context of game engine infrastructures. These platforms, optimised for responsiveness and visual coherence, encode normative values of realism and control. But within these feedback systems, artists cultivate deviation, delay, and recursion as artistic strategies. In this sense, this framework does not reject the infrastructure outright, but works from inside its rhythms, pushing at the edges of its logic.

Game engines are structured around procedural consistency: frame-based logics, modular pipelines, and scripting architectures that prioritise seamless interactivity. These computational systems enforce not only technical parameters but also narrative defaults, privileging linearity, agency, and closure. Such artistic strategies do not intervene at the level of code or system performance per se, but instead inhabit the assumptions that such systems encode. As Luciana Parisi argues, computation is rule-bound yet generative, producing indeterminacies that exceed the platforms designed to contain them; speculative drift operates in relation to this excess, as a deliberate misalignment with the system's dominant logic.²⁴

Rather than positioning experimental artistic practice as oppositional to platform infrastructures, speculative drift engages with what Ruha Benjamin describes as the politics of the default: the silent, encoded norms that operate beneath the surface of socio-technical systems.²⁵ Defaults are not neutral; they are ideological choices made durable through repetition and built into the infrastructures of technology. For Benjamin, refusal is not simply about negation or exit, but about refiguring what participation means: a choice not to comply with inherited scripts, and not to be optimised by design. In this light, speculative drift becomes a quiet act of counter-default worlding. It is not a protest that disables the platform, nor a spectacle of critique: it is a recalibration that lingers with what the system did not intend. It shifts atten-

²⁴ Parisi, *Contagious Architecture*.

²⁵ Benjamin, *Race After Technology*.

tion from what a system is supposed to do, to what it might do otherwise when approached with intention and slowness. Drift sidesteps the oppositional frame, working instead through divergence and partial alignment. In artistic terms, this means creating from within the tools of the game engine to allow something unforeseen to unfold: to inhabit a space that is neither compliant nor resistant, but contingent, situated, and quietly generative.

This approach resonates with Donna Haraway's invitation to 'stay with the trouble,' which encourages sustained, ethical entanglement with damaged worlds rather than a search for purity or escape.²⁶ Speculative drift extends this ethos as method, remaining within the infrastructural logics artists inherit and working through their tensions and residues as generative conditions. Drift emerges when artists resist the urgency to resolve or transcend difficulty, remaining with forms of procedural friction as sites of partial reworlding. It operates as a situated mode of cohabiting with digital systems, subtly redirecting them towards other possible futures.

María Puig de la Bellacasa extends this ethos by framing care not as mastery or repair, but as a speculative and political practice: a way of remaining with what is fragile, partial, and interdependent.²⁷ While Haraway calls for staying with the trouble, Bellacasa gives shape to how this staying-with might be enacted, as an ethics of attention to the overlooked and the incomplete. In her work, care is not the restoration of functionality, but a commitment to processes that resist closure. When read alongside speculative drift, her work reveals how attention to delay, failure, and incompleteness can be a mode of care: one that does not fix but remains with the unresolved. Artists drifting within game engine infrastructures are not optimising systems, but attuning to their minor tonalities, often lingering with what technical culture discards as inefficient or marginal. Drift, in this context is a gesture of attentiveness: it notices the affective gaps in the proce-

26 Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, North Carolina: Duke University Press, 2016).

27 María Puig de la Bellacasa, *Matters of Care: Speculative Ethics in More Than Human Worlds* (Minneapolis: University of Minnesota Press, 2017).

dural debris that dominant workflows seek to erase, affirming the significance of what the pipeline deems irrelevant.

Anna Tsing's work on precarity and contaminated diversity further helps articulate drift as a mode of composition within constraint.²⁸ For Tsing, precarity is not only a symptom of extraction or instability but also a condition for unexpected alliances and latent potential. This temporality of emergence, the idea that worlding can arise from fragments and unexpected assemblages resonates deeply with the kinds of world-making enacted by artists working within game engines. Speculative drift shares affinities with Tsing's concept of collaborative survival, building from procedural debris in the hope that something livable might still be composed, while sustaining an aesthetic and methodological openness to incompleteness.

This speculative sensibility of working with and through infrastructural residues links back to Luciana Parisi's account of algorithmic excess.²⁹ Parisi's insistence that algorithmic architectures generate futures not yet thinkable, and that the speculative is not a break from computation but entangled with its recursive nature, pushes speculative drift towards a deeper theorisation of what it means to work with systems as non-fully-known. In artistic practice, this means recognising that the tools themselves (shaders, physics engines, rendering paths) are already generating forms outside of human intention. Parisi understands computation not as deterministic, but as speculative: it unfolds futurity not from human intention but from the autonomous contingency of algorithmic systems. For her, speculative thought is already coded within the recursive logics of computation. Drift resonates with this account by activating the surplus within the system in order to inhabit it differently. Artists who drift are not decoding the engine's algorithm, but co-articulating with its indeterminate tendencies, allowing the system to misperform into something else.

28 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton: Princeton University Press, 2015).

29 Parisi, *Contagious Architecture*.

This orientation resonates with Erin Manning's notion of the minor gesture, a subtle deviation that modulates a system from within rather than rupturing it.³⁰ The minor gesture is relational and immanent, without demanding legibility or overt resistance. It moves sideways, quietly redirecting force. Speculative drift operates in this spirit as a mode of attunement rather than merely a technique. It describes how artists might engage infrastructure not to defeat or bypass it, but to feel its contours, slow its momentum, and co-inhabit its excesses. Drift is infrastructural not because it breaks the system, but because it remains within, altering its rhythms, probing its possibilities, and making space for alternative rhythms and logics without rupture.

This emphasis on modulation over rupture finds further resonance in Tiziana Terranova's account of control within digital systems.³¹ Terranova describes power as operating less through direct command than through the orchestration of affect, tempo, and scale. Her theorisation of soft control helps clarify the stakes of drift: it shows how agency is not simply repressed but subtly steered, often through systems designed to feel intuitive or frictionless. Speculative drift engages this soft control not by opposing it directly, but by disturbing its flow and destabilising smoothness, thereby attuning to moments where friction can be felt. As Terranova reminds us, the informational is never neutral, but rather socially, temporally, and affectively loaded. Artists who drift are not avoiding friction but choosing how and where to engage it: they slow down what is meant to be seamless, amplify what is meant to pass unnoticed, and in doing so, expose the system's aesthetic and political textures.

Returning to María Puig de la Bellacasa, her emphasis on care as speculative ethics prompts reflection on what it means to remain with infrastructures under conditions of constraint and overdetermination. In her formulation, care extends beyond maintenance towards a speculative commitment to neglected possibilities. Drift, then, becomes a speculative form of care for what the system overlooks and for the potential that can emerge within its insta-

³⁰ Manning, *The Minor Gesture*.

³¹ Tiziana Terranova, *Network Culture: Politics for the Information Age* (London: Pluto Press, 2004).

bilities and delays. This positions artistic engagement as a quieter, durational politics that senses potential in the minor.

Positioned within this broader critical context, speculative drift becomes both a method and a worldview. Rather than proposing a singular theory of resistance, speculative drift allows for aesthetic uncertainty and conceptual deferral. It gives name to those gestures that do not fit easily within activist rhetoric or technological subversion, but which nonetheless register a speculative realignment of attention and form.

Importantly, drift is not only about system reorientation: it is about modes of sensing, navigating, and composing within environments structured by the technical, visual, and narrative defaults of platform infrastructures. James Malazita, for instance, has shown how game engines materialise gendered and racialised assumptions into design defaults and simulation logics.³² His work reveals how these engines are not neutral containers, but cultural artefacts with encoded epistemologies that shape what is rendered thinkable, playable, or desirable in simulation space. Scholars such as Sengers *et al.* have foregrounded the importance of infrastructural legibility: not just what systems do, but how they anticipate being used, seen, and understood.³³ They emphasise that platforms are always already configured by assumptions about their ideal user and context of use, which exert a shaping force on creative possibilities, nudging behaviours towards norms under the guise of seamlessness.

Speculative drift functions as a situated compositional strategy, responding directly to these infrastructural conditions. It draws attention to what the system normalises or forecloses through ambient deviation rather than overt subversion. By drifting through interface expectations, asset hierarchies, or timing conventions, artists subtly deform what the platform expects from them. These gestures create room for forms of expression that are neither entirely oppositional nor complicit but emerge through improvisational entanglement with the tools themselves.

32 Malazita, *Enacting Platforms*.

33 Phoebe Sengers, Kirsten Boehner, Shay David, and Joseph 'Jofish' Kaye, 'Reflective Design', in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (Aarhus: ACM, 2005), pp. 49–58.

In this way, speculative drift renders the politics of infrastructural defaults visible through immanent adjustment.

This engagement unfolds through subtle dissonance, an attunement to the system's rhythm that neither fully synchronises nor breaks apart. It is not the glitch's moment of rupture, but a soft, continuous modulation. It senses the ways platforms translate gesture into value and responds by lingering in what exceeds that translation. Drift does not extract; it dwells. It senses where technical legibility loses resolution, where control becomes porous, and where computation generates artefacts not easily assimilated back into the system. In these misalignments, it develops a vocabulary that is irregular and quietly affective.

Platform logic, particularly evident in the asset-heavy pipelines of game engines, tends to frame creative labour as a matter of selection and optimisation. In contrast, speculative drift cultivates perceptual modes that are less concerned with completion than with emergence. Artists who drift develop a sensitivity to the in-between states of platforms: held frames, abstract interactions, fuzzy assets. These are not breakdowns in the system but expressions of its excess: aesthetic residues that resist being made productive. These artists develop a sensitivity to artefacts or behaviours deemed marginal by the engine's intended logics, making them not errors to be erased, but materials to be worked with, textures to be felt. They operate outside the metrics of success and functionality, opening space for an alternative relation to technical failure.

The 'speculative' in speculative drift must be understood not as future-casting, but as a way of inhabiting instability and contingency in the present. It is the act of staying-with unfinishedness, of composing amid tension rather than reaching for resolution. In this, it resonates with a temporality of "becoming with" rather than "overcoming" infrastructure. It draws on the not-yet of algorithmic architectures — the ways in which computational systems generate recursive potentialities — and the always-already of infrastructural protocols that dictate how assets behave, how light is cast, how cameras are positioned. These temporalities are not easily synchronised; speculative drift lives in their frictional interplay.

In this way, it operates across multiple experiential scales, from microtemporal dissonances such as physics jitter or frame-rate fluctuations to ambient affective tones, as when a simulated environment registers as affectively unsettled or atmospherically saturated. It also manifests in representational domains, through narrative slippage, symbolic excess, and worldbuilding tropes that diverge from established ludic conventions. Together, these multiscale deviations reveal the system's texture, allowing artists to slow and subtly deform the protocols through which digital reality is constructed.

This makes it especially valuable for understanding creative practice within game engine contexts, where standardisation and optimisation increasingly dominate. Speculative drift opens space for modalities of artistic work that may be slow, ambient, overly detailed, resistant to legibility, or emotionally excessive. These are not strategies of refusal but techniques of staying: a willingness to inhabit the excess of infrastructure and to let forms emerge from within its noise. In doing so, artists participate in a reworlding of the platform by drifting through it otherwise and becoming co-agents in its deformation, cultivating a relation to infrastructure that is partial and durational: a form of embedded speculation that does not seek to scale or resolve. What emerges is a creative practice attuned to systems as shifting surfaces that can be inhabited with attention, improvisation, and care.

Case Studies: Practising Speculative Drift

While speculative drift has been articulated as a conceptual and methodological strategy, its textures and tensions emerge most fully in practice. The following examples function as active sites through which the concept is extended and made sensorially legible. These works drift through the material, procedural, and perceptual conditions of game engines, remaining with their frictions and excesses. What follows is less a typology than a set of orientations — compositional logics that emerge from within platforms and pull them subtly off course.

Each of these artists stages a different modality of drift, whether visual, narrative, or procedural, while embedded in the system's infrastructural logics. Their practices gently nudge the engine's parameters into unfamiliar alignments rather than attempting to interrupt or overwrite its pipeline. These gestures function as recalibrations, aesthetic and affective techniques that draw out the engine's internal tensions. Speculative drift can be interpreted both through what is shown and through how it moves across surface and tempo, unsettling expectation through atmospheric modulation.

This section attends to how artists drift within infrastructural constraint, lingering at the edge of what the engine deems functional. Their work unfolds within the embodied realities of design tools, render pipelines, and procedural logic rather than in the abstract space of critique. Drift here operates as a technique, an attunement to systems not designed for subversion yet capable of generating aesthetic residue. In this residue something else begins to take shape, a speculative sensibility that remains within the platform, quietly rerouting its habits.

Drift as Engine Saturation: Pete Jiadong Qiang

Pete Jiadong Qiang's digital environments are maximalist, ornamental, restlessly layered. Working primarily within the real-time game engine Unity, Qiang generates scenes in which geometry, texture, and atmosphere accumulate to the point of procedural excess. Rather than aiming for legibility or spatial clarity, his compositions drift towards a form of visual saturation that challenges the engine's logic of optimisation. Shaders stutter, reflections warp, and lighting parameters push against the conventions of visual realism through recursive ornamentation.

This is a compositional practice that moves within the platform's constraints while troubling its defaults. In Qiang's work *Queer Maximalist Hyperbody* (2017-24), light behaves less as illumination and more as affective haze: glittering, pulsing, folding over ornate surfaces. Materials are not static assets, but reactive membranes; their behaviour is contingent on viewing angle, camera depth, or ambient interaction. This sensory drift foregrounds

what Parisi gestures to as the generative excess of computational systems³⁴, that is, their capacity to produce more potentiality than their design anticipates. In this sense, Qiang's scenes operate less as discrete compositions than as densely layered visual systems whose instability contributes to their affective force.

Reflective and emissive surfaces dominate these environments, drawing attention to the unstable behaviour of rendering pipelines under conditions of visual saturation. This affective layering, where no one object or element stabilises the scene, operates like a durational overload, an aesthetic condition in which the eye cannot settle, and the interface becomes atmospheric.

Rather than using Unity to build immersive realism or traditional game-like interactivity, Qiang reorients the engine towards maximalist visual accumulation. This ornamentality is not frivolous, but strategic: it redirects technical power towards a baroque saturation that exceeds utility. It is here that the work performs speculative drift by rerouting the aesthetic vectors of the system. Excess is rendered meaningful: a shimmering instability that feels intentional without being resolved. Within this drift, legibility gives way to atmosphere and control dissolves into affective recursion. Qiang's environments do not collapse the engine, they dwell in its overflow.

This practice demonstrates how speculative drift can emerge from visual logic itself, not as glitch or rupture, but as recursive accumulation. By overstretching the engine's rendering systems and moving away from standard assets, Qiang turns optimisation against itself. In doing so, he opens up a space for reconsidering what visual coherence means under computational conditions.

Here, excess is not the enemy of sense, but its speculative companion: what spills beyond functionality becomes the very terrain of feeling. Qiang's work invites us to attend to what the system leaks, not as failure, but as a poetics of overflow. In *Queer Maximalism HyperBody*, where the artist builds hyper-ornamented, speculative bodies that resist spatial legibility and narrative cohesion. Constructed in Unity but overflowing its logic, the work stages embodiment as unstable, reflective, and procedurally irreducible. What might have been treated as

34 Parisi, *Contagious Architecture*.

excess — hyper-reflective surfaces, blooming shaders, recursive reflections — is instead centralised. The hyperbody does not ‘load’ fully in the conventional sense; it recedes and reappears, glitching not in error, but in constant transformation. Through this procedural instability, speculative drift becomes affective: the viewer does not master the image, but is enveloped by its temporal blur.

Rather than reinforce Unity’s default aesthetic pipeline, its emphasis on coherent surfaces, responsive physics, and real-time interactivity, *HyperBody* stages drift through surplus: ornament as politics, reflection as refusal, movement as deferral. These gestures do not speak to computational materiality alone, but also to how identity and embodiment are processed by systems optimised for predictability. In this sense, Qiang’s work exemplifies speculative drift as both infrastructural and political. The hyperbody refuses to be legible, responsive, or resolved. It does not invite play or performance: it invites ambiguity. This is not the body as avatar but the body as radiant artefact, shimmering across an engine that cannot quite stabilise it.

Qiang destabilises not only aesthetics but the ontological assumptions of simulation. There is no stable point of orientation, no coherent arc of interactivity; perception hovers, fragments, and reorients across layered environments. Speculative drift here operates not only at the level of rendering but through narrative incompleteness and asset accumulation, where textures, scans, figures, and architectural fragments coexist without resolving into a unified spatial logic. Worldbuilding unfolds as an ongoing aggregation rather than a finished composition.

Drift becomes both compositional and relational: a way of remaining within the engine while allowing its materials (borrowed, modified, collaboratively shaped) to exceed the conventions of gameplay coherence. These environments do not aim for seamless interaction but cultivate suspended navigation and partial encounters. Systems begin to shimmer and strain under the weight of accumulated reference and affect because they are made to host more than optimisation anticipates.

This recursive density resonates with Parisi’s account of algorithmic indeterminacy, the generative surplus embedded within

computational architectures.³⁵ In Qiang's work, speculative drift becomes not only a visual destabilisation but a narrative and relational provocation, foregrounding the engine as a site where cultural memory, fandom, and procedural logic intra-act.³⁶ What emerges is a saturation of the infrastructure: a worlding practice that reveals how platforms can sustain entanglement, excess, and unfinishedness within their operational bounds.

Here, speculative drift names an orientation that stays with these infrastructural defaults while quietly deforming them. It does not attempt to remake the system whole but unsettles its internal hierarchies of value. Qiang's interventions shimmer as critique: slow, excessive, affective disturbances that make visible the ideological substrates of platform design. In this light, speculative drift becomes refracted into a method of aesthetic redirection. The work does not dismantle the pipeline, but rather inhabits its margins and makes them central to the aesthetic experience. Through this approach, speculative drift is not only sensed but theorised: an orientation that both responds to and remakes the logics of infrastructural constraint.

Drift as Narrative Decentralisation: Alice Bucknell

Alice Bucknell's *The Martian Word for World is Mother* (2022) stages speculative drift not through visual overload, but through narrative architecture and planetary speculation. Presented as a three-channel video installation, the work renders three distinct Martian futures: corporate terraforming, extractive bio-infrastructure, and an alien ecology that exceeds human epistemology. Rather than offering a single, coherent projection of settlement, the project fractures the imaginary of Mars into competing cosmologies. Each world proposes its own logic of habitation,

³⁵ *Ibid.*

³⁶ Pete Jiadong Qiang, 'HyperBody: An Experimental VR Game Exploring the Cosmotronics of Game-Fandom through a Posthumanist Lens', unpublished PhD thesis (Goldsmiths, University of London, 2023) The term intra-act is a coinage of Karen Barad (*Meeting the Universe Halfway*, Duke University Press, 2007), whose concept of 'intra-action' differs meaningfully from 'interaction' and carries specific onto-epistemological weight.

governance, and knowledge, without collapsing into synthesis. The result is not a unified simulation but a distributed field of speculation, one that drifts across ideological registers rather than stabilising within a singular narrative horizon.

The work unfolds without player interaction: there are no tasks, no branching choices, no progression to be mastered. Instead, the simulation plays out as a durational environment presented as a video work, structured by shifting perspectives and layered scripts. Architecture, landscape, and infrastructural systems appear already in motion, as if the world precedes the viewer and will continue beyond them. Drift here does not emerge as visual instability but as narrative decentralisation. The engine's capacity for immersive coherence is redirected towards multiplicity. Rather than guiding attention through goal-oriented structure, the piece sustains a condition of suspended orientation, where competing futures coexist without resolution.

Bucknell's Martian terrains are not neutral backdrops for human expansion. They are thick with the residues of law, capital, language, and planetary imagination. In one channel, settlement is framed as techno-utopian salvation; in another, as corporate resource management; in the third, as a more-than-human system whose intelligence does not map onto terrestrial hierarchies. These worlds are not aesthetic variations but infrastructural propositions. Speculative drift operates here through juxtaposition. By placing these cosmotechnical visions side by side, the work exposes the assumptions embedded in each: who decides, who benefits, who names the world. Drift becomes a compositional method for refusing narrative consolidation, allowing tension to persist across channels. In this sense, the work resembles what Anna Tsing describes as "patchy landscapes"³⁷: uneven zones of development where multiple temporalities and economies coexist without synchronising. Mars appears not as a blank frontier but as a layered field of infrastructural desire, speculative capital, and ecological projection. Drift unfolds across these patches, refusing to smooth their frictions into a coherent planetary narrative.

37 Tsing, *The Mushroom at the End of the World*.

The project's engagement with speculative fiction is neither homage nor adaptation, but reorientation. The invocation of Ursula K. Le Guin is less a literary reference³⁸ than a structural echo: worlding as carrier, as accumulation rather than conquest.³⁹ Yet Bucknell's gesture is not nostalgic. The Martian environments are rendered through contemporary simulation technologies, drawing on consultation with space lawyers, astronomers, drone operators, and AI linguists.⁴⁰ These collaborations are folded into the work's speculative logic. Law becomes landscape; planetary science becomes aesthetic texture; machine learning becomes a narrative collaborator. The simulation stages the infrastructures through which Mars is imagined and administered. Drift emerges in this entanglement between speculative fiction and policy discourse, between planetary fantasy and bureaucratic protocol.

Unlike the maximalist density of Qiang's environments, Bucknell's drift is spatially expansive yet narratively unresolved. Camera movement glides across terrain without anchoring the viewer in a stable vantage point. Built structures loom within alien atmospheres; infrastructural systems hum beneath crystalline formations. The three-channel format does not multiply immersion so much as fragment it. Rendered worlds unfold across adjacent screens, producing slight shifts in attention and scale: the viewer cannot apprehend the entirety at once. This spatial distribution generates a subtle misalignment, an awareness of incompleteness, of partial vision. Drift manifests as the inability to totalise the scene.

What unsettles here is not the mechanics of rendering, but the organisation of futurity. The simulation runs smoothly; the drift lies in its refusal of teleology. Corporate utopia, extractive capitalism, and alien ecology remain in tension, none authorised as the definitive future. Even the speculative language system developed for the alien world gestures towards epistemologies that exceed human categorisation. Here, drift operates at the level of

38 Ursula K. Le Guin, *The Word for World Is Forest* (New York: Berkley Publishing Corporation, 1976).

39 Ursula K. Le Guin, 'The Carrier Bag Theory of Fiction', in *Dancing at the Edge of the World: Thoughts on Words, Women, Places* (New York: Grove Press, 1989), pp. 165–70.

40 Alice Bucknell, *The Martian Word for World is Mother* (2022).

ontology. The engine's habitual centring of human agency is displaced by distributed intelligences and planetary temporalities. Mars becomes not a frontier to be mastered, but a site of competing relational orders.

In this sense, speculative drift in Bucknell's practice unfolds as infrastructural critique through narrative dispersion. The work inhabits the representational power of real-time simulation while gently deforming its ideological defaults. Settlement narratives are slowed; extraction is rendered atmospheric rather than triumphant; technological progress is reframed as precarious negotiation. Rather than opposing the infrastructure of simulation, Bucknell allows it to stage its own contradictions. The engine's cinematic capacities — its lighting systems, environmental rendering, and volumetric atmospheres — are mobilised not towards spectacle, but towards ambiguity.

This ambiguity is not emptiness. It is a density of unresolved propositions. Each Martian world is coherent enough to be believable, yet incomplete enough to resist closure. Drift emerges in the gap between plausibility and certainty. The viewer is not positioned as conqueror or saviour but as witness to infrastructural imagination at work. The simulation does not demand identification; it invites attunement. The absence of interactive agency becomes a compositional choice: meaning accrues through duration rather than intervention.

If Qiang saturates the pipeline to expose its visual excess, Bucknell stretches narrative infrastructure until its ideological seams become visible. The work demonstrates that speculative drift need not manifest as a purely aesthetic form. It can take the form of narrative hesitation, of parallel futures held in suspension. By refusing to collapse Mars into a single story, Bucknell renders visible the competing logics already embedded in contemporary space discourse. Drift becomes a way of remaining with those tensions rather than resolving them into a singular vision of progress.

Here, the engine functions not simply as a tool but as host for planetary speculation. Its capacity to render coherent environments is turned towards the staging of incoherent futures. The work neither dismantles simulation nor celebrates it. Instead, it occupies a middle register, allowing the apparatus to articulate its own excesses and blind spots. Through atmospheric persistence

and narrative multiplicity, *The Martian Word for World is Mother* reframes worldbuilding as an exercise in distributed authorship and infrastructural doubt.

Speculative drift, in Bucknell's hands, becomes a politics of narrative suspension. It refuses the acceleration of conquest and the neat resolution of planetary crisis. It remains with the uncertainty of habitation, with the entanglement of law, ecology, and technology. In doing so, it reveals that the speculative is not an escape from infrastructure, but a way of inhabiting it otherwise: through dispersion and multiplicity.

Drift as Systemic Absurdity: Theo Triantafyllidis

Theo Triantafyllidis stages speculative drift through systemic absurdity: not the spectacle of a broken simulation, but the estrangement that arises when a world's rules are internally coherent yet socially uncanny. *Feral Metaverse* (2024) takes the form of an online multiplayer environment structured by a deliberately sparse and unusual rule-set. Players enter the world without choosing their avatar, without instructions, and without access to verbal or textual language. There are no cues to scaffold behaviour, no quests to clarify intention, no tutorial to establish purpose. Communication unfolds through gesture, proximity, and improvised mark-making. The system withholds explanation, yet it does not withhold structure. Drift emerges in the gap between these two conditions.

Unlike conventional game environments that anchor experience in legible objectives, *Feral Metaverse* reframes participation as a collective negotiation with constraint. The work does contain a goal — togetherness — but it is never disclosed. Players must infer it through trial, imitation, and coordination. If they fail to sustain the fragile conditions of coexistence, the world responds structurally: extermination and repopulation occur, resetting the social field. In this sense, interactivity is not refused but reparameterised. Agency persists, yet it is stripped of familiar affordances of mastery. The engine continues to compute smoothly, but its social grammar is estranged.

This procedural design generates what might be called systemic absurdity. The logics of optimisation and progression typically embedded in multiplayer platforms remain technically intact: avatars move, collide, assemble, and persist within a rule-bound environment. Yet these behaviours no longer culminate in achievement or reward. Instead, they accumulate into awkward collectivities. Players crawl, carry, huddle, disperse, gesture towards nothing, or cluster around emergent structures whose purpose remains ambiguous. The absurdity is not randomness. It is the precise effect of a coherent system deprived of its usual narrative incentives.

Drift here operates at the level of procedural ethics. Kindness is not a moral supplement but a survival condition. The absence of language destabilises competitive reflexes and exposes the infrastructural expectations that ordinarily govern online interaction. Without chat, instruction, or hierarchical scoring, coordination must be enacted through embodied approximation. Movement becomes communicative. Delay becomes meaningful. The platform's habitual acceleration of response is replaced by a slower tempo of recognition and misrecognition. What appears initially as dysfunction reveals itself as a recalibration of rhythm.

This temporal dimension resonates with Shintaro Miyazaki's account of "algorhythmics,"⁴¹ in which algorithmic systems organise experience through microtemporal pulses and feedback loops. In *Feral Metaverse*, rhythm is not harnessed for optimisation but allowed to hesitate. Gestures misalign. Assemblies dissolve and reform. Collective patterns emerge only to falter. The system's update cycles remain intact, yet their affective orientation shifts. Rather than reinforcing clarity, they produce tonal dissonance. Drift unfolds as the modulation of tempo within a persistent computational structure.

The grotesque embodiment that characterises Triantafyllidis's aesthetic amplifies this effect. Avatars appear exaggerated, awkward, sometimes vulnerable or feral in their behaviour. Yet they are not scripted caricatures; they are vessels for human participants navigating constraint. The result is a social field that oscillates between cooperation and collapse. Platform

41 Miyazaki, 'Algorhythmics'.

logic does not disappear. It is intensified. Modular expectations — responsiveness, legibility, feedback — remain embedded in the engine's architecture, but their outcome becomes unstable. The system performs exactly as coded, yet what it produces feels estranged.

This estrangement aligns with Ruha Benjamin's framing of refusal as a creative reimagining of engagement from within dominant systems.⁴² The players of *Feral Metaverse* do not opt out of the platform; they remain inside it, inhabiting its rule-set while declining its familiar scripts of competition and spectacle. Refusal is enacted not through sabotage but through indifference to instrumental reward. The work stages a social rehearsal in which performance is decoupled from productivity. The result is not chaos but suspension.

Olga Goriunova has argued that art's intervention in platform cultures often occurs through friction rather than rupture.⁴³ Triantafyllidis's practice exemplifies this frictional mode. The simulation does not crash. It persists. Yet its persistence becomes uncanny. Coordination is possible, but never guaranteed. Communication functions, but never stabilises. The work reveals how platforms discipline experience not only through explicit rules but through ambient expectations about how interaction should feel. By subtracting instruction and conventional feedback, *Feral Metaverse* renders those expectations visible.

The absurdity at stake is therefore structural rather than comedic. The world operates, yet its purpose remains opaque. Players enact behaviours that are technically correct but socially ambiguous. Drift emerges as a redistribution of significance. Actions no longer point towards narrative resolution. They thicken into atmosphere. One watches clusters form and dissolve, not to track progress, but to sense collective hesitation. The platform becomes a laboratory of provisional coexistence.

Importantly, *Feral Metaverse* is not anti-platform. It does not reject the engine's capabilities. Instead, it inhabits them hyperbolically. Real-time synchronisation, persistent world architec-

⁴² Benjamin, *Race After Technology*.

⁴³ Olga Goriunova, *Art Platforms and Cultural Production on the Internet* (London: Routledge, 2012).

ture, and multiplayer networking remain fully operative. What shifts is their orientation. Rather than facilitating spectacle or competition, these systems sustain vulnerability and fragility. The extermination-and-repopulation cycle confirms this precarity. Social failure does not result in a dramatic end-state but in reset. Drift persists across iterations.

Where Bucknell disperses narrative across parallel futures and Qiang saturates rendering logic to expose aesthetic excess, Triantafyllidis concentrates on platform sociality itself. He isolates the infrastructural assumptions that organise multiplayer experience and gently dislocates them. Drift manifests not as glitch but as collective awkwardness. It is the sensation of being inside a functioning system whose purpose cannot be fully grasped.

Speculative drift, in this context, becomes a method of inhabiting systemic excess without resolving it. The world continues. Players persist. Coordination falters and reforms. The engine's logics remain legible, yet their meaning shifts. What emerges is not failure but a reorientation of engagement. By withholding instruction and amplifying constraint, Triantafyllidis transforms optimisation into vulnerability. The metaverse becomes feral not because it collapses, but because it refuses to behave according to inherited scripts.

In this way, *Feral Metaverse* reframes multiplayer infrastructure as a site of speculative ethics. Drift names the condition of remaining within platform systems while loosening their teleologies. It is not an escape from computation, but attunement to its social grain. The absurdity that surfaces is not ornamental. It is infrastructural. The system runs. The players adapt. Meaning hesitates. And in that hesitation, another mode of relation briefly becomes thinkable.

Conclusion: Speculative Drift as Infrastructural Reorientation

Speculative drift names a conceptual reorientation in how artistic practice engages game engines. It shifts attention from confrontation to inhabitation, from rupture to modulation, foregrounding the minor adjustments through which infrastructures are felt, strained, and subtly reoriented. Rather than positioning

artists outside platform systems, the concept attends to how they remain within computational environments long enough to register their pressures and redirect their tendencies.

Across the works examined, drift does not appear as a single aesthetic style or technical gesture. It unfolds as a situated mode of working that moves through the logics of the engine itself. In Pete Jiadong Qiang's environments, rendering systems are intensified until coherence begins to fray under ornamental density. Visual saturation becomes a method for exposing the thresholds of optimisation. The engine's capacities are not refused but thickened, allowing procedural excess to surface as aesthetic condition. Drift emerges through accumulation.

In Alice Bucknell's Martian worlds, narrative infrastructure is redistributed across competing futures. The simulation does not guide the viewer towards mastery or resolution; instead, it stages parallel cosmologies whose claims to legitimacy remain unsettled. Here, drift operates through temporal suspension and epistemic dispersal. Worldbuilding becomes an exercise in inhabiting contradiction. The engine sustains the simulation smoothly, yet its narrative grammar no longer converges towards a singular horizon. Drift unfolds through narrative decentralisation.

Theo Triantafyllidis's multiplayer environment relocates drift into social protocol. By withholding instruction and conventional feedback, the system recalibrates expectations embedded in online interaction. Coordination persists, yet its purpose remains opaque. Platform logic remains operational, but its social grammar is estranged. Drift manifests through procedural ethics, where rhythm, repetition, and collective awkwardness displace optimisation and spectacle.

These practices suggest that speculative drift is not an aesthetic category but a method of infrastructural negotiation. It attends to how game engines organise perception, interaction, and production while recognising that these systems are neither fully closed nor entirely malleable. Drift registers the friction that emerges when artistic practice presses against embedded assumptions about clarity, progress, and utility. It operates through modulation rather than disruption.

This repositioning contributes to ongoing debates in platform studies and software aesthetics. Game engines are often under-

stood as consolidating standardisation through asset ecosystems, subscription models, and workflow pipelines that privilege efficiency and scalability. These conditions remain operative. Yet the works discussed here demonstrate that infrastructural systems also contain zones of ambiguity. Rendering parameters can be overstretched. Narrative frameworks can be redistributed. Multiplayer protocols can be recalibrated. Drift names the compositional labour of working within these zones without claiming transcendence from them.

Importantly, speculative drift does not propose that artists dismantle platform power or escape computational constraint. Its force lies in persistence. By remaining with the engine's operational field, artists reveal how optimisation is never complete, how procedural logic produces surplus, and how minor deviations can accumulate into altered orientations. Drift draws attention to the textures of infrastructure: the ways it feels, hesitates, saturates, or strains under pressure.

This emphasis on immanence also reframes the political stakes of artistic engagement with engines. Rather than equating critique with opposition, speculative drift recognises that infrastructures shape the very conditions of cultural production. To work inside them is unavoidable. The question becomes how that work unfolds. Through density, delay, opacity, or recalibrated interaction, drift exposes the normative assumptions embedded in computational systems while refusing the fantasy of exteriority.

Speculative drift therefore offers a lens for analysing computational worlds beyond representational content. It encourages attention to how digital worlds are computed, parameterised, and socially structured. By situating artistic practice within the grain of software rather than above it. By tracing how drift manifests visually, narratively, and procedurally, we gain a vocabulary for describing creative acts that neither submit to platform logic nor attempt to rupture it spectacularly.

If game engines now function as cultural infrastructures, then artistic practice within them becomes a form of infrastructural composition. Drift names the orientation that emerges when artists treat engines not as neutral tools but as dynamic environments whose defaults can be sensed and reweighted. It remains close to the system, attentive to its rhythms and constraints, and

responsive to its excesses. In doing so, it reveals that even highly standardised platforms contain openings — not outside computation, but within its unfolding.

Speculative drift does not promise systemic transformation at scale. Its gestures are local, durational, and compositional. Yet precisely through this modesty, it clarifies how infrastructural systems can be inhabited otherwise. It positions the artist as neither engineer nor antagonist, but as a participant capable of altering tempo, density, and orientation from within existing architectures.

To drift is to stay with infrastructure long enough to perceive its instability and to compose from that perception. Grounded in immanence and attunement, drift refigures game engines not only as sites of optimisation and control, but as terrains of speculative possibility.

Bibliography

- Barad, Karen, *Meeting the Universe Halfway* (Durham, North Carolina, Duke University Press, 2007).
- Benjamin, Ruha, *Race After Technology: Abolitionist Tools for the New Jim Code* (Cambridge: Polity, 2019)
- Braidotti, Rosi, *The Posthuman* (Cambridge: Polity, 2013)
- Chia, Aleena, Brendan Keogh, Dale Leorke, and Benjamin Nicoll, 'Platformisation in Game Development', *Internet Policy Review*, 9.4 (2020) <https://doi.org/10.14763/2020.4.1515> [accessed 17 May 2025]
- Chun, Wendy Hui Kyong, *Updating to Remain the Same: Habitual New Media* (Cambridge, Massachusetts: MIT Press, 2016)
- Deleuze, Gilles, and Félix Guattari, *Kafka: Toward a Minor Literature*, trans. by Dana Polan (Minneapolis: University of Minnesota Press, 1986)
- , *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. by Brian Massumi (Minneapolis: University of Minnesota Press, 1987)
- Foxman, Maxwell, 'United We Stand: Platforms, Tools and Innovation With the Unity Game Engine', *Social Media + Society*, 5.4 (2019) <https://doi.org/10.1177/2056305119880177> [accessed 20 May 2025]
- Freedman, Eric, *The Persistence of Code in Game Engine Culture* (London: Routledge, 2020)
- Gillespie, Tarleton, *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions That Shape Social Media* (New Haven: Yale University Press, 2018)

- , ‘The Politics of “Platforms”’, *New Media & Society*, 12.3 (2010), 347–64
- Goriunova, Olga, *Art Platforms and Cultural Production on the Internet* (London: Routledge, 2012)
- Haraway, Donna, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, North Carolina: Duke University Press, 2016)
- Helmond, Anne, ‘The Platformization of the Web: Making Web Data Platform Ready’, *Social Media + Society*, 1.2 (2015), 1–11 <https://doi.org/10.1177/2056305115603080> [accessed 15 May 2025]
- Le Guin, Ursula K., ‘The Carrier Bag Theory of Fiction’, in *Dancing at the Edge of the World* (New York: Grove Press, 1989), pp. 165–70
- , *The Word for World Is Forest* (New York: Berkley Publishing Corporation, 1976)
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Manning, Erin, *The Minor Gesture* (Durham, North Carolina: Duke University Press, 2016)
- Miyazaki, Shintaro, ‘Algorithmics: Understanding Micro-Temporality in Computational Cultures’, *Computational Culture*, 2 (2012) <https://computationalculture.net/algorithmics-understanding-micro-temporality-in-computational-cultures/> [accessed 20 May 2025]
- Nick Montfort and Ian Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, Massachusetts: MIT Press, 2009)
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019)
- Parisi, Luciana, *Contagious Architecture: Computation, Aesthetics, and Space* (Cambridge, Massachusetts: MIT Press, 2013)
- Pasquinelli, Matteo, ‘Three Thousand Years of Algorithmic Rituals: The Emergence of AI from the Computation of Space’, *e-flux journal*, 101 (2019) <https://www.e-flux.com/journal/101/273678/three-thousand-years-of-algorithmic-rituals-the-emergence-of-ai-from-the-computation-of-space/> [accessed 18 May 2025]
- Poell, Thomas, David Nieborg, and José van Dijck, *Platforms and Cultural Production* (Cambridge: Polity, 2021)
- Pold, Søren Bro, and Christian Ulrik Andersen, *The Metainterface: The Art of Platforms, Cities, and Clouds* (Cambridge, Massachusetts: MIT Press, 2018)
- Puig de la Bellacasa, María, *Matters of Care: Speculative Ethics in More Than Human Worlds* (Minneapolis: University of Minnesota Press, 2017)
- Seaver, Nick, *Computing Taste: Algorithms and the Makers of Music Recommendation* (Chicago: University of Chicago Press, 2022)
- Sengers, Phoebe, Kirsten Boehner, Shay David, and Joseph ‘Jofish’ Kaye, ‘Reflective Design’, in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (Aarhus: ACM, 2005), pp. 49–58

- Qiang, Pete Jiadong, 'HyperBody: An Experimental VR Game Exploring the Cosmotronics of Game-Fandom through a Posthumanist Lens', unpublished PhD thesis (Goldsmiths, University of London, 2023)
- Terranova, Tiziana, *Network Culture: Politics for the Information Age* (London: Pluto Press, 2004)
- Tsing, Anna Lowenhaupt, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton: Princeton University Press, 2015)
- Wiener, Norbert, *Cybernetics: Or Control and Communication in the Animal and the Machine*, 2nd edn. (Cambridge, Massachusetts: MIT Press, 1961)

Artworks

- Bucknell, Alice, *The Martian Word for World is Mother* (video work, 2022) <https://alicebucknell.com/projects/the-martian-word-for-world-is-mother-2022> [accessed 20 May 2025]
- Qiang, Jiadong Pete, *Queer Maximalism HyperBody* (VR game, 2017-2024) <https://beijing.systems/>; <https://store.steampowered.com/app/2884170/HyperBody/> [accessed 20 May 2025]
- Triantafyllidis, Theo, *Feral Metaverse* (Online Multiplayer Game and Immersive Installation, 2023-24) <https://slimetechnology.org/works/feral-metaverse> [accessed 20 May 2025]

LUKE CASPAR PEARSON

A WORLD BUILT OF ACTORS: THE IRONIC DESIGN LANGUAGE OF GAME ENGINES

Anyone who plays games is generally aware that objects and structures in game worlds are often not what they seem to be. We confidently stride towards our well-earned reward, throw back the lid of the treasure chest only to find ourselves attacked by the very chest we sought to open.¹ Freshly baked pizza toppings might be used to boost our health, charisma or confidence.² Slapping and spraying paint onto walls and floors can turn hard surfaces into colourful pools where we can swim or hide.³ Even in games that provide sweeping cinematic narratives worthy of Hollywood, we might find the main character dying hundreds of times, yet the story moves forward, blissfully unaffected.⁴ This free-floating detachment between objects and their meaning is not some deficit or problem with games. As sociologist Graeme Kirkpatrick has suggested, the formal contradictions of the videogame are in fact an essential property of the videogame form, or further, the *form itself*. For Kirkpatrick, players treat game worlds with the ‘awareness that it will pretend or purport to be one thing (its fiction, if you will) while actually holding out affordances and sensations that are discrepant with this.’⁵ This argument is compelling in positioning the ‘discrepant’ as a state that runs through games, from the buttons we press and their meanings in-game, to the objects

1 *Dark Souls*, FromSoftware, 2011.

2 *Betrayal at Club Low*, Cosmo D, 2022.

3 *Splatoon*, Nintendo, 2015.

4 *Uncharted 4*, Naughty Dog, 2016.

5 Graeme Kirkpatrick, *Aesthetic Theory and the Videogame* (Manchester: Manchester University Press, 2011), p. 112.

and worlds that we interact with. This situation is ever so close to how irony can be described at its broadest, cultural theorist Claire Colebrook defining it as ‘saying what is contrary to what is meant.’⁶ Because computers are ‘dimensionless and thus imageless’⁷ the establishment of objects and worlds as signs, and the relationship between signifier and signified, is something that is created from scratch and as such is liable to change. This ironic standpoint might draw most games close to literary critic Patricia Waugh’s ideas of ‘metafiction’, where a work ‘systematically draws attention to its status as an artefact in order to pose questions about the relationship between fiction and reality.’⁸ Objects and worlds in games often say something different to what they mean, and holding this co-existent duality is an essential property of the medium. By situating games as ironic structures, we can explore their potential as media that can challenge, subvert and distort traditional and established ways of seeing and conceiving of the world around us. As Mara Forest says while staring into the fire in *Crow Country*:⁹ ‘Maybe everything will be okay. And maybe it won’t.’

Games as ironic computation

I have previously discussed games as ‘ironic computation,’¹⁰ where advanced computational techniques are applied in the service of making experiences and media that play with and destabilise these relationships (*creating* discrepancies). A table found in an abandoned apartment in *The Last of Us*¹¹ does not really signify an object with a surface to arrange plates for a meal. In the mechanics of the game, it is clearly defined as something to hide behind, so much so that tables that would not really hide the char-

6 Claire Colebrook, *Irony, The New Critical Idiom* (London: Routledge, 2004), p. 10.

7 Friedrich Kittler, *Optical Media*, trans. by Anthony Enns (Cambridge: Polity, 2010), p. 228.

8 Patricia Waugh, *Metafiction: The Theory and Practice of Self-Conscious Fiction* (London: Methuen, 1984), p. 2.

9 *Crow Country*, SFB Games, 2024.

10 Luke Pearson, ‘Architectures of Ironic Computation’, *Inflection*, 3 (2016), 90–101 (p. 95).

11 *The Last of Us*, Naughty Dog, 2013.

acters still serve as cover. As a coded object the table is detached from the meanings and affordances it has in our physical world. This ironic detachment is fine for gamers. If players are aware of the discrepancy of game worlds, particularly when related to real-world objects and meanings, then this fits with rhetorician Wayne Booth's reading that 'ironic reconstructions depend on an appeal to assumptions, often unstated, that ironists and readers share.'¹² Booth identifies that the ironic author and reader share a secret knowledge and similarly the weirdness of the game object does not need to be explicitly stated because players of games know that this is an intrinsic nature of the medium. As Colebrook says: 'irony allows us to inhabit our own context, acknowledge the existence of other contexts and enable our own context to be open, fluid and creative.'¹³ In these terms the table is not incorrect, it is simply something new, a *videogame table*. As the philosopher David Chalmers would argue about other digital furniture, 'virtual chairs are quite different to physical chairs. Still, they're perfectly real objects.'¹⁴ In the Japanese arcade game *Cho Chabudai Gaeshi*,¹⁵ the table even transcends into a physical interface for the player to bash and flip in anger, sending game objects flying and collecting points.

Ironic computation is also a way of describing how games generally use computers for different means to those that we often find discussed in popular culture and discourse. Artificial intelligence, simulations, smart cities, big data, and digital manufacturing all fit into modernist 'grand narratives' of how humans will overcome their problems through technological innovations. Games, on the other hand, expend vast amounts of computing power on telling stories and creating systems where meaning is consistently shifting and distorted. This type of playful interaction between signifier and signified challenges our perception of other forms of computation. Ian Bogost argues that seeing games

12 Wayne C. Booth, *A Rhetoric of Irony* (Chicago: University of Chicago Press, 1974), p. 33.

13 Colebrook, *Irony*, p.211.

14 David Chalmers, *Reality+: Virtual Worlds and the Problems of Philosophy* (London: Allen Lane, 2022), p. 199.

15 *Cho Chabudai Gaeshi*, Taito, 2009.

as ‘caricatures’¹⁶ makes us question our reliance on simulations to solve all the world’s problems. The rejection of grand narratives and the introduction of irony as an aesthetic mode is one of the key underpinnings of postmodernist thought. This leads to the following question: how much of this irony is defined by the medium itself, and how much is established by the software used to create these media – *game engines*?

Generating irony in game engines

Contemporary game engines emerge from a close historical relationship between the software and the titles it created. The 1990s innovations of id Software combined the technical inventions of John Carmack and the creative work of John Romero, with the progression from *Doom*¹⁷ to the iterations of *Quake* driven by new advances in game engine technology. But as Jason Gregory states, id’s engines maintained ‘a reasonably well-defined separation between its core software components (...) and the art assets, game worlds and rules of play that comprised the player’s gaming experience.’¹⁸ In essence, this makes the game engine a framework upon which any number of symbols, signs and meanings could be attached. While id Software’s engine technologies power a great many games and mods (the *Doom* engine remaining in commercial use as of 2024’s *Selaco* by Altered Orbit Studios), the largest growth of the game engine in terms of influence and scope has emerged from another 90s title, *Unreal*.¹⁹ The Unreal Engine, built for the game’s design, has expanded into a mammoth platform encompassing game design, VFX and virtual production for film, architecture and product design, with the company’s stated aim to provide the structure for a future metaverse.²⁰

16 Ian Bogost, ‘The Cathedral of Computation’, *The Atlantic*, 15 January 2015.

17 *Doom*, id Software, 1993.

18 Jason Gregory, *Game Engine Architecture*, 2nd edn (Boca Raton, Florida: CRC Press, 2014), Section 1.3.

19 *Unreal*, Epic Games, 1998.

20 Andrew Webster, ‘Tim Sweeney Explains How the Metaverse Might Actually Work’, *The Verge*, 23 March 2023.

This trajectory fits with the modernist principles of a unifying system, capable of solving the problems of multiple industries at once. Epic Games has acquired or invested in many other companies in fields such as photogrammetry (Quixel and RealityCapture), facial animation (Cubic Motion), architectural visualisation (TwinMotion) and even music (Bandcamp). Yet the iterative, sometimes chaotic and confusing nature of Unreal's systems (as with that of its competitors such as *Unity*) speak to a software that has held multiple identities and seeks to fold ever more design environments into its capabilities, to shift its language according to the industry in which it is applied. Unreal's beginnings were attached to a very specific language – the first-person shooter game. As of Unreal Engine 5.5, the software offers 26 templates encompassing games, film production, architecture, car and product design, and simulation. Through its new *Fab* platform and *Unreal Engine for Fortnite* (UEFN), the engine continues to expand into more general design platform models. Each iteration of the engine offers new tools, bug fixes and refinements. In this regard we can see Unreal as an ever-changing language.

For the philosopher Richard Rorty, one of the properties of the ironic mode of thought is an awareness that 'the terms in which they describe themselves are subject to change, always aware of the contingency and fragility of their final vocabularies.'²¹ While Unreal's expanding and changing vocabulary may be primarily aimed at new industries, it has also provided artists with new voices to explore alternative and ironic worlds through the technology. As Mia Consalvo and Dan Staines argue, 'the affordances and constraints of particular engines, working in concert with the creative community around a particular engine, shape both game engine use as well as the game engine thinking that determines what is and is not possible.'²² Unreal-made titles such as *Octopath Traveler*²³ or *Guilty Gear Strive*²⁴ already challenge this with their visual style. But by expanding the cross-industry user base

21 Richard Rorty, *Contingency, Irony, and Solidarity* (Cambridge: Cambridge University Press, 1989), p. 74.

22 Mia Consalvo and Dan Staines, 'Reading Ren'Py: Game Engine Affordances and Design Possibilities', *Games and Culture*, 16.6 (2021), 762–78 (p. 764).

23 *Octopath Traveller*, Square Enix, 2018.

24 *Guilty Gear Strive*, Arc System Works, 2021.

of Unreal, the engine is opened to new and ironic adoptions by bringing new design and artistic vocabularies into contact with it.

Art collective Keiken have spoken about how Unreal Engine provides the exciting possibility to design expansive worlds to live in, to connect through and to challenge societal frameworks of gender and ecology.²⁵ By using the software to dismantle social constructs and rebuild them in new and more hopeful ways, Keiken's work demonstrates the tension of the game engine. On the one hand, there is something of the modernist *tabula rasa* in Keiken's projects such as *Morphogenic Angels*, where they design an entirely new world from the ground up. But through their subversion (or correction) of social structures and reassemblages of meaning, Keiken's work also seems to be that of the ironist, using the game engine as a willing collaborator. Artist Alice Bucknell, who uses Unreal in ecologically driven projects such as *The Alluvials* (2023–24), also uses the engine as a 'site' for delivering lectures to students, turning a traditional form of academic discourse into an interactive experience.²⁶

By subsuming and accommodating different industry syntaxes and aesthetics into the software, and through its persistent iteration, the vocabulary of Unreal Engine is never fixed. Pippin Barr argues that 'video games, and games in general, are never truly "finished." The conversations with their rules can always continue a little longer; we can see the rules as invitations to ask questions.'²⁷ Unreal itself is open to questions that ironically probe its power, such as 'stress test' videos²⁸ where users overload the engine with excessive geometry, or the playful reimagining of games such as *Super Mario RTX – Unreal Engine 5*.²⁹ In this fan-made Mario game using Unreal Engine and Nvidia's RTX raytrac-

25 Keiken, speaking at panel discussion: 'Speculative Storytelling through Games', Wild Digits, Victoria and Albert Museum, 29 November 2024.

26 Alice Bucknell, lecture delivered at Cinematic and Videogame Architecture Studio, The Bartlett School of Architecture, University College London, 7 October 2024.

27 Pippin Barr, *The Stuff Games Are Made Of* (Cambridge, Massachusetts: MIT Press, 2023), p. 23.

28 Lively Geek, 'Nanite Stress Test in Unreal Engine 5', YouTube, 16 November 2021.

29 Funkyzeit Games, 'I Created a Mario Game I Always Wish Existed: Super Mario RTX - Unreal Engine 5', YouTube, 18 August 2022.

ing technology, cute visuals of Nintendo are transformed into a dark language of cinematic death and destruction by virtue of the engine's advanced visual effects. Unreal's realism is used to ironically explore what Mario is *actually* doing in his games.

An Unreal vocabulary

We can see this vocabulary as soon as we start a new project (perhaps picking from one of these cross-industry frameworks) and start to populate our level. Unreal's standard interface offers a 'Place Actors' panel, where we can select different types of objects and insert them into the game world. *Actors* are one of the key classes of objects (UObjects) in Unreal's systems, and on the surface this term comes replete with all the cinematic and theatrical allusions of what this might mean. Yet rather than the clear distinction between actor, prop and set that we might find in a theatre production, we find a first ironic detachment in the fact that actors are a standard class that represents *all* objects placed into the world. The standard sky offered by Unreal, *SM_SkySphere* is a Static Mesh Actor class. The 'atmosphere', or weather of the world is equivalent to a car, an ammo box, or a speaking, scripted NPC. In fact, as Tim Sweeney has explained, this terminology is derived from the 'actor model' in computer science.³⁰ In this model, everything is composed of discrete actors, thus subsuming every object the designer places into the world into an independent unit that must have its relations with other actors established through code and messaging (Fig. 1).

Unreal tends to mix languages between game, computer science and filmic syntaxes. If we want to elevate an Actor to something that might be controlled, we can use the *Pawn* class, which is able to receive instructions by being 'possessed' by a player. The pawn brings associations of game-like structures, but also symbolises the lowest rung of agency. More complex are *Character* classes that in Unreal's terms is a Pawn 'that includes

30 Tim Sweeney, cited in 'Classic Tools Retrospective: Tim Sweeney on the First Version of the Unreal Editor', *Game Developer*, 9 January 2018.

the ability to walk around.’³¹ If we take character in its more cinematic form, we might expect that this difference involves definitions such as ‘a person represented’ or even ‘a particular quality’³² rather than simply the ability to walk. Unreal’s terminology can seem rather strange at first, particularly as all these Actor classes are placed in worlds called *Levels* – a word completely embedded in gaming vernacular. Other engines, such as Unity, can be confusing in the opposite: using the evidentiary term *GameObject* for objects, but placing them in *Scenes*, back into the idiom of cinema and theatre.



Fig. 1. *The Actors' Dressing Room*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. Actors of interchangeable types relax while waiting to be placed into a game world. 3D modelling by author, Unreal Starter Content Pack, Free Assets and CC Attribution Assets: Quick Treelt Tree by CG Dive; Asset Kit – Potions by Luciano O. Mollo.

³¹ In-engine tooltip description of Character class in Unreal Engine 5.

³² Cambridge Dictionary, 'Character'.

Despite these cinematic or theatrical allusions, Ian Bogost reminds us that ‘game engines move far beyond literary devices and genres (...) game engines regulate individual videogame’ artistic, cultural, and narrative expression.’³³ While agreeing with this assessment, Mikhail Fiadotau argues that ‘there is also an immaterial constraint at play: the conventions and canons associated with the engine.’³⁴ In Unreal’s case, some of the canonical decisions underpinning its design are drawn not from game design or computer science, but from the software and design syntax of another creative discipline – architecture. Given Unreal was originally developed for a specific game (rather than being ported from another industry), this might seem strange. But as James Malazita discusses, this shapes one of the most fundamental aspects of the design environment, the Cartesian axes that regulate the position and orientation of everything in the world.

As Malazita details, the axes of Unreal Engine are drawn from the conventions of architectural software, rather than those of animation or other screen-based media:

It modelled itself on architecture’s Z-up world. Unreal’s (the game) modelers worked primarily in 3D Studio, leading to Unreal (the engine) inheriting architecture’s axes.³⁵

Malazita finds that unlike software such as Maya where the z-axis represents the in/out eyeline of the viewer looking towards the screen, users of Unreal are more like architects or engineers ‘hunched over a drafting table, looking down onto floorplans and manufacturing schematics.’³⁶ Tim Sweeney himself confirms that this is the case ‘if you think of the world from an overhead perspective’ and that ‘this standard was earlier chosen by AutoCAD (an architectural CAD package made by Autodesk) deriving 3D data from 2D floorplans.’³⁷ (Fig. 2).

33 Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* (Cambridge, Massachusetts: MIT Press, 2006), p. 56.

34 Mikhail Fiadotau, ‘Game Engine Conventions and Games that Challenge Them: Subverting Conventions as Metacommentary’, *Replay: The Polish Journal of Game Studies*, 3.1 (2017), 47–65 (p. 49).

35 James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024), p. 65.

36 *Ibid.*, p. 63.

37 Tim Sweeney, comment on ‘Z-Up vs Y-Up, the Solution to the Debate Lies Within...’, *Unreal Engine Forums*, 8 July 2015

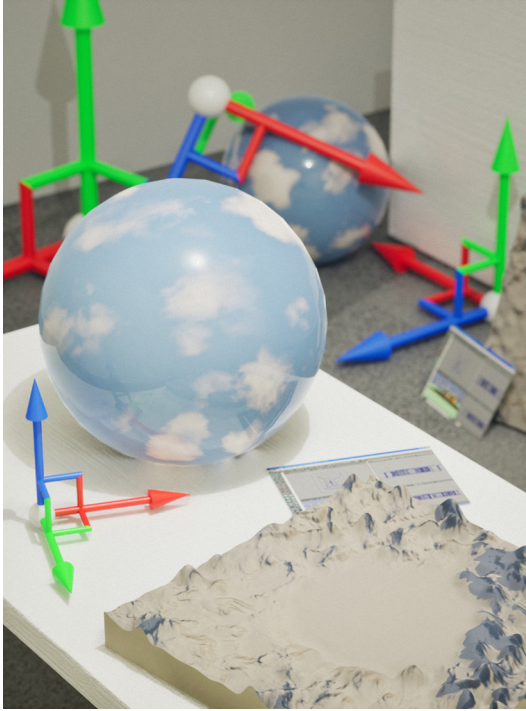


Fig. 2. *Drafting Table*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. A designer's eye view onto the axial structures of Unreal Engine. 3D modelling by author; Unreal Starter Content Pack.

Earlier versions of Unreal, such as UE1 (1998) and UE2 (2001) utilised a split-viewport layout, more commonly associated with architecture, engineering and product design. However, while the engine has moved directly towards those industries, its standard user interface has moved away from it. Unreal 5.5 opens into a single viewport, using a perspective camera that can be controlled with typical FPS controls. This is quite different to architectural modelling packages like Rhinoceros, where the 4-viewport approach persists, but it is not necessarily *unarchitectural* in nature. Prior to the advent of modern architectural drawing, generally attributed to the Italian architect Leon Battista Alberti (1404–1472) – providing fabrication instructions through dimensioned, illustrated material – buildings would often be designed

by the architect directing construction on site. Unreal's mobile camera returns us to the 'Middle Ages' where worlds are assembled and refined by the designer directly occupying that space. Yet Unreal's terminology for its visual scripting system *Blueprints* is derived from the type of technical drawings made in architecture and engineering that communicate a transferrable and replicable design. While the engine's standard level templates place the designer in a *tabula rasa* where they can synthesize a world around themselves, Blueprints speak to the type of reusable, object-based components that underpin the meaning of the world. Blueprints also superseded the previous system *Kismet*, with its more poetic allusions to 'destiny.' Consequently, the architectural basis for the engine's worldbuilding capabilities brings the software into conversation with architectural theory.

Ironic objects

This mapping of behaviour at the object level, whether through blueprint-level logic or through components that can be attached to actors, creates a situation where the behaviour and meaning of objects can be easily changed by the designer, and indeed the player. The *Event Graph* node-based environment in which Blueprints are visually constructed is mirrored in other tools like the *Material Editor* or *State Machine* constructor. In all these cases 'equations, texture maps, time, and space are treated equally, a logic of ontological-flattening-for-interoperability.'³⁸ This interoperability, encouraged by the engine's interface, makes the (re)assembling of meaning trivial – it is only the connection of a Bézier curve away. One of the first tutorials a budding Unreal student might take could involve turning a cube red when the player clicks on it, building up to something more advanced like making a door swing open as the player approaches.³⁹ In such a scenario, it would be easy to swap behaviours, and for the door to turn red while the cube swishes around. Doors, and their opening, are so

38 Malazita, *Enacting Platforms*, p. 132.

39 Gorka Games, 'Learn How to Open and Close Doors in Unreal Engine 5', YouTube, 4 September 2022.

fundamental to our expectation of architecture in the real world that architect Juhani Pallasmaa has called the door handle the 'handshake of the building',⁴⁰ yet the playful student in the early stages of learning the software can upend that expectation with ease (Fig. 3).



Fig. 3. *Blueprint Association*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. The contingent connections between objects and meaning. 3D modelling by author, *Unreal Starter Content Pack*.

In this case, while we may all have prior knowledge of how physical doors work – players of games already know that not every door really opens. The fact that the door can be so easily reprogrammed makes it somewhat unknowable, and ironic. As

⁴⁰ Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2nd edn (Chichester: Wiley, 2005), p. 56.

architectural historian Emmanuel Petit argues on irony in architecture, ‘the opacity of the signifier makes the sign explicit *as* sign or representation.’⁴¹ This behaviour manifests not only through individual Actors and Blueprints but also through *Blueprint Components*, reusable code that can be attached to other blueprints, enabled or disabled at runtime, and subjected to different manipulations that change their meaning further.

Breaking through this relationship can form the basis for entire game mechanisms. The central feature of *I Am Dead*⁴² is the ability for the player to manipulate the camera plane to cut into objects and reveal their insides – and their (often surreal) inner truth. The game’s title is ironic, with the dead protagonist Morris Lupton examining the hidden lives of everything within the world. The game’s designer Ricky Haggett talks about how the team needed to implement two-sided unlit materials and idiosyncratic modeling techniques to represent the interior of these objects.⁴³ This notion of the unknowable or disconnected hidden meaning of an object is symbolised in the one-sided materials that are typical in most game engines. Moving inside an object reveals that there is no interior and moreover, the exterior walls become invisible as only one direction of the surface is rendered. However, Unreal offers an easy one-click activation of material ‘two-sidedness,’ letting users see geometry in ways that are more common in other design software. By leveraging the engine’s capability in a careful interplay of material meaning and geometry, *I Am Dead* allows the player to literally cut into objects and slice through the opacity separating the signifier and signified.

The techniques used by Hollow Ponds demonstrate a great hurdle overcome in the development of convincing spatial representations through computer graphics – how to *hide* objects from view. In ‘Hidden Surface Problems,’ Jacob Gaboury examines the challenges computer scientists faced in calculating the visibility of objects in relation to one another. For Gaboury, although game spaces depicted on our screens have a superficial resemblance

41 Emmanuel Petit, *Irony; Or, The Self-Critical Opacity of Postmodern Architecture* (New Haven: Yale University Press, 2013), p. 17.

42 *I Am Dead*, Hollow Ponds, 2020.

43 Ricky Haggett, cited in conversation with the author, 2020.

to the history of perspective representation (emerging in Western art), or perhaps scenes from cinema, how those images are arrived at is totally different. He asserts that this establishes ‘the dual function of computer graphics as both structured objects and rendered image, irreducible to either one or the other.’⁴⁴

Opacity

This relationship between opacity (both in meaning and in visibility) is particularly well evoked by the mobile game *Vignettes*,⁴⁵ where rotating objects change their form and meaning based on common geometrical forms. This builds up a network of seemingly disparate objects that are connected by their appearance on the screen at a specific orientation. Following Gaboury’s ideas about rendering, the different objects in the game maintain a connection because of their visual combination on the screen. At the engine level, this relation is purely mathematical – comparing rotation vectors of 3D mesh objects. In my studio You+Pea’s game *FusiForms*,⁴⁶ commissioned for NYU Game Center’s *No Quarter* showcase, we explored a similar ironic relationship between screen-space convergence and mathematical equivalency. The two-player game is played through two projectors, creating a front-and-back projection onto a screen and separating each player from one another. Players are tasked with finding elements within buildings that look like faces, by rotating, moving and scaling these architectural structures. They then attempt to match the faces together to create a unified projection. Yet the point at which these faces converge may involve vast differences between the scales, rotation and position of each building. Things are made more complex by the fact that the projection screen used creates a brighter image through *back projection*, meaning the other player’s screen image is slightly brighter than the player’s own. As players combine buildings through their common facial features, the

44 Jacob Gaboury, ‘Hidden Surface Problems: On the Digital Image as Material Object’, *Journal of Visual Culture*, 14.1 (2015), 40–60 (p. 53).

45 *Vignettes*, Skeleton Business, 2017.

46 You+Pea, *FusiForms*, two-player projection installation commissioned for *No Quarter*, NYU Game Center, New York, 2018.

buildings ‘fuse’ and become added to a final cityscape that appears when the game is completed, showing the unique architectural combinations that have been created (Fig. 4).

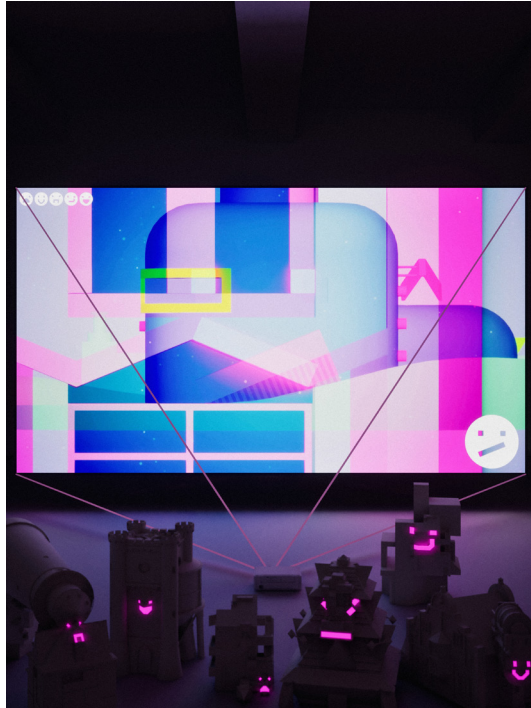


Fig. 4. *FusiForms*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. Architectural forms created through the comparative orientation of engine-space and projection-space. 3D modelling by You+Pea (Sandra Youkhana & author), Unreal Starter Content Pack.

The game relies on physically aligned projectors to function properly, yet in theory it could be played without this overlay – although players would lack any visual context and the game would become impossibly hard. But this could occur because the game works through comparing relative positions, rotations and scales of 3D models, together called *Transforms* in Unreal, by using arrays and data tables of comparative combinations. As a structured system then, the game does not care whether the projectors have been

aligned properly to appear correctly for the players, it is a purely mathematical comparison. To be able to test this (given the game was being installed remotely in New York), we constructed a miniature version of the installation in-engine, using Unreal's *Render Targets*, a way of sending camera feeds to textures and materials within the engine. This allowed us to apply projector feeds to materials, with approximate light transmission levels, and calibrate the relative Transforms of the architectural models we had made.

Unreal was probably not the perfect engine for achieving this. Its inbuilt split-screen system had to be forced across two projector outputs by running the game in windowed mode directly from the editor during the exhibition. The packaged game would not behave in the same way, and we lacked the test environment to implement Unreal's *nDisplay* tiling system. While this technical limitation could doubtless be solved with more time and a bigger team, as Mikhail Fiadotau says, 'the deliberate choice to push the envelope of the engine's functionality and the conspicuous refusal to follow established conventions can be seen as a commentary on the engine's capabilities, limitations and "idioms of practice"'⁴⁷ As with the ironist's use of text, the meaning of the game engine is expanded and detached from its already established language. Fiadotau argues that this generates a 'metacommentary' on the engine itself, one relying on both the designer's and the player's awareness of the conventions of game engines.⁴⁸

As Pippin Barr (and others) argue, a central irony of game code is that 'the interface should melt away,'⁴⁹ the more functionally perfect a game is, the less it should get in the player's way. This situation is normally desirable in games that prioritise 'immersion' but breaks where the interface or underpinnings of the game come to the surface unintentionally. Glitches and bugs can create new ironic connections between objects and their meanings, even beyond those that game players will take for granted as part of the medium. *Cyberpunk 2077*,⁵⁰ built on CD Projekt RED's proprietary *REDEngine*, promised an immersive, narrative-driven

47 Fiadotau, 'Game Engine Conventions', p. 61.

48 *Ibid.*

49 Barr, *The Stuff Games Are Made Of*, p. 70.

50 *Cyberpunk 2077*, CD Projekt RED, 2020.

future world to experience, but on release was riddled with bugs and temporarily withdrawn from sale on the PlayStation Store. Many of these glitches subverted or reorganised the meaning of objects in the world. Players found cars driving straight through them, pedestrians standing in the T-pose and unrelated objects fused together, spinning furiously on the spot. The game engine's capability for assembling meaning means it is also easy to mis-assemble through glitches and errors, and may even be desirable, for as writer Legacy Russell argues, 'it helps us to celebrate failure as a generative force, a new way to take on the world.'⁵¹

But beyond examples of glitches making new object relationships through broken associations, games like *I Am Dead*, *Vignettes* or our *FusiForms* project are examples of developers leaning specifically into mechanics to generate meaning. Stefan Werning has observed that many contemporary titles now leverage the idiosyncratic computational techniques of digital production and 'readjust player perceptions to focus on how a specific effect was implemented'⁵², thereby generating meanings that detach from a traditional narrative. Such works do not necessarily dispense with story, but instead use their mechanics as the primary generator of meaning, bringing the ironic potential of the ludic object to the centre of the player experience.

Mechanical paradox

A notable example of this is *Viewfinder*,⁵³ built on the Unity engine, which gained public interest through early tech demos shown on lead developer Matt Stark's social media. In the game, players take instant photographs of scenes within the environment, and then project the geometries contained within those photographs back into the 3D space of the world. This inventive mechanic forms the basis of the puzzles and narrative, while also focussing player attention on the game's specific systems. By photocopying photographs, players make recursive, projective spaces

51 Legacy Russell, *Glitch Feminism: A Manifesto* (London: Verso, 2020), p. 16.

52 Stefan Werning, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021), p. 37.

53 *Viewfinder*, Sad Owl Studios, 2023.

where geometry repeats in a fragmented manner. Early in the story, players will find a moment where they are able to record and project different visual forms of space together – ‘real’ space, the space of a pencil drawing, then an impressionistic painting, an American cartoon, a child’s doodle and a retro videogame dungeon. Combining these geometries together through the mechanic provides an impressive demonstration of the game’s capabilities, while also emphasising the possibility of creating paradoxical architecture within the game.

These types of specialised interactions could fit with Rorty’s assertion that ‘ironists specialize in redescribing ranges of objects or events in partially neologistic jargon.’⁵⁴ *Viewfinder* establishes a new way of expressing spatial interactions and creates a new set of terminologies for doing so. Progressing through the game, players will understand that certain materials cannot be photographed, and so the capture and projection of 3D space becomes implicitly related to architectural materiality. Such is the interest in the game’s unique system, discussions have emerged on gamedev Reddit forums, and several YouTube channels have made recreations of the mechanics, in both Unity⁵⁵ (as per the original) and Unreal Engine. These broadly interpret the system as using clipping planes that mimic the camera’s view frustum, performing real-time cutting of objects within the field of view, before duplicating them. To project back into the world, a similar cutting is performed, with the cut objects removed and the original duplicated objects placed into this new void. A comment from the original developer on one of the videos suggests that this is reasonably close to how they achieved the effect.⁵⁶

By recreating these systems users have discovered limitations that reveal more about how the world’s design is synthesised around the mechanics in unusual and ironic ways. In one video tutorial, YouTuber TNTC recreates *Viewfinder*’s systems, but notes that due to the computational power required for real-time mesh cutting, the developers have used simple geometries

54 Rorty, *Contingency*, p. 78.

55 TNTC, ‘Real-Time World Cutting in Unity: Recreating an Inspiring Game Mechanic’, YouTube, 17 September 2024.

56 Comment from @mattstark7814 on Will Logs, ‘Viewfinder in Unity’, YouTube, 30 August 2022.

and basic shapes to create the architecture depicted in the game world. The combinatory possibilities of simple forms subjected to complex geometrical and symbolic rules have been a foundational part of much postmodern architectural theory connected to irony, seen in the works of architects such as John Hejduk, Arata Isozaki and even the early studies of Zaha Hadid. Beyond the immediate level design, these videos also discuss how structures and effects in the far distance, even ‘fog’ fields, are all mapped to physical objects, so they appear more interesting when cut by the ‘infinite’ frustum. This upends our typical expectations of how game worlds are constructed – here there is no normal *Skybox* or *Sky Sphere* typical to a first-person game, because that could not be captured and re-projected in a satisfactory manner (Fig. 5).



Fig. 5. *Viewfinding*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. Changing the meaning of a geometrical world through frustum cutting. 3D modelling by author, Unreal Starter Content Pack and Free Assets.

Everything in *Viewfinder*'s world is designed to emphasise the photographic mechanic, and as such to be subjected to ironic disconnections and reconnections of meaning in the pursuit of generating spatial paradoxes. One of the most notable uses of paradox in architecture was eighteenth-century printmaker Giambattista Piranesi's *Carceri* series of etchings, where he designed a series of prison interiors that were spatially impossible according to the rules of perspective. This depiction of a prison as both a space of containment, but also one of impossibility led architecture theorist Manfredo Tafuri to describe the *Carceri* as a place where not people but 'only *things* become truly "liberated."' ⁵⁷ In *Viewfinder*, we do take 'selfies' but the player's figure is a distorted silhouette, instead it is the world itself that is freed through the camera to assume different forms, as a direct result of the real-time geometry processing possible in a contemporary game engine. The fact that *Viewfinder*'s mechanics are so connected to our understanding of perspective and its translation into computer language reinforces Malazita's assertion that 'graphics are a constant struggle between data architectures and visual representations, between their leaky ontological status as "both image and object."' ⁵⁸ In the context of spatial design, this position of 'both-and' was outlined by the postmodern architect Robert Venturi as his way of approaching a world where 'space and its elements become readable and workable in several ways at once,' ⁵⁹ exactly as we find in *Viewfinder*.

Inflected objects

Often, ironic connections are a consequence of efficient design within Unreal. *Blueprint Interfaces*, for example, are collections of shared functions that can be implemented across a range of different objects. Interfaces are an example of 'polymorphism' in coding, whereby a base class of object can communicate with derived

57 Manfredo Tafuri, *The Sphere and the Labyrinth: Avant-Gardes and Architecture from Piranesi to the 1970s*, trans. by Pellegrino d'Acierno and Robert Connolly (Cambridge, Massachusetts: MIT Press, 1987), p. 32.

58 Malazita, *Enacting Platforms*, p. 84.

59 Robert Venturi, *Complexity and Contradiction in Architecture* (New York: Museum of Modern Art, 1966), p. 16.

classes of objects, without needing to know what they are. Jason Gregory states that this has the effect of making ‘a heterogeneous collection of objects *appear* to be homogeneous, from the point of view of the code using the interface.’⁶⁰ In a game space, the player may encounter objects that are connected and detached at once. Stefan Werning cautions us that this can create a design environment that ‘frames digital games as collections of parts rather than an integral whole.’⁶¹ Yet this connection, between parts and whole, has a rich potential for exploration, specifically with ironic possibilities this affords. In an architectural context, a similar condition can be found in what Venturi termed ‘inflection,’ fragments within a designed environment that hint at an overall, formal whole, without explicitly disclosing it:

Inflection in architecture is the way in which the whole is implied by exploiting the nature of the individual parts, rather than their position or number. By inflecting toward something outside themselves, the parts contain their own linkage (...) Inflection is a means of distinguishing diverse parts while implying continuity.⁶²

Despite his cautions about fragmentation, Werning also describes how the designers of *Half-Life*⁶³ ‘formulated self-imposed rules’ for designing the world ‘such as combining seemingly incompatible assets in creative ways—which (...) inspired some of the gameplay elements for which the *Half-Life* franchise would become famous.’⁶⁴ As Petit argues, ‘instead of providing the literal continuity of a work’s meaning, inflection implied a formal continuity, which unfolded through time.’⁶⁵ The pipes encountered in a *Mario* game have that formal continuity, which a new player will come to understand through repeated engagement with the world. In *Katamari Damacy*⁶⁶ we can argue that every object in the world inflects towards one another, as they

60 Gregory, *Game Engine Architecture*, Section 3.1.1.4.

61 Werning, *Making Games*, p. 60.

62 Venturi, *Complexity and Contradiction*, pp. 88–90.

63 *Half-Life*, Valve, 1998.

64 Werning, *Making Games*, p. 60.

65 Petit, *Irony*, p. 54.

66 *Katamari Damacy*, Namco, 2004.

can all be rolled and attached to the Katamari ball, but it is their scale value that determines when that inflection takes place. In our game *Everyone is Architecture*,⁶⁷ we proposed turning people into interchangeable architectural elements, where meanings can change but also coalesce into architectural forms – inflecting towards one another.

Another game emphasising this approach is *The Magic Circle*,⁶⁸ which obviously takes its name from Johan Huizinga's foundational text on play, *Homo Ludens*.⁶⁹ The Magic Circle centres around the story of a QA tester exploring an unfinished fantasy game, and all the fragmented, incomplete and malleable elements within that world. The game's metanarrative hints at the history of game development, particularly the great unfinished and poorly received 'auteur' games of the late 1990s and early 2000s, like *Daikatana*⁷⁰ and *Duke Nukem Forever*.⁷¹ One of the game's central mechanics is the reprogrammability of everything within the world, with players able to extract functions from objects and then apply their behaviours to other elements. The game's trailer puts this front and centre with the tag line 'Don't Fight It... Rewrite It' while showing us a newly transformed mushroom biting the head off a strange alien dog.

This mechanic lets players assume the agency of the designer within a game engine environment and indulge in *bricolage*, a term Werning uses to describe how engines encourage 'making do with the resources available and strategically (re)combining them.'⁷² One of the ways of doing this is to reconfigure elements, not physically, or compositionally, but through their meaning and behaviours. Early in the game we see the fictional designer Ish Gilder clumsily manipulate objects in front of the player, in lieu of detailed animations, demonstrating the contingency of these objects. We also encounter loading screens that become three-dimensional spaces through parallax and 'ghost' objects

67 *Everyone is Architecture*, You+Pea, 2018.

68 *The Magic Circle*, Question, 2015.

69 Johan Huizinga, *Homo Ludens: A Study of the Play Element in Culture* (London: Routledge & Kegan Paul, 1949).

70 *Daikatana*, Ion Storm, 2000.

71 *Duke Nukem Forever*, Gearbox Software, 2011.

72 Stefan Werning, *Making Games*, p. 38.

that only appear once the player dies. Bricolage as a technique generates ironies because its mode of design requires a mediation between objects, their composition, and their meaning. In her work discussing the voice of women in computing through a study of programming styles, American sociologist Sherry Turkle describes how ‘bricoleurs construct theories by arranging and re-arranging, by negotiating and renegotiating.’⁷³ This process of constant arrangement and negotiation is key to the Magic Circle, as a way of destabilising the (male) auteur’s singular vision of the world. Turkle compares the more ‘logical’ and compartmentalised designs of ‘planners’ to the more negotiated works of *bricoleurs*. Unreal appears to sit at the intersection of these positions. It is undoubtedly a software environment that promotes compartmentalisation, and the repetitive deployment of structure, and yet its connection into asset libraries (Marketplace, and now Fab) makes it easy to work as a bricoleur.

Solidified ephemera

Harun Farocki’s *Parallels I-IV* reveals the strange and ironic detachment between the process of creating a virtual world, and the illusion of reality that world presents. In *Parallel I*, we watch an unknown game developer pushing clouds around in a scene, composing them just so.⁷⁴ While Farocki’s editing and framing put this simple design manoeuvre into a larger philosophical context about computer simulation, we can see how Unreal’s authors explicitly train users in this type of ironic design language. In a 2018 GDC presentation, Epic developer Sjoerd De Jong shows how to create ‘local’ volumetric fog through *Volume Materials* and *Particle Systems*. By tying a particle system to the shape of an architectural form using a *Static Mesh Actor*, De Jong creates shaped fog fields, demonstrating how any conceivable sculptural form could be turned into a cloud.⁷⁵ Such an approach recalls American archi-

73 Sherry Turkle and Seymour Papert, ‘Epistemological Pluralism: Styles and Voices within the Computer Culture’, *Signs*, 16.1 (1990), 128–57.

74 Harun Farocki, dir., *Parallel I* (Germany, 2012).

75 Unreal Engine, ‘Volumetric Fog and Lighting in Unreal Engine 4 | GDC 2018’, Epic Developer Community, 26 March 2018.

tects Diller Scofidio + Renfro's 2002 *Blur Building*, a pavilion which dissolved into a cloud of mist through a lightweight structure containing 35,000 high pressure nozzles. Yet while the ironic connection of building and cloud was achieved by making the structure as thin as possible, De Jong simply applies an invisible material to his Unreal mesh, disappearing the architecture and leaving only the cloud. We could imagine this technique applied to every geometry in the world, producing a contemporary version of Cory Arcangel's *Super Mario Clouds* (2002), with nothing left but bouncy cumuli. Like many other custom features, this technique is now inbuilt in Unreal with the introduction of *Local Fog Volumes* in 2024, subsuming it into the standard language of the engine (Fig. 6).



Fig. 6. *Fog Geometries*, Unreal Engine 5 render, Luke Caspar Pearson, 2024. The solidification of fog and ephemera into physical forms. 3D modelling by author, Unreal Starter Content Pack and CC Assets: Quick TreeIt Tree by CG Dive.

The relationship between solid and fog is emblematic of the relationship Unreal maintains with depictions of the natural world, its ephemera and phenomena. While Epic-owned platforms like *Quixel* and *RealityCapture* promise the integration of photorealistic nature into the engine, the ironic possibilities afforded by fog (or grass, trees and sunlight) relate to Alenda Chang's call for *rambunctiousness* in environmental game design, which she classifies as 'boisterous, wild, unruly'.⁷⁶ For Chang, 'rambunctiousness is intuitively related to the irony and irreverence celebrated by Nicole Seymour in *Bad Environmentalism*'.⁷⁷ Seymour's definition of bad environmentalism rests on 'environmental thought that employs dissident, often-denigrated affects and sensibilities'⁷⁸ but she also discusses 'how irony's conceptual doubling allows it to disrupt the binarized logic of despair/hope in environmental thinking'.⁷⁹ The work of JODI, and specifically their *Untitled Games* (1996–2001), based on a highly visually abstracted version of *Quake*⁸⁰ demonstrates how challenging and even removing the figurative can address the specific 'ecology' of a game world. Using 'very basic forms like just a line or square, just black or white,' JODI would 'attach these forms to the behaviour of the code so that we would have a better view on how such a game is driven'.⁸¹ In doing this, JODI's work also demonstrates that in a game engine, every asset is open to change, altering the entire symbolic meaning of the environment.

The unruliness that Chang calls for is also important because as Colebrook argues, 'to use a discourse ironically allows the continued articulation of that discourse'.⁸² To repeat something ironically is still to repeat it, so in fact the greatest impact may happen through more thorough and bizarre severances of meaning. An

76 Alenda Y. Chang, 'Rambunctious Games: A Manifesto for Environmental Game Design', *Art Journal*, 79.2 (2020), 68–75 (p. 68).

77 *Ibid.*

78 Nicole Seymour, *Bad Environmentalism: Irony and Irreverence in the Ecological Age* (Minneapolis: University of Minnesota Press, 2018), pp. 5–6.

79 *Ibid.*

80 *Quake*, id Software, 1996.

81 Francis Hunger and JODI, 'Perspective Engines: An Interview with JODI', in *Videogames and Art*, ed. by Andy Clarke and Grethe Mitchell (Bristol: Intellect, 2006), pp. 280–97 (p. 287).

82 Colebrook, *Irony*, p. 213.

example of this is Xiaojun (Katrina) Lin's video game *Symbiocene: To Grieve With The Dead*,⁸³ designed in the Cinematic and Video-game Architecture course I lead at the Bartlett School of Architecture, UCL. Lin's game (made in Unreal) uses an abstracted landscape and procedurally generated creatures to explore the human-led extinction events of specific animals and plants. Moving through the creature's habitats, players carry out specific 'game-like' tasks such as collecting objects and reaching objectives, triggering the world to symbolically repeat that extinction event. The desire of the player to play the game *as a game* ironically restages the impact of the Anthropocene. Our expectations of games, as formed by the game engine, allow for the environment and even our agency within it to become an ironic act. If games are, as C. Thi Nguyen argues, 'a way of writing down forms of agency, of inscribing them in an artefact,'⁸⁴ then we can also see how those inscriptions can be multilayered and playful in their meaning. De Jong shows how the ethereal and the solid are interchangeable at a moment's notice, just as Farocki wryly observes how designers can change the weather one cloud at a time. Lin's game shows how staging agency can itself be an ironic, rambunctious act, creating new relationships between ourselves, the game engine and our environment.

The ironies of Unreal

The examples I have discussed pale in the face of the size and scope of Unreal Engine as it progresses deep into its fifth iteration. It contains innumerable systems, with more added with each subsequent version. It is hard to see Unreal as anything other than a grand modernist project of software: one platform to rule them all. Yet by leveraging the game engine's ironic tendencies, we can remake conceptions of game environments, challenging the drift towards sameness and fixity of meaning.

83 *Symbiocene: To Grieve With The Dead*, Xiaojun (Katrina) Lin, 2024.

84 C. Thi Nguyen, *Games: Agency as Art* (Oxford: Oxford University Press, 2020), p. 17.

Project Titan,⁸⁵ Epic's latest sample game for Unreal, is promoted as the collaborative work of over 4000 volunteers, creating an open world together through emergent interactions and individual design styles. Despite achieving this lofty goal, the leader of the project at Epic discussed the numerous difficulties, not least artists working in 'outdated' ways, such as lower resolution texturing and making unnecessary *Level of Detail* models that did not leverage Unreal's modern tools such as *Nanite*.⁸⁶ Despite it being an impressive project, one is left to wonder about how much it has been smoothed over into a glossy, GDC-ready discussion piece. Petit reminds us that 'the notion of a clearly demarcated and synthetic "truth" has always been a central target for ironists,'⁸⁷ and it is tempting to consider what Project Titan might have been, were the guard rails removed. A lawless hellscape like the infamous *Minecraft*⁸⁸ server *2b2t*, or perhaps a gentler yet weirder version of *Second Life*?⁸⁹

Importantly, the ironic structures promoted by game engines might actually be able to work against this unifying drift. For Petit, irony has been used by designers as 'a vehicle to recuperate the trans-ideological profundity and complexity of reality against the ideological simplifications of the (...) hegemonic systems they opposed.'⁹⁰ Irony challenges Unreal as a software platform that streamlines and idealises how we conceive the world. Beneath the corporate presentations and company acquisitions sits a game engine that is highly adept at creating visual realism but just as good at upturning that façade and assembling new meanings in real time. Gaboury reminds us that while 'we may think of computer graphics as principally a visual medium, in fact it is structured by a particular theory of the nature of objects, their relation to one another, and to the world around them.'⁹¹

85 Epic Games, *Project Titan Sample Game*, collaborative open-world game developed with 4,000+ community contributors, Unreal Engine 5, 2024.

86 Unreal Engine, 'How to Build an Open World Game with 4,000 Strangers | Unreal Fest 2024', Epic Developer Community, 16 September 2024.

87 Petit, *Irony*, p. 22.

88 *Minecraft*, Mojang Studios, 2011.

89 *Second Life*, Linden Lab, 2003.

90 Petit, *Irony*, p. 22.

91 Gaboury, 'Hidden Surface Problems', p. 44.

Unreal underpins both conventional commercial games but also Keiken's worldbuilding, the explorations of gender and identity in the work of LuYang, or a totalitarian state embodied as a giant policeman looking down on you (*Militsioner*, TALLBOYS, TBA) where new generations of artists and designers are playing with the meaning-making possible in the game engine as ironists.

When Ursula Le Guin spoke of her 'carrier bag theory of fiction', she evoked the types of everyday objects and activities that were carried out in society, by women, that would never be allowed to fit into traditional narratives of heroes and conquests. She used the example of weaving a basket, all the elements used to create a container to carry food, clothing, or mementos.⁹² There is no doubt that game engines are adept at offering us heroes and conquests, their history is evidence that they are often born umbilically attached to violence and victory. Yet their spread into other design fields has also offered the opportunity for different stories, vocabularies and lexicons to be incorporated by virtue of the ironic structures game engines afford. As I have shown, through irony game engines give designers and artists the means to *challenge* game engines. Such software may be marketed as pointy, cutting-edge tools for realising visions and returning investments, but they are also carrier bags, software to explore not only 'how people relate to everything else in this vast sack,'⁹³ but also what people are, and what a sack might be. A sack boy perhaps? Or perhaps not.

Bibliography

- Barr, Pippin, *The Stuff Games Are Made Of* (Cambridge, Massachusetts: MIT Press, 2023)
- Bogost, Ian, 'The Cathedral of Computation', *The Atlantic*, 15 January 2015 <https://www.theatlantic.com/technology/archive/2015/01/the-cathedral-of-computation/384300/> [accessed 12 December 2025]
- , *Unit Operations: An Approach to Videogame Criticism* (Cambridge, Massachusetts: MIT Press, 2006)

92 Ursula K. Le Guin, *The Carrier Bag Theory of Fiction* (London: Ignota Books, 2019).

93 *Ibid.*, p. 37.

- Booth, Wayne C., *A Rhetoric of Irony* (Chicago: University of Chicago Press, 1974)
- Bucknell, Alice, lecture delivered at Cinematic and Videogame Architecture Studio, The Bartlett School of Architecture, University College London, London, 7 October 2024
- Cambridge Dictionary, 'Character', *Cambridge Dictionary*, n.d., <https://dictionary.cambridge.org/dictionary/english/character> [accessed 12 December 2025]
- Chalmers, David, *Reality+: Virtual Worlds and the Problems of Philosophy* (London: Allen Lane, 2022)
- Chang, Alenda Y., 'Rambunctious Games: A Manifesto for Environmental Game Design', *Art Journal*, 79.2 (2020), 68–75
- Colebrook, Claire, *Irony* (London: Routledge, 2004)
- Consalvo, Mia, and Dan Staines, 'Reading Ren'Py: Game Engine Affordances and Design Possibilities', *Games and Culture*, 16.6 (2021), 762–78
- Fiadotau, Mikhail, 'Game Engine Conventions and Games that Challenge Them: Subverting Conventions as Metacommentary', *Replay: The Polish Journal of Game Studies*, 3.1 (2017), 47–65
- Funkyzeit Games, 'I Created a Mario Game I Always Wish Existed: Super Mario RTX — Unreal Engine 5', YouTube, 18 August 2022, <https://www.youtube.com/watch?v=XCVubOzbFzI> [accessed 12 December 2025]
- Gaboury, Jacob, 'Hidden Surface Problems: On the Digital Image as Material Object', *Journal of Visual Culture*, 14.1 (2015), 40–60
- Game Developer, 'Classic Tools Retrospective: Tim Sweeney on the First Version of the Unreal Editor', *Game Developer*, 9 January 2018 <https://www.gamedeveloper.com/design/classic-tools-retrospective-tim-sweeney-on-the-first-version-of-the-unreal-editor> [accessed 12 December 2025]
- Gorka Games, 'Learn How to Open and Close Doors in Unreal Engine 5', YouTube, 4 September 2022 <https://www.youtube.com/watch?v=O7vmp73ue4Y> [accessed 12 December 2025]
- Gregory, Jason, *Game Engine Architecture*, 2nd edn (Boca Raton, Florida: CRC Press, 2014)
- Huizinga, Johan, *Homo Ludens: A Study of the Play Element in Culture* (London: Routledge & Kegan Paul, 1949)
- Hunger, Francis, and JODI, 'Perspective Engines: An Interview with JODI', in *Videogames and Art*, ed. by Andy Clarke and Grethe Mitchell (Bristol: Intellect, 2006), pp. 280–97
- Keiken, contribution to panel discussion, 'Speculative Storytelling through Games', Wild Digits, Victoria and Albert Museum, London, 29 November 2024
- Kirkpatrick, Graeme, *Aesthetic Theory and the Videogame* (Manchester: Manchester University Press, 2011)

- Kittler, Friedrich, *Optical Media*, trans. by Anthony Enns (Cambridge: Polity, 2010)
- Le Guin, Ursula K., *The Carrier Bag Theory of Fiction* (London: Ignota Books, 2019)
- Lively Geek, 'Nanite Stress Test in Unreal Engine 5', YouTube, 16 November 2021 https://www.youtube.com/watch?v=v9kynURWW_I [accessed 12 December 2025]
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Nguyen, C. Thi, *Games: Agency as Art* (Oxford: Oxford University Press, 2020)
- Pallasmaa, Juhani, *The Eyes of the Skin: Architecture and the Senses*, 2nd edn (Chichester: Wiley, 2005)
- Pearson, Luke, 'Architectures of Ironic Computation', *Inflection*, 3 (2016), 90–101
- Petit, Emmanuel, *Irony; Or, The Self-Critical Opacity of Postmodern Architecture* (New Haven: Yale University Press, 2013)
- Rorty, Richard, *Contingency, Irony, and Solidarity* (Cambridge: Cambridge University Press, 1989)
- Russell, Legacy, *Glitch Feminism: A Manifesto* (London: Verso, 2020)
- Seymour, Nicole, *Bad Environmentalism: Irony and Irreverence in the Ecological Age* (Minneapolis: University of Minnesota Press, 2018)
- Sweeney, Tim, comment on 'Z-Up vs Y-Up, the solution to the debate lies within...', *Unreal Engine Forums*, 8 July 2015 <https://web.archive.org/web/20191007215605/https://forums.unrealengine.com/community/general-discussion/46691-z-up-vs-y-up-the-solution-to-the-debate-lies-within> [accessed 12 December 2025]
- Tafari, Manfredo, *The Sphere and the Labyrinth: Avant-Gardes and Architecture from Piranesi to the 1970s*, trans. by Pellegrino d'Acierno and Robert Connolly (Cambridge, Massachusetts: MIT Press, 1987)
- TNTC, 'Real-Time World Cutting in Unity: Recreating an Inspiring Game Mechanic', YouTube, 17 September 2024 <https://www.youtube.com/watch?v=rdExKo8zYBI> [accessed 12 December 2025]
- Turkle, Sherry, and Seymour Papert, 'Epistemological Pluralism: Styles and Voices within the Computer Culture', *Signs*, 16.1 (1990), 128–57
- Unreal Engine, 'How to Build an Open World Game with 4,000 Strangers | Unreal Fest 2024', Epic Developer Community, 16 September 2024 <https://dev.epicgames.com/community/learning/talks-and-demos/1340/unreal-engine-how-to-build-an-open-world-game-with-4-000-strangers-unreal-fest-2024> [accessed 12 December 2025]
- , 'Volumetric Fog and Lighting in Unreal Engine 4 | GDC 2018', Epic Developer Community, 26 March 2018 <https://dev.epicgames.com/community/learning/talks-and-demos/Ebe/volumetric-fog-and-lighting-in-unreal-engine-4-gdc-2018-unreal-engine> [accessed 12 December 2025]

- Venturi, Robert, *Complexity and Contradiction in Architecture* (New York: Museum of Modern Art, 1966)
- Waugh, Patricia, *Metafiction: The Theory and Practice of Self-Conscious Fiction* (London: Methuen, 1984)
- Webster, Andrew, 'Tim Sweeney Explains How the Metaverse Might Actually Work', *The Verge*, 23 March 2023 <https://www.theverge.com/2023/3/23/23652928/tim-sweeney-interview-epic-games-fortnite-metaverse> [accessed 12 December 2025]
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- Will Logs, 'Viewfinder in Unity', YouTube, 30 August 2022 <https://www.youtube.com/watch?v=8rr83zwzIOA> [accessed 12 December 2025]

Artworks

- Farocki, Harun, *Parallel I* (HD video, colour, sound, 15 min. 53 sec., Germany, 2012).
- You+Pea, *Everyone is Architecture* (interactive installation, 2018).
- You+Pea, *FusiForms* (two-player projection installation, 2018).

Ludography

- Gearbox Software, *Duke Nukem Forever* (2011), PlayStation 3, Xbox 360, Windows PC.
- Altered Orbit Studios, *Selaco* (2024), Windows PC.
- Arc System Works, *Guilty Gear Strive* (2021), PlayStation 4, PlayStation 5, PC, Xbox.
- CD Projekt RED, *Cyberpunk 2077* (2020), PlayStation 4, PlayStation 5, Xbox One, Xbox Series X/S, PC.
- Cosmo D, *Betrayal at Club Low* (2022), PC.
- Epic Games, *Unreal* (1998), PC.
- FromSoftware, *Dark Souls* (2011), PlayStation 3, Xbox 360, PC.
- Hollow Ponds, *I Am Dead* (2020), Nintendo Switch, PC.
- id Software, *Doom* (1993), MS-DOS.
- id Software, *Quake* (1996), PC.
- Ion Storm, *Daikatana* (2000), PC, Nintendo 64.
- Linden Lab, *Second Life* (2003), PC.
- Xiaojun (Katrina), *Symbiocene: To Grieve With The Dead* (2024), PC.
- Militsioner*, TALLBOYS (TBA), PC.
- Mojang Studios, *Minecraft* (2011), PC, Xbox, PlayStation, Nintendo Switch, Mobile.

Namco, *Katamari Damacy* (2004), PlayStation 2.
Naughty Dog, *The Last of Us* (2013), PlayStation 3.
——, *Uncharted 4: A Thief's End* (2016), PlayStation 4.
Nintendo, *Splatoon* (2015), Wii U.
Question, *The Magic Circle* (2015), PC.
Sad Owl Studios, *Viewfinder* (2023), PlayStation 5, PC.
SFB Games, *Crow Country* (2024), PC, PlayStation, Xbox, Nintendo Switch.
Skeleton Business, *Vignettes* (2017), iOS, Android.
Square Enix, *Octopath Traveler* (2018), Nintendo Switch, PC.
Taito, *Cho Chabudai Gaeshi* (2009), Arcade.
Valve, *Half-Life* (1998), PC.

EDDIE LOHMEYER

ANIMAL ENGINES
AND THE FERILITY OF GLITCH

on a wolf
a firefly
attaches...
Kaneko Tohta¹

SELECT GAME. A waterfall of corrupted ROM memory flows down screen. PLAY. Frames alternate wildly between fragmented tiles and palettes. PLAY A G7.² This garbled sequence describes the psychedelic forms of *Digital TV Dinner*, a work of glitch video art created in 1979 by queer and transgender artist Jamie Faye Fenton with collaborators Raul Zaritsky and Dick Ainsworth. Widely regarded as the first instance of glitch art, *Digital TV Dinner* was produced by Fenton through the misuse of a Bally Astrocade, a game console for which she wrote the programming language Bally BASIC while working at Bally Midway throughout the 1970s. Because Fenton coded the Astrocade's operations and was intimately aware of its material affordances, she also knew that a

1 Kaneko Tohta, *Selected Haiku: With Notes and Commentary: Part 2 1961-2012* (Winchester, VA: Red Moon Press, 2012), p. 75.

2 SELECT GAME, PLAY, and PLAY A G7 are commands drawn from Bally BASIC (and its successor, AstroBASIC), the programming language Fenton developed for the Astrocade. PLAY A G7 is a music processor instruction directing the console's three-channel sound chip to play the note G7 (G in the seventh octave) on tone channel A. Its inclusion here evokes the multimedia totality of the Astrocade as an engine — rendering graphics, executing logic, and generating sound — all of which are subject to feral disruption in *Digital TV Dinner*.

user could pound the system with a fist and pull out a game cartridge mid-play when powered on, leaving behind a strange residue of the Astrocade's internal memory (Figure 1). Hence, *Digital TV Dinner* was generated by Fenton through a series of embodied interventions with the code and hardware of a commercial videogame system, often in instances where even Fenton could not anticipate the system's unpredictable results.

Fenton's work, situated within broader trans histories of videogames and experimental media, highlights the ways in which glitch-art practices are historically and materially entangled with videogame engines. The waterfalls of garbled data in *Digital TV Dinner* express a dynamic relationality among human and non-human, user and code, glitch and engine. By using the term game engine, I refer to the concept of an engine as a software framework for developing and rendering 2D and 3D gameworlds.



Figure 1. Jamie Fenton with Raul Zaritsky and Dick Ainsworth, *Digital TV Dinner*, 1979. Screenshot.

The dominant understanding of a commercial engine as a modifiable software environment for game creation with Unreal, Unity, or RAGE that powers *Grand Theft Auto V* (GTA V), is organised around technical developments in the first-person shooter

genre, notably John Carmack and John Romero's work on id Tech 1 that powered *Doom* (1993). *Doom* along with the id Tech 2 that powered *Quake* (1996), afforded players the ability to create new character skins, game maps, weapons, and gameplay modes, influencing the emergence of grassroots modding, speedrunning, and machinima communities in the early 1990s. My aim here is not to elaborate on videogame modding cultures as I have done so in detail elsewhere, but rather to highlight the lively becoming of glitch practices in a material co-constituency among programmer-artist, code, pixels, scanline, Zilog Z80 CPU, as well as the embodied sites of contact among Fenton's hand that slams the plastic surface of the Astrocade to generate a glitch.³ Using Fenton's embodied manipulations as a point of departure and inspiration, this chapter explores an expansive and more inclusive theory of glitch aesthetics, particularly how artists exploit commercial engine software to reveal the dominant epistemologies through which we play, design, and study videogames.

As with the Bally Astrocade, I consider a game engine as the underlying code of a videogame platform that organises and executes operations across hardware and software: rendering graphics, interpreting physics, and carrying out the game's artificial intelligence models. Early home consoles like the Astrocade indicate that historical game engines were inventive and efficient computers that animated gameworlds through an ongoing coordination among code and hardware. The glitches and acts of intentional dismantling seen in *Digital TV Dinner* show that, within a vibrant yet long-neglected history of trans media and glitch, the Astrocade was designed to run and correlate player-system actions. Yet, it is also designed to be unravelled. This chapter lays the groundwork for an expanded theory of technical error that I call the *ferality* of glitch aesthetics. The ferality of glitch is a relational process of dynamic and ongoing impermanence among human and nonhuman bodies at work. It refers to the agential mesh through which artist and engine negotiate

3 For a comprehensive history of recent modding practices see Lohmeyer, Eddie. *Unstable aesthetics: Game Engines and the Strangeness of Modding* (New York: Bloomsbury Academic, 2023).

the material becoming of glitch, whether through unpredictable rupture or planned intervention.

In these mutual exchanges, glitch operates as a coextension of human and technical system that exceeds tired binaries of analogue/digital, computational/video, form/genre, representation/abstraction, as well as human/machine. The feral nature of glitch is one of affective revealing, displaying comfortable interfaces whilst detonating those familiar digital forms into radical spaces of difference. Ferality works to *unveil* the authority of videogame culture and the proprietary contours of the game engine as well as the ways the game development industry disciplines players into expected flows of play. At the same time, this mechanic of unveiling perpetuates what Rosa Menkman so aptly calls ‘destructive generativity’ and the potential emergence of radical media forms.⁴ The feral glitch defamiliarises normal experiences of gameplay as it gnaws through the surface of graphical forms, marking a territory in the engine ecosystem with the spectral remains of media artefacts.

This chapter evokes ferality as a metaphor for glitch aesthetics and brings together conversations in animal studies, queer game studies, as well as feminist materialist philosophies to consider the alien capacities of glitch as they are taken up in a mutual phenomenology with a human user. Ferality highlights glitch as a fundamentally nonhuman, queer, and animal entity that evades domestication and capture by the technical rules of an engine and normal gameplay. For one, my understanding of the feral glitch as a nonhuman actant, is influenced by Karen Barad’s posthumanist, feminist account of agential realism. In efforts to counter representationalist thinking, Barad introduces a performative epistemology and ethics for the liveliness of matter. That is, the material world is composed of intricate natural, social, and technoscientific entanglements that dynamically configure our becoming. Barad refers to the velocities and slownesses, collisions and alliances of matter as intra-activity, or the boundless agential forces of things — Astrocade engine, Fenton’s

4 Rosa Menkman, ‘Glitch Studies Manifesto’, in *Video Vortex Reader II: Moving Images beyond YouTube*, ed. Geert Lovink and Rachel Somers (Amsterdam: Institute of Network Cultures, 2011), p. 342.

fist, corrupted pixels, mishandled ROM cartridge — that continually remake material space-time configurations.⁵ Barad's agential realism is helpful for understanding the nonhuman agency of the feral glitch, especially with the increasing ubiquity of video-games in our everyday lives. Ferality speculates on the hidden life of computational error and the unpredictable autonomy of the glitch artefact, while challenging anthropocentric frameworks through forms of material attraction and repulsion that exceed human activity. With Barad's agential realism, I see glitch as a boundary making practice in which new material-discursive relations are forged from the ways artists and programmers generate potential errors through technical disruptions to game engines and expected gameplay.

In addition to agential realism, the feral glitch likewise expresses its nonhumanness as a vibrant *animality*; an electric anima and frenzied spirit through which the possibilities for technical error are actualised. Here, I draw from animal studies and specifically Akira Mizuta Lippit's rhetoric of animality and wildlife. Lippit contends that since modernity and the organisation of bourgeois subjectivity in the late 19th century, human beings have defined themselves through a negation of the animal being. In our strange distance to the animal world, we have anthropomorphized the animal being into an uncanny other. These human-centric views that assign identity and embodiment to the animal being are unconscious forces that operate beyond conscious thought.⁶ He situates these unconscious energies of the animal as a technical metaphor for cinema, suggesting that the electromagnetic force of moving images articulates the otherworldliness of animal beings, what Lippit calls the *animetaphor*. With Lippit's rhetoric of wildlife in mind, I see glitch as an animetaphor that expresses an affective, unknowable animality through the game engine as a worldbuilding system, and the electronic errors that it (destructively) generates.

5 Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham N.C.: Duke University Press, 2007), pp. 133–6.

6 Akira Mizuta Lippit, *Electric Animal: Toward a Rhetoric of Wildlife* (Minneapolis, MN: University of Minnesota Press, 2008), pp. 7–8.

Echoing Fenton's pioneering glitch practices and Pow's trans historiography, I also see ferality and the potential for glitch aesthetics within contemporary game engines as a fundamentally queer practice. Specifically, I draw from queer game studies, a field that Bo Ruberg and Adrienne Shaw have argued mobilises queerness 'to simultaneously destabilize and reimagine videogames themselves'. Modes of queer gaming work to counter dominant binaries within videogame culture: narrative/play, win/failure, control/agency, pleasure/frustration, competition/reward, player/engine and afford fresh ways of seeing the radically political value inherent to games.⁷ Within queer gaming, Merritt Kopas and Naomi Clark see glitch as a mode of *queer failure* 'that's too drastic and uncontrolled' for the normal cycles of dying and respawning that typify gameplay.⁸ In the material fabric of human user and engine, the potential creation of a glitch operates through queer mechanics that question our normative assumptions of games by reconfiguring who normally plays them, while opening up possibilities for what videogames can do.

In the first part of the chapter, I explore the ferality of glitch in *Digital TV Dinner*. Tracing a genealogy for the Astrocade game engine into the present, in the last half of the chapter, I examine two contemporary videogame artworks: Brent Watanabe's *San Andreas Streaming Deer Cam* (2015–16) and Alice Bucknell's *The Alluvials* (2023–24).⁹ In Watanabe's *San Andreas Streaming Deer Cam* (SASDC), the artist reimagines *GTA V* as a nonplayable mod and programs a virtual deer with the game's pedestrian artificial intelligence to generate its erratic behaviour. Of its own accord, the deer freely roams the 49 square mile map of San Andreas, perpetuating a chaotic butterfly effect through its interactions with in-game objects and NPCs. Bucknell's *The Alluvials* consists of a video work and interactive game that probes the water

7 Bonnie Ruberg and Adrienne Shaw, *Queer Game Studies*, ed. Bonnie Ruberg and Adrienne Shaw (Minneapolis: University of Minnesota Press, 2017), pp. ix–x.

8 Naomi Clark and Merritt Kopas, 'Queering Human-Game Relations: Exploring Queer Mechanics & Play', *First Person Scholar*, 18 February 2015.

9 Alice Bucknell, *The Alluvials*, digital video (1920 × 1080), colour, sound, 38 min 05 sec, 2023, United States of America.

supply and drought politics of a future Los Angeles as well as our broader climate crisis. Combining speculative worldbuilding with queer and ecological game mechanics, Bucknell creates the project's machinima film and videogame using modded environments from *GTA V*'s metropolis Los Santos in combination with psychedelic AI diffusion sequences, drone mapping, as well as artist-designed game environments in Unity. In both contemporary works, I observe how the ferality of glitch operates through its coextension with contemporary game engines, namely through mechanics of queer failure and nonhuman, animal perspectives. The repurposing of *GTA V*'s standard gameplay to produce novel modes of glitch aesthetics points to the unique ways artists use game engines to speculate on ecological possibilities for being in the world. Moreover, in highlighting these material engagements among artists and game engines in Fenton's *Digital TV Dinner* as well as Watanabe's *SASDC* and Bucknell's *The Alluvials*, this chapter argues for a more inclusive understanding of glitch aesthetics in the ways we think, write about, and play videogames.

Expanded Fields of Error

In relation to videogame culture, a glitch is commonly thought of as an unpredictable error or rupture within the standard operations of a game engine that rears its head through a variety of forms: a temporary freeze, crash, frame rate drops, compression and encoding/decoding errors, clipping, hardware failures (Red Ring of Death associated with an infamous Xbox 360 hardware crash), physics-based launching that defy conventional in-game gravity, boundary errors where players intentionally break outside the game map, as well as sequence breaking, or when players employ glitches to bypass a game's levels or narrative to progress. To reiterate, I use ferality to think through an expanded understanding of glitch practices that incorporates the material work of both human and engine. Rosa Menkman reinforces this broader view, framing glitch as an erratic break in the normal transmission of data in a system through which noise artefacts are generated. To Menkman, glitch emerges from

the hegemonic pursuit of a noiseless, transparent channel. That is, with each new version, software upgrade, model, etc. there is the possibility of a system revealing its 'inherent fingerprints of imperfection'.¹⁰ When a glitch interrupts the procedural operations of a game engine and violently launches an avatar through the polygonal surfaces of the map's boundaries, it points to the agential capacity of glitch beyond its vernacular as a technical error at the level of code, hardware, or procedure. It also upends user assumptions regarding media genres, habitual interfaces, as well as the ways we inhabit and navigate videogame spaces. That is, glitches occur through the agency of an errant system, yet they are taken up in social and technical discourses of meaning making. Menkman calls this embodied experience of glitch its *moment(um)*: a strange instance in which a human user is thrust into an entropic space and control of the system is placed under threat. In this instance, noise carries with it a singular momentum and generates a glitch when it potentially slips forward into technical error or works to challenge the user's presumed knowledge of media technologies.¹¹

When we experience a glitch, it sometimes takes the form of what artists refer to as 'wild' or a glitch that occurs unintentionally without human intervention. Moreover, some glitches are 'domesticated' or purposely generated by an artist typically through computational tools or software that establish possible conditions for noise artefacts to emerge. In these existing animal metaphors (wild and domesticated) that consider the purity of noise artefacts, I frame glitch within a more expansive aesthetic field that works across and within a heterogeneity of media genres, techniques, and effects. Casey Boyle adopts a similar stance in his rhetoric of glitch through the concept of metastable orientation: mediated experiences that exceed the linear oscillation between human subjects and technical things. In instances of metastability, material relations among humans and nonhumans coalesce, vacillate, and transform on a preindividual level before

10 Rosa Menkman, *The Glitch Moment(um)* (Amsterdam: Institute of Network Cultures, 2011), p. 11.

11 Menkman, *The Glitch Moment(um)*, p. 31.

subject and object are territorialised.¹² Boyle's understanding of glitch is especially attentive to rhetorical modes of critical making that aren't strictly prescribed to digital or even technological approaches to failure. That is, within a constellation of human and technical exchanges, a glitch within a game engine becomes a site of affirmative difference instead of a system failure that needs remedying.

Digital TV Dinner and the Mechanics of Queer Failure

In this more inclusive framework for glitch practices, the feral glitch is catalyzed through the material negotiations and intra-acting (to borrow Barad's term) among artist-programmer and engine. In their groundbreaking study of Fenton's work, Whit Pow positions *Digital TV Dinner* within a trans historiography of computers and glitch art, arguing that Fenton's critical misuse of the console she helped design reveals a distinctly transgender history of glitch media. Fenton's embodied gestures in the form of removing cartridges and pounding the console with a fist to generate lively glitch patterns, is a trans history of glitch informed by what Pow calls *unmeditation*, or technical practices of breaking down the hegemonic discourses of videogames, long dominated by a masculine-coded, white, and heteronormative history of computers.¹³ In this case, glitch serves as a material entanglement among human bodies and technical nonhuman actants that necessarily works to undo impositions of power and control which have traditionally excluded trans life from video-game culture. To Pow, a trans history of glitch works 'within and outside of the boundaries of what can be stored, represented and fully known', through processes of undoing and revealing dominant technical frameworks.¹⁴ Recent critical attention in academic and media art communities has focused on Fenton's accomplishments within a broader history of computational

12 Casey Boyle, 'The Rhetorical Question Concerning Glitch', *Computers and Composition* 35 (March 2015), 12–29, p. 21.

13 Whitney Pow, 'A Trans Historiography of Glitches and Errors', *Feminist Media Histories* 7, no. 1 (2021), 197–230, p. 203.

14 Pow, 'A Trans Historiography of Glitches and Errors', p. 202.

media. In 1977, Fenton developed the Bally BASIC ROM operating system while working for arcade engineers Dave Nutting Associates. The following year she developed BASIC Zgrass for an early system called the Bally Home Library Computer. During her tenure at Midway, then the videogame division of Bally, Fenton designed the sci-fi space shooter arcade game *GORF* (1981). In 1985, Fenton developed the software framework that later became MacroMind Director (which evolved into Adobe Director) an early multimedia editing application that influenced new media and net art genres through interactive CD-ROM and web-based assets as well as Shockwave games (a precursor to Flash). Fenton's *Digital TV Dinner* was featured in the 2019 exhibition *Chicago New Media* curated by glitch artist jonCates and the VGA Gallery in Chicago, Illinois, and shown at Ars Electronica. The exhibition displayed Fenton's *Digital TV Dinner* with Pow's playable videogame *Digital TV Breakfast* (2018): a glitchy 3D remediation of Fenton's errant patterns designed in Unity that considers the role of trans media in everyday life.¹⁵

In an interview with jonCates and Jonathan Kinkley through the Art Institute of Chicago, Fenton discusses the advanced specs of the Astrocade engine, a system meant to rival the Atari 2600 at the time. Compared to the Atari 2600, the Astrocade has more memory and better graphics at 24-colour memory with 160 x 102 pixels and 2 bits per pixel. It is powered by a Zilog Z80 microprocessor with pioneering frame buffer technology or the allocation of system RAM that stores pixels for each video frame.¹⁶ Pow says that in *Digital TV Dinner*, unmediation flows through the ways Fenton possesses a kind of forensic awareness of the system's inner workings and yet uses this technical knowledge to break the system. When Fenton slams the Astrocade with a fist and ejects a cartridge, the glitches produced highlight the player's typical and ongoing mediation of gameplay as well as our interpellation into media systems of power, rules, and control. Fenton's unmediation of

15 jonCates, Jonathan Kinkley, and Jamie Fenton, 'Stability Isn't Everything It's Glitched Up to Be: An Interview with Jamie Fenton'.

16 jonCates, Jonathan Kinkley, and Jamie Fenton, 'Stability Isn't Everything It's Glitched Up to Be'.

the Astrocade engine, and tipping the system towards feral-ity, shows our reliance on interfaces as continuous and transparent surfaces through which we habitually perceive digital forms and assimilate the technical authority of game engines into our everyday lives. As Pow says, the discontinuity of glitch shows how technical media doesn't work as we presume, and historically has not worked for trans people.¹⁷

The liminal spaces of unmediation in *Digital TV Dinner* operate through queer mechanics of failure. Queer thinking in games often expresses possibilities for difference beyond the contours of software that govern player experience. Video-games can embody difference through their LGBTQIA+ narratives or related assets but also through the physics and mechanics of play. Naomi Clark and Merritt Kopas have called this upending of standard play queer mechanics — the possibilities for encoding heteronormative competition, pleasure, mastery, and reward into queer spaces by disrupting game rules.¹⁸ One such mechanic takes the form of failure — when a player dies or fails in a game, it typically reinforces expertise over controls and mechanics. Fail enough and the game engine disciplines the player's running, jumping, shooting, and strafing towards a mastery of the game and ultimately winning. Judith Halberstam has called this refusal of successful gameplay *queer codes* in which the act of failing works 'to rewrite the notion of achievement altogether and to exploit the normative code to produce transformative possibilities...'¹⁹ Clark and Kopas argue that glitch serves as a mechanic of queer failure to be embraced and affirmed. Through the complex nature of code, glitch emerges as an agential dynamic of the game engine, a convulsive response that dismantles cycles of die and restart. Moreover, they claim that to advocate for 'glitch autonomy' in new media art means to keep the source of the glitch's feral howl concealed; that is, failing to disclose the glitch's technical

17 Pow, 'A Trans Historiography of Glitches and Errors', pp. 203–04.

18 Clark and Kopas, 'Queering Human-Game Relations'.

19 Judith Halberstam, 'Queer Gaming: Gaming, Hacking, and Going Turbo', in Bonnie Ruberg and Adrienne Shaw, *Queer Game Studies*, ed. Bonnie Ruberg and Adrienne Shaw (Minneapolis: University of Minnesota Press, 2017), p. 194.

origins, keeping an air of wonderment about its creation and meaning.²⁰ In this way, the glitch patterns in *Digital TV Dinner* are a mechanic of queer failure charged among Fenton's embodied gestures and software code that catalyse a sense of wonder about the glitch's techne. Fenton addresses this sense of awe in the process of manipulating the Astrocade in that each act of banging the system and ejecting a game involves some luck in the glitch's potential outcome, but also a sense of gratitude for the Astrocade and its unanticipated, alien expressions. As Fenton says, this serendipitous process has to do with the Astrocade's hardware as the system was designed so that a player could insert and pull out a cartridge while the power remained on. The console includes buffers that could withstand the cartridge's ROM chip being inserted and removed again. The Astrocade's video output was also NTSC legal meaning that it could be recorded by a video cassette system. As Fenton notes:

if you just took the cartridge out while executing code — well, whatever that code was doing, it would keep on doing it. It would fill the screen with some sort of pattern. Usually, it would look like a memory dump of some of the memory of the system, but it could be other things as well. What we discovered is something like LSD, or as though we put some electrodes into your brain and just gave you a random shock. In other words, you could take the cartridge out while the game was on and this would cause all kinds of interesting things to happen. So there's Glitch Art!²¹

In these instances of wonder about a potential glitch, ferality emerges through a kind of embodied, queer failing that reveals the material boundaries of the Astrocade engine as it forces the video output towards a space of engaging with games otherwise (Figure 2).

20 Clark and Kopas, 'Queering Human-Game Relations'.

21 jonCates, Jonathan Kinkley, and Jamie Fenton, 'Stability Isn't Everything It's Glitched Up to Be'.

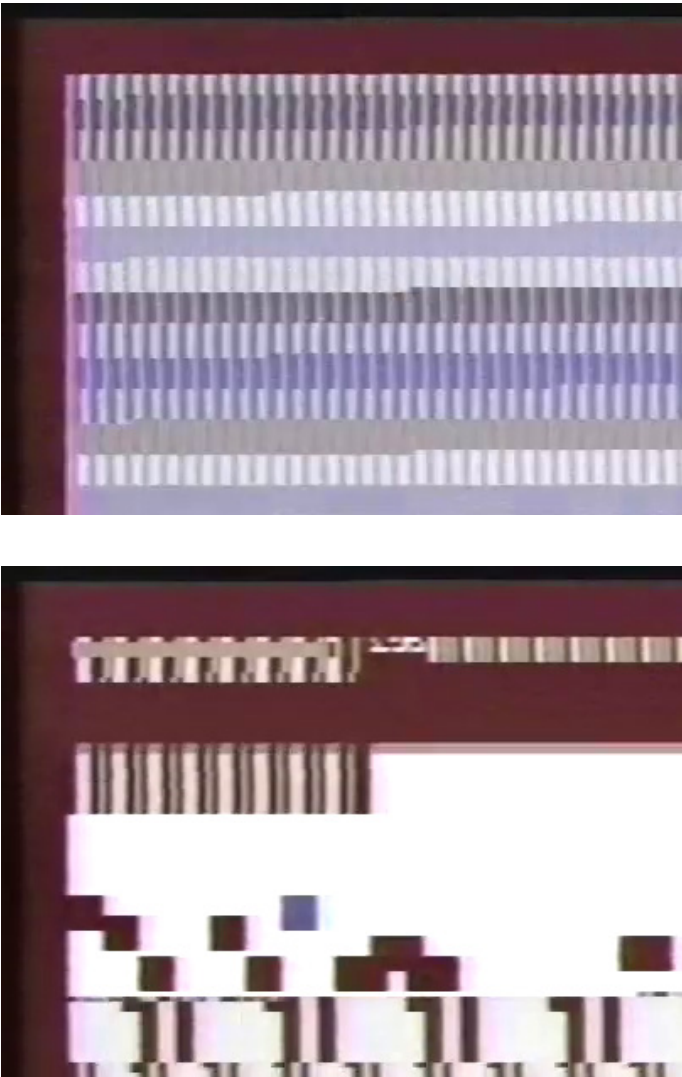


Figure 2. Awe and wonder at the feral glitch in Jamie Fenton with Raul Zaritsky and Dick Ainsworth, *Digital TV Dinner*, 1979. Screenshots.

The Apparatus of Glitch

The feral glitch operates through instances of queer failure, yet within a dynamic material engagement among human and nonhuman actants, what Barad refers to as an apparatus. In their posthuman understanding of matter and why it matters, Barad argues for a *performative* approach that champions practices of engaging with matter — observing, playing, making, doing, theorising — that intra-actively constitute and re-constitute our being in the world. Working outside of representation and the West's preoccupation with language and the things it references, agential realism sees matter as continually refracting through a keen and vital relationality. Material phenomena such as Fenton's embodied interventions and the conjuring of a glitch through pounding fists are entanglements of different agential forces at work. This dynamic field of intra-acting bodies and technical objects — Astrocade, fist, buffer pins that tolerate cartridge push and pull — challenges the straight, white, and masculine logics of dominant computer cultures by enacting new material-discursive boundaries and technoscientific forms of knowledge. Within material (re)configurings of people, engines, and glitches, Barad sees an apparatus not as merely a technical thing used for empirically observing the world, but as a broader constellation of boundary-making practices, techniques, and perceptual effects.²² Reworking the philosophy of Niels Bohr and his advancements in quantum physics, Barad sees apparatuses as open-ended and continually reconstituting the boundaries of what we know.²³ Apparatuses aren't limited to telescopes, high-tech laboratories, equipment, and rules of observation. They possess a more extensive topology of human and nonhuman actions through which practices of knowing vibrantly materialise. In *Digital TV Dinner*, ferality is mobilised through the lively relations of console, memory buffers, human bodies, digits, extended limbs, distorted pixels, flickering frames, taken up in affects of wonderment and gratitude that shape (and reshape) a broader apparatus of glitch aesthetics.

22 Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, pp. 139–40.

23 *Ibid.*, p. 185.

Fenton's handling of the Astrocade and respectful anticipation of the glitch highlight the unknowability of computational error outside of human-centred practices. This material weaving of game engine, Fenton's technical knowledge, and act of queer failure, highlights glitch practices within trans media histories as a lively apparatus of human and nonhuman activity through which ferality roams.

Animal Energies, Electric Ether

If historical engines like the Astrocade are taken up in apparatuses of glitch production that we see in Fenton's *Digital TV Dinner*, then modern game engines likewise are manipulated by artists-programmers to redraw the contours of glitch aesthetics and our knowledge of technical error. Glitch's metaphor of ferality behaves through nonhuman and queer affects. Yet, the feral glitch, through its psychedelic forms that claw and scratch, carries with it an animal energy. Here, my aim is to trace ferality in Fenton's work to its frenzied state in Bucknell's *The Alluvials* and Watanabe's *San Andreas Streaming Deer Cam (SASDC)*, looking specifically to posthumanist conversations in the field of animal studies. This shift towards the nonhuman animal-other works to counter Western man as a rational being whose body is presumed to be abled, white, and heteronormative. As Cary Wolfe notes, animal studies upends our expectations of what accounts for a knowing, embodied subject, held up by the humanist disciplines we take as given.²⁴ The modern human subject defines themselves in relation to what they are not, while different possibilities for subjectivity and embodiment are pushed to the side. Those bodies that are queer, feminine, disabled, elderly, and animal are taxonomised by man as an abnormality, un- or subhuman, and deviating from what is normal. Thus, when humans interiorise relationships to animals, companion or wild, it serves as an anthropocentric endeavour through which the rational human reinforces dominant subject positions and discards the other as

24 Cary Wolfe, *What Is Posthumanism?* (Minneapolis, MN: University of Minnesota Press, 2013), p. xxviii, xxix

beastly or feral. In response to this marginalizing of animal subjectivities, Rosi Braidotti has advocated for a new paradigm of animal embodiment that is attentive to the nuanced entanglements among people and nonhuman organisms. That is, animals require an ontological framework of their own that doesn't continue to support representational systems of human subjectivity.²⁵

By evoking ferality, my aim is to consider how these animal ontologies are expressed metaphorically through the confluence of game engines, queer mechanics, and glitch aesthetics. Lippit suggests that animals have traditionally haunted the realm of the human subject, existing as an uncanny, unknowable energy, shifting 'from a metaphysic to a phantasm; from a body to an image; from a living voice to a technical echo'.²⁶ This strange residue of animality operates as an unconscious phantasm. The unconscious embodies the animal in that both are sustained through a kind of ongoing reinnervation that keeps its charge eternally. Lippit observes this animal unconscious through the lens of late 19th and early 20th century discourses in psychoanalysis and cinema. During the 1890s, Sigmund Freud and Josef Breuer developed their theory of hypnoid states, drawing a connection between unconscious thought and more animalistic instincts. With hypnoid states, Freud and Breuer saw a kind of split consciousness where certain affects and thoughts, as they impinge upon the nervous system, are severed off from everyday consciousness, supplementing another consciousness onto the nervous system. The hypnoid episode adds a different psychic state to the mind's existing schema, opening up pathological conditions of hysteria.²⁷

Within these 19th century psychoanalytical frameworks, hypnosis serves as the mental and affective state that continually regenerates hysterical symptoms. At the time, these unconscious energies of the hypnoid-hysteric condition, were thought to possess an electromagnetic and prelinguistic force. In part, this thinking emerged from the electric processes of the nervous system but also from earlier concepts of animal magnetism, a theory posited

25 Rosi Braidotti, *The Posthuman* (Cambridge: Polity, 2013), p. 70.

26 Lippit, *Electric Animal*, p. 21.

27 Breuer, Josef, and Sigmund Freud. *Studies on Hysteria*. Vol. 2 of *The Standard Edition of the Complete Psychological Works of Sigmund Freud* (London: Hogarth and the Institute of Psycho-Analysis, 1955), p. 15.

by German physician Franz Anton Mesmer in the late 18th century that posits living things are imbued with a cryptic, invisible energy circulating among people and objects. Blockages in this flow of magnetism resulted in psychic unrest. Moreover, electricity as a mysterious energy was taken up in 19th century Spiritualist discourses, where it was seen as an otherworldly conduit to the afterlife as well as a mechanical intermediary for objectively capturing ghostly activity.

To Lippit, this electric animality taken up in psychoanalysis serves as the animetaphor as an expressive vitality that emerges from the nonhuman animal's inability to use language. The animetaphor imbues language with the strange and unknowable magnetism of the nonhuman, witnessed in cinematic technologies of the late 19th century. For instance, Eadweard Muybridge's chronophotographic experiments in animal locomotion sought to capture the immediacy of musculature, pose, and gait in non-human creatures, recording the spectral animal in its displacement from the modern world. Cinema and electromagnetic reproduction of the filmic image become metaphor for the animal entity that stalks the unconscious as 'a vast mausoleum for animal being'. Specifically, 'cinema is like an animal; the likeness a form of encryption. From animal to animation, figure to force, poor ontology to pure energy, cinema may be the technological metaphor that configures mimetically, magnetically, the other world of the animal'.²⁸

Extending Lippit's concept of animetaphor to glitch, I argue that ferality works through a nonhuman unknowability; a mode of animal embodiment that fractures language. In *Digital TV Dinner*, the animetaphor bursts through the Astrocade's expected game interfaces, exposing spectral layers of code and memory dumps underneath. Like Menkman's assertion of glitch, Lippit observes that the animal's electromagnetic force is destructive as well as generative. Just as the unconscious idea shocks the nervous system, it also reveals possibilities for existing otherwise. The feral glitch dismantles the regulatory nature of game engines as it opens to queer and nonhuman spaces of play.

28 Lippit, *Electric Animal*, p. 187, 196.

Chaotic Deer, Moth-Tree Symbiosis, and Glitching Life Otherwise

In Brent Watanabe's *SASDC* (2015–16), the animetaphor of glitch embodies the artist's manipulation of the RAGE engine and virtual deer that randomly roams the gameworld of *GTA V*, leaving unbridled chaos in its path. The RAGE engine was developed by Rockstar San Diego in the mid-2000s and was initially used to power Rockstar Games Presents *Table Tennis* in 2006. Before RAGE, Rockstar employed the RenderWare engine from Criterion Games to develop the earlier *GTA* titles on console and PC. With the release of *GTA V* in 2013, RAGE was upgraded with ambient occlusion lighting and advanced particle systems and further modified with the release *Red Dead Redemption 2* (2018) to include volumetric weather, pre-calculated global lighting, and support for Vulkan: a cross-platform API for advanced 3D rendering. Game critic and journalist Chris Stead has analysed the technical strengths of the RAGE engine, commending its efficiency at rendering large open worlds, nuanced AI behaviour from NPC characters, realistic weather, as well as accommodating middleware support. For instance, RAGE integrates smoothly with the animation engine Natural Motion as well as software engineer Erwin Coumans' well-known bullet physics engine.²⁹

Watanabe's *SASDC* emerged from a lively game modding community in which amateur gamers and programmers utilise RAGE to create everything from vehicle cannons with semitruck projectiles to mods that allow for heightened immersion by integrating accurate California architecture, signs, and advertisements into the game map. Watanabe created the mod using the Script Hook V library in RAGE that takes advantage of the engine's versatile AI frameworks for NPCs, programming the deer's behaviour to replicate the game's pedestrian AI. Because pedestrians in *GTA V* are considerably interactive, at times engaging in dialogue or attacking the player if confronted, when these AI pipelines are applied to a deer, it transforms it into a skittish landmine whose collision with other in-game AIs produces a series of cataclysmic

29 Chris Stead, 'The 10 Best Game Engines of This Generation', *IGN*, 15 July 2009.

happenings throughout the fictional San Andreas. Watanabe designed the virtual deer to be invincible but also to respawn periodically at different parts of the game map, perpetuating its chaotic interactions. At times, the deer finds itself at the centre of a police dragnet and in others at the centre of a violent gang war. Yet, there is a particular episode of the deer's frantic actions that embodies the queer, electromagnetic spirit of the feral glitch. The deer stands still on a busy Los Santos avenue. Around the deer, cars and buses careen out of control, knocking over traffic lights as they avoid its presence. Suddenly, the shockwave of a massive explosion rips through the air, vibrating the city street with its force and causing totalled cars and debris to jump 20 feet into the air. Reacting to the explosion, the startled deer takes off, galloping down a busy avenue into oncoming traffic (Figure 4). As the creature barrels onward, cars crash off the road to get out of its way. More explosions and shockwaves throw vehicles into the air. As it makes its way across a large bridge, a muscle car appears to intentionally drive into the deer, launching it into the air and causing its polygonal body to take on a glitchy rigor mortis. Among the muscle car's wreckage, the deer lies on its back with rigid legs pointed to the sky, part of its body resting inside the geometric surfaces of the bridge's walkway (Figure 3).

The destructive energy of the deer's path releases the feral glitch to freely roam the RAGE engine's territory. Amidst the pandemonium, the deer carries with it a vital nonhuman essence; the animetaphor at once destructive, yet generative. Through the deer's rampage, we bear witness to the autonomy of a nonhuman apparatus at work; an animal engine exploring its own capacities for rendering a gameworld otherwise. Watanabe highlights these feral energies by situating the artificial deer within the context of a wildlife cam, streaming the project live on sanandreasanimalcams.com and on Twitch with roughly 200,000 viewers joining to watch the deer's exploits. In this material apparatus of artificial intelligences and human actors, if the RAGE engine functions as an ecosystem with its own physics, laws, and algorithmic cycles, then the feral glitch rips through this virtual wilderness with an unpredictable, animated fluidity. Gilles Deleuze and Félix Guattari have referred to these kinds of material happenings as 'becoming-animal', rather, a space hollowed of signification and

leaving behind only intensities, wild affects, shockwaves, and skittish gestures.³⁰



Figure 3. Deer in glitchy rigor mortis waiting to respawn, Brent Watanabe, *San Andreas Streaming Deer Cam*, 2015–16. Screenshot.



Figure 4. Explosive Shockwaves and frantic deer in Brent Watanabe, *San Andreas Streaming Deer Cam*, 2015–16. Screenshot.

³⁰ Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis, MN: University of Minnesota Press, 1987), pp. 233–5.

Among these feral vibrations, queer failure emerges in the mechanic of *revealing* the proprietary nature of RAGE and the potential to modify those dominant gamespaces into something new. It also reveals the technical limitations of the engine. Yet, like the wonder and gratitude Fenton holds for the potential glitch, Watanabe's horned beast confronts the viewer with a sense of awe (and unease) about its strange ontology. What are the capacities of the deer's intelligence as it interacts with the engine? Does the deer's presence repel oncoming cars at a certain proximity? Are some vehicles (aggressive muscle car) and pedestrians attracted to the deer and attack it based on certain thresholds? Is the deer's frantic galloping the catalyst for explosive shockwaves? In their incisive analysis of SASDC, Bo Ruberg argues that the deer's often ambivalent nonhuman actions — at times seeming to long for a connection to the human world, while also glitching out the engine through its unintentionally destructive nature — embody a 'queer posthumanism'. By this, Ruberg indicates that the deer's non-human embodiment (its body, wild expressions, and desire for human connection) take on a posthumanism that champions non-normative gender and sexuality.³¹ Here, the player's inability to control the deer opens up a feral space that moves outside of hegemonic modes of videogame play through the creature's agency as 'a posthuman figure who has no need of people'.³²

In Alice Bucknell's *The Alluvials* we witness similar kinds of nonhuman entities that carry the ferality of glitch through queer and ecological mechanics. In the machinima component of the project, Bucknell uses *GTA V* and RAGE to investigate the politics of LA's water usage and supply in a speculative future version of the city, combining modded San Andreas environments, AI machine hallucinations that coalesce historical and present-day redevelopment proposals for the LA River, as well as 3D scans of the city recorded via drone. Bucknell uses a variety of non-anthropocentric viewpoints to interrogate these water politics: wildfire, ancient trees, the Los Angeles River, as well as the spectre

31 Bo Ruberg, 'After Agency: The Queer Posthumanism of Video Games that Cannot be Played', *Convergence: The International Journal of Research into New Media Technologies* 28, no. 2 (2022), 413–30, p. 415.

32 *Ibid.*, p. 420.

P-22, Los Angeles' famous Hollywood mountain lion that resided in the city's Griffith Park. In *The Alluvials* videogame, Bucknell structures four levels around meta-approaches to play, with each corresponding to a traditional gaming genre (openworld, FPS, puzzle, and walking simulator). Spanning these levels, the player inhabits the role of the LA River, an entanglement of Yucca Moth and Joshua Trees, a raging wildfire, as well as an American Grey Wolf. Bucknell developed the game's speculative mythologies in Unity. Through these animal and elemental encounters, machinima and game weave together stories of a near-future desertified LA, a revitalized (however, synthetic) river system, and the morally questionable company Aquarius that produces H₂O, a new kind of water filled with mood stabilizers to help the population cope with, as Bucknell tells us, a world constantly on fire.³³

In the broader apparatus among artist, Unity, machine hallucinations, and spectral mountain lions, Bucknell speaks to the properties of game engines and the possibilities for worldbuilding:

Game engines are a really efficient worlding technology as they allow for an immediate immersion in a speculative narrative that in itself is its own microcosm [sic], but is also spongy, parasitic, and rife with references. In other words, game environments are a space that feels both familiar and otherworldly, which is the perfect container for constructing stories that have one foot in the present and the other in an uncertain future (or many possible futures... Constructing a total environment inside game engines allows these speculative crossovers to become both intimate and urgent – both totally alien and the logical next step – and to portal viewers right into the middle of these hybrid and unraveling worlds.³⁴

Both game and machinima utilise engines to reconsider normative gaming tropes through glitchy deconstructions: pixelated title screens, uneasy machine hallucinations, fragmented 3D scans of canals and bridge structures. Yet beyond these surface artefacts, *The Alluvials* catalyzes moments of ferality through what I have previously termed aimless modes of play. By this I mean

33 Bucknell, *The Alluvials*.

34 David McLeavy and Alice Bucknell, YAC Interviews with Artists: Alice Bucknell, *Young Artists in Conversation*, August 2022.

forms of glitch, modding, queer failure, and so on that intervene in the standard processes of winning or losing.³⁵

In *Level 2: Extinction Burst* of *The Alluvials*, Bucknell deconstructs the competitive nature of a first-person shooter death-match into a ‘first-person pollinator’. The player assumes the point-of-view of a colony of glowing Yucca moths and follows them through the derelict structures of a future Hoover Dam. Floating in this disembodied view, the player is eventually given the option to play as a lone Yucca moth or Joshua Tree. Joshua Trees and Yucca moth have long held a symbiotic mutualism in that the Yucca moth is the tree’s only pollinator and the tree serves as a host for the moths to lay eggs. Select the role of moth, and the player flies around, pollinating different Joshua Trees, moth antennae hanging down from the interface. Here, the player aimlessly lands on the Joshua trees to lay eggs and pollinate, generating psychedelic ripples of what Bucknell calls ‘drunken post-pollination flight paths’, a kind of visualisation of interspecies euphoria and ancient orgasmic energy from millennia of coevolution (Figure 5).³⁶ If the player opts to embody a Joshua tree, they take on the mechanic of talking and using the voice to draw glowing moth colonies towards its branches, resulting in lively rhizomatic outflows from the tree’s root structure (Figure 6). Bucknell designed the level so that it uses procedural generation to recompose its tree structures, moth eclipses, and pollination trajectories upon each play. Through the interweaving of these nonhuman agencies, Bucknell explores the tension among nuanced ecosexual relations produced from a co-evolutionary love story as well as the spiral of ecological destruction ushered in by the Anthropocene.

35 Eddie Lohmeyer. *Unstable aesthetics: Game Engines and the Strangeness of Modding* (New York: Bloomsbury Academic, Bloomsbury Publishing Inc, 2023), p. 4.

36 Alice Bucknell, ‘Alice Bucknell, *The Alluvials* Level 2: Extinction Burst, 2024’, Gazelli Art House.



Figure 5. Woozy post-pollination moth flight, Alice Bucknell, *The Alluvials*, 2023–24. Screenshot.

In *The Alluvials*, the feral glitch emerges from aimless play and an affirmative refusal of reward, competition, cycles of winning/losing, as well as the pleasures of simulated killing. Rather, glitch emerges through a queer mechanic that Bo Ruberg (and echoed by Bucknell) has called *permalife*; a subversive response to *permadeath* where players typically die once, cyclically respawn, and continue. *Permalife* mechanics, typically explored by queer and LGBTQIA+ game developers, make the inability to die a central aspect of gameplay. For queer artists and game designers, these experiences of permanent in-game life work as a palliative measure against the necropolitics and symbolic violence enacted within dominant gaming cultures.³⁷ We likewise witness these *permalife* mechanics in Watanabe's *SASDC* as an unplayable game that situates the player within the uncanny space of observing an animal-machine intelligence carve its territory through the engine ecosystem. If *ferality* emerges from the *permalife* cycles of woozy pollination by denying a successful win state, then it also carries the non-representational force of animality. To merge flesh with virtual moth or tree and inhabit nonhuman views of flying,

37 Bo Ruberg, 'Permalife: Videogames and the Queerness of Living', *Journal of Gaming and Virtual Worlds* 9, no. 2 (2017), 159–73, 160–161.

pollinating, or speaking ancient wisdom to attract moth eclipses, transforms the standard engine gamespace into the wild affects of the becoming-animal through strange tree and insect temporalities. Bucknell has spoken to the nonhuman energy of these animal embodiments in the context of games and the metaverse, stating that ‘Understanding the importance of glitches, mutants, and morphing alliances with uncertain ends to me speaks to a way that we can reconcile this technology and future worlds with a non-hierarchical, less human-centric and ultimately less capitalistic idea of what the muta/metaverse is and what it can do.’³⁸



Figure 6. Rhizomatic Joshua Tree bursts enacted by moth eclipses, Alice Bucknell, *The Alluvials*, 2023–24. Screenshot.

Like Watanabe’s deer, the player in *Extinction Burst* contemplates the autonomy of glitch aesthetics through a sense of not knowing or not understanding the forms of affirmative failure that unfold; glitchy bursts of rhizomes or drunken moth vision and its relation to the procedural generation that continually sustains permalife activity. As I have argued, ferality is a mechanic of revealing that not only discloses the habitual ways we play video-

³⁸ Federica Zambelletti and Alice Bucknell, *New Worlds A conversation with artist and writer Alice Bucknell on her new series of talks, screenings and performances at Somerset House, KoozArch*, July 6, 2022.

games — cycles of dying, respawning, and gaining mastery over the system to win — but in the case of *The Alluvials*, reveals the limits of anthropocentric knowledge about Earth's nuanced ecosystems. As Bucknell says, 'By 'unlearning' through these nonhuman 'ghosts' and 'monsters' of a damaged planet, we can begin to understand how limited our own comprehension of the Earth, its ecosystem, and the inner workings of that ecosystem (its intelligence) really is.³⁹

The queer and nonhuman processes in Fenton's *Digital TV Dinner*, Watanabe's deer, or Bucknell's plant and animal entities, articulate what Alenda Chang has called 'bit narratives'. Examining the relationship among environmentalism and videogames, Chang theorizes nonhuman ontologies of plant and animal game assets, drawing a relation to the 18th and early 19th century literary genre known as 'it narratives': short, published stories written from the vantage point of material objects (an old shoe, a bank note) and sometimes animals (a crested wren, dog, a red deer). Playfully rethinking the genre, Chang suggests that bit narratives communicate the experiences of non-living assets in games that have become ubiquitous in our everyday interfacing with computers. Bit-narratives often feature digital objects — garbled ROM memory, apocalyptic deer, elderly Sycamore — as characters in gameworlds but also digital artefacts in and of themselves created, for instance, by misusing a Bally Astrocade.⁴⁰

Just as I began with memory patterns of the Astrocade, I end with the feral howl of an ancestral wolf spirit. In Bucknell's third level of *The Alluvials*, *Sorites Paradox*, the player explores a desertified Los Angeles as an American Grey Wolf, roaming an open world map and engaging in dialogue options with various nonhuman entities: an anthropomorphic water bottle-salesperson from Aquarius, an ancient rock with super intelligence, as well as El Aliso the Sycamore tree. Here, as with Level 2, there is no required win state or anything to achieve or master. The player-becoming-wolf merely receives, listens to, and considers

39 Vittoria Martinotti and Alice Bucknell, 'On technology and humanity: Alice Bucknell and her alternative worlds', *Red Eye*, April 6, 2023.

40 Alenda Y. Chang, *Playing Nature: Ecology in Video Games* (Minneapolis, MN: University of Minnesota Press, 2019), pp. 124, 128–9.

the game's nonhuman agencies and their deep ecological wisdom. As they explore, the player follows the path of a spectral wolf ancestor; the spirit of a collective wolfpack intelligence that communicates through mysterious runic emojis. Eventually, the player-wolf finds themselves on the roof of a skyscraper, communing with their spectral canine self through feral howls whilst surrounded by LAPD helicopters (Figure 7). Within these aimless mechanics, the Grey Wolf has no options left but to keep living, migrating to evade human encroachment and the ruinous cycles of disaster capitalism. As Legacy Russell argues, to keep on living is to embody glitch as an 'all-consuming joyful failure within a system that never wanted us and that will not make space for us if we simply wait for it (...) of this beatific brokenness and as we travel beyond it, we ask: *What's next? Where to go from here?*'.⁴¹ I don't know where we go from here. There may not be a 'here' for us to progress towards or arrive at. Yet, from the boundary making practices of glitch aesthetics, what we can do is imagine new worlds and ecological possibilities by deconstructing the authority of game engines; playing and living life otherwise through a feral howl at the moon.



Figure 7. Feral howls and spiritual communion with wolf pack ancestors, Alice Bucknell, *The Alluvials*, 2023–24. Screenshot.

41 Legacy Russell, *Glitch Feminism: A Manifesto* (London: Verso, 2020), p. 58.

Bibliography

- Barad, Karen, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, North Carolina: Duke University Press, 2007)
- Boyle, Casey, 'The Rhetorical Question Concerning Glitch', *Computers and Composition*, 35 (2015), 12–29, <https://doi.org/10.1016/j.comp-com.2015.01.003> [accessed 19 January 2025]
- Braidotti, Rosi, *The Posthuman* (Cambridge: Polity, 2013)
- Breuer, Josef, and Sigmund Freud, *Studies on Hysteria*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, ed. and trans. by James Strachey and others, 24 vols (London: Hogarth Press and the Institute of Psycho-Analysis, 1955), II
- Chang, Alenda Y., *Playing Nature: Ecology in Video Games* (Minneapolis: University of Minnesota Press, 2019)
- Clark, Naomi, and Merritt Kopas, 'Queering Human-Game Relations: Exploring Queer Mechanics & Play', *First Person Scholar*, 18 February 2015, <https://www.firstpersonscholar.com/queering-human-game-relations/> [accessed 19 January 2025]
- Deleuze, Gilles, and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. by Brian Massumi (Minneapolis: University of Minnesota Press, 1987)
- jonCates, Jonathan Kinkley, and Jamie Fenton, 'Stability Isn't Everything It's Glitched Up to Be: An Interview with Jamie Fenton', in *Perspectives on In/stability*, ed. by Delinda Collier and Robyn Farrell (Chicago, Illinois: Art Institute of Chicago, 2022). doi:10.53269/26939851/01/04
- Lippit, Akira Mizuta, *Electric Animal: Toward a Rhetoric of Wildlife* (Minneapolis: University of Minnesota Press, 2008)
- Lohmeyer, Eddie, *Unstable Aesthetics: Game Engines and the Strangeness of Modding* (New York: Bloomsbury Academic, 2023)
- McLeavy, David, and Alice Bucknell, 'YAC Interviews with Artists: Alice Bucknell', *Young Artists in Conversation*, August 2022, <https://youngartistsinconversation.co.uk/Alice-Bucknell> [accessed 19 January 2025]
- Martinotti, Vittoria, and Alice Bucknell, 'On Technology and Humanity: Alice Bucknell and Her Alternative Worlds', *Red Eye*, 6 April 2023, <https://red-eye.world/c/on-technology-and-humanity-alice-bucknell-and-her-alternative-worlds> [accessed 19 January 2025]
- Menkman, Rosa, *The Glitch Moment(um)* (Amsterdam: Institute of Network Cultures, 2011)
- Pow, Whitney (Whit), 'A Trans Historiography of Glitches and Errors', *Feminist Media Histories*, 7.1 (2021), 197–230. doi:10.1525/fmh.2021.7.1.197

- Ruberg, Bo, 'After Agency: The Queer Posthumanism of Video Games that Cannot be Played', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 413–30. doi:10.1177/13548565221094257
- , 'Permalife: Videogames and the Queerness of Living', *Journal of Gaming and Virtual Worlds*, 9.2 (2017), 159–73. doi:10.1386/jgvw.9.2.159_1
- Ruberg, Bo, and Adrienne Shaw, eds, *Queer Game Studies* (Minneapolis: University of Minnesota Press, 2017)
- Russell, Legacy, *Glitch Feminism: A Manifesto* (London: Verso, 2020)
- Stead, Chris, 'The 10 Best Game Engines of This Generation', *IGN*, 15 July 2009, <http://www.ign.com/articles/2009/07/15/the-10-best-game-engines-of-this-generation> [accessed 19 January 2025]
- Tohta, Kaneko, *Selected Haiku: With Notes and Commentary: Part 2 1961–2012*, trans. by The Kon Nichi Translation Group (Winchester, Virginia: Red Moon Press, 2012)
- Wolfe, Cary, *What Is Posthumanism?* (Minneapolis: University of Minnesota Press, 2013)
- Zambeletti, Federica, and Alice Bucknell, 'New Worlds: A Conversation with Artist and Writer Alice Bucknell on Her New Series of Talks, Screenings and Performances at Somerset House', *KoozArch Un-built Imaginary*, 6 July 2022, <https://www.koozarch.com/interviews/new-worlds> [accessed 19 January 2025]

Artworks

- Bucknell, Alice, *The Alluvials* (4K single-channel video, colour, sound, 38 min., 2023, United States)
- , *The Alluvials Level 2: Extinction Burst* (interactive video game, 2024)

Ludography

- id Software, *Doom* (id Software, 1993), MS-DOS.
- id Software, *Quake* (id Software, 1996), MS-DOS.
- Midway Manufacturing, *GORF* (Midway Manufacturing, 1981), Arcade.
- Pow, Whit, *Digital TV Breakfast* (self-published, 2018), PC.
- Rockstar North, *Grand Theft Auto V* (Rockstar Games, 2013), PlayStation 3; Xbox 360.
- Rockstar San Diego, *Rockstar Games Presents Table Tennis* (Rockstar Games, 2006), Xbox 360.
- Rockstar Studios, *Red Dead Redemption 2* (Rockstar Games, 2018), PlayStation 4; Xbox One.

LOGAN DAVIS AND JAMES MALAZITA

AGAINST THE GRAIN:
FELVIDEK, RPG MAKER, AND CINEMATIC
GAME DEVELOPMENT PRACTICES

Music pulses faster than I can move. Low on supplies and out of wine from a fight with some Hussite Knights just moments earlier, I take a swing with my sword. My armour-clad hands sweep in from the side and rake the nearest coffee-fuelled youthful cultist just before his friend (with a maw where their stomach should be) returns the strike. The music seems to pulse faster now, picking up tempo as the probability between victory and loss narrows, but I assume it's a trick of the mind. I take my time with the world waiting to hear my next move, and I choose to pray. My hands rise, but this time they are not covered in steel plates but loose spun robes. No metallic shell to ward off blows of iron but the draperies to attest I am a man of faith and its word is good as I am filled with new vigour. The cultist still teases me with pokes and swings when their turn comes; but I have many arms and many tools and many turns left to make.

Felvidek (Jozef Pavelka and Vlado Ganaj, 2024) is a turn-based role-playing game set in an alternative 15th century Slovakia developed in the RPG Maker game engine. As a self-described JRPG (Japanese Roleplaying Game), *Felvidek* shared several mechanics with early JRPGs such as early entries in the *Final Fantasy* (Square) and *Phantasy Star* (Sega) series.¹ *Felvidek* features a

1 Jozef Pavelka and Vlado Ganaj, *Felvidek*. The video game was uploaded on Steam on 29 March 2024, <https://store.steampowered.com/app/2299900/Felvidek> [accessed 18 January 2025].

party-based system where combat unfolds in turn-based rounds, where the player is given unlimited time to choose each party member's move before watching their party (and enemies) act out those commands. The game's navigation consists of walking through an 'overworld' (a map of the world the player is able to navigate as a 2D plane), chatting with various non-player characters, and managing the party's inventory of increasingly powerful equipment.

While *Felvidek*'s gameplay is, on the surface, reminiscent of classic JRPGs, the game's story differs markedly. The player takes control of two primary cast members: Pavol, an alcoholic knight whose wife has left him, and Matej, a devout and strict priest who greatly dislikes Pavol (a common feeling among the game's denizens, the player comes to find). The two are sent to investigate an explosion outside their lord's castle during a Hussite invasion. While doing so, Pavol and Matej uncover a group of cultists composed of local youths who have been roasting coffee on the fiery head of a demon in pursuit of power to rebuke the Hussites. Drinking the demon-infused coffee causes people to turn into bloodthirsty demons. Pavol and Matej pursue a quest to stop the cult, find Pavol's wife who has become involved with the group, and help mellow Matej's personality. The story oscillates from absurd to surreal, slapstick to horrific, and often manages to straddle both ends of any given descriptive spectrum. Aesthetically, too, *Felvidek* looks and sounds different from its JRPG heritage. Interspersed with pre-rendered 3D cutscenes, and dithered, statically rendered graphics. Visually, *Felvidek* sits between the high-fidelity look of contemporary Western titles, PlayStation-era ludo-nostalgia, grainy handheld film, and the visual language of the JRPG.

In this essay, we will argue that *Felvidek* reflects a shared heritage with Czechoslovak New Wave film, a cinema movement of *avant-garde* Czechoslovak film makers who tackled political but intimate stories, and that this shared heritage can broaden our understanding of the relation between game materiality and cinematic style. Emerging in the 1960s, a handful of Czechoslovak directors, actors, and film crews participated in a critical response to established cinematic conventions 'determined to replace the propaganda images of Socialist Realism, the official aesthetic of

the Soviet bloc countries, with those of real life'.² The plots of Socialist Realism cinema centred on far more morally simplistic tales where 'nominal conflicts between "positive" and "negative" characters' helped illustrate the path towards a better, socialist future.³ In short, these films 'represented society not as it was but as it ought to develop' according to a Stalinist and post-Stalinist dialectical reading of history.⁴ Czechoslovak New Wave Cinema responded to these propagandistic films by avoiding characterizations that were unambiguously positive or negative, and instead portrayed 'everyday reality without the approved stereotypes' which historically 'distorted representations of actual life and actual history'.⁵ Czechoslovak New Wave Cinema tells grounded stories using unconventional techniques of storytelling, presentation, and composition to represent the anxieties and realities of everyday life within Central Europe. The directors who belong to this genre mixed 'humour and tragedy by manipulating stylistic techniques that create a certain element of fantasy' in order to produce 'more serious, more experimental, more socially critical films'.⁶

Given both *Felvidek's* narrative complexity and its aesthetic and mechanic sensibilities, the decision to make *Felvidek* on RPG Maker could be read as a creative choice to go against the engine's 'grain', an increasingly popular analytic term in game studies used to characterize the material affordances and constraints of a game engine and the ways they influence game creation. Developed by Benjamin Nicoll and Brendan Keogh, the concept of engine grain describes the way its default settings and affordances can create "patterns" and "fibers"—protocols, standards, and affordances—

2 Peter Hames, 'The Czechoslovak New Wave', in *Traditions in World Cinema*, ed. by Linda Badley, R. Barton Palmer and Steven Jay Schneider (Edinburgh: Edinburgh University Press, 2005), pp. 67–79 (p. 69).

3 *Ibid.*, p. 70.

4 *Ibid.*

5 See *Ibid.*, p. 71, and Herbert Eagle, 'Andrzej Wajda...', in *Cross Currents 1*, ed. by Ladislav Matějka and Benjamin Stolz (Ann Arbor, Michigan: University of Michigan Press, 1982), pp. 339–53 (p. 339).

6 Lubica Učník, 'Aesthetics or Ethics? Italian Neorealism and the Czechoslovak New Wave Cinema', in *Italian neorealism and global cinema* 59, ed. by Laura E. Ruberto and Kristi M. Wilson (Detroit, Michigan: Wayne State University Press, 2007), pp. 54–72 (p. 64).

that orient users towards particular design methodologies.⁷ The analytical metaphor here is wood grain: fibrous, rigid, and – importantly – unidirectional; a core component to the material practice of the woodworker's craft, something that must be selected for, moved with, and acted against.

In *Felvidek*, however, we can read a more collaborative and interpretive relationship with the material and social realities of the RPG Maker engine than an antagonistic, unidirectional, or 'recalcitrant' relationship to the engine would suggest.⁸ Rather, *Felvidek* dances with the visual and narrative qualities of RPG Maker in ways that suggest more of a filmic approach that aligns with the avant-garde narrative and editing techniques, attention to psychological detail, and narrative focus on group interaction over that of individual or atomistic protagonists, and its mechanical rejection of the 'everyday stereotypes' of JRPGs in ways echoed in Czechoslovak New Wave cinema.⁹ As such, *Felvidek* provides an opportunity for game studies scholars to reorient our understanding of engine grain away from a rigid, arboreal one and towards a more fluid, narratological, cinematic one. Rather than wood grain, *Felvidek* and its historical, political, and aesthetic entanglements with both JRPGs and Czechoslovak New Wave cinema show how game engines enact film grain.

RPG Maker, the JRPG, and Box Speed

Game studies scholars have conceptualized game engines as assemblages of software that streamline the production of digital games.¹⁰ Traditionally, medium- and large-scale game studios built their own in-house software and development environments for use on their own work, such as the *id* Engine and the RE Engine,

7 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), p. 63.

8 Brendan Keogh, 'Situating the videogame maker's agency through craft', *Convergence* 28.2 (2022), 374–88.

9 Dina Iordanova, *Cinema of the other Europe: The industry and artistry of East Central European Film* (London: Wallflower Press, 2003), p. 97.

10 James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024).

owned by id Software and Capcom. However, the growing material and economic complexity needed to create games that are playable across consoles, personal computers, and mobile devices have contributed to the outsourcing of production, standardisation, and platformisation of game engines, with even major companies like Square Enix abandoning in-house engines for third party software.

The two most commercially popular engines, Unreal and Unity, are considered 'general purpose' in that they — theoretically — were built without any possible imagined game genre in mind. This notion has been critiqued and complicated both by academics and game developers.¹¹ All engines, through their defaults and assemblages, allude to some expected path of development even if their rhetorics elide those presumptions.

RPG Maker is perhaps more explicit about the games it imagines its users creating; it positions itself as a genre-specific game development environment. In other words, unlike Unity and Unreal, RPG Maker is rhetorically constructed as being more constrained, designed to allow for the development of a specific kind of game: the pixel-art Japanese Role-Playing Game, or JRPG. The JRPG genre describes a collection of games featuring similar pixel-art styles, grand narratives, and turn-and-menu battle mechanics, largely developed by Japanese studios like Capcom and Squaresoft, which came to prominence on gaming consoles in the early 1990s. The term was not widely deployed in the 1990s, however, and represents more of a social anachronism, a 'nostalgic and temporal association of JRPGs with a period in gaming history that existed before consoles and computers technologically converged'.¹² As Jayme Dale Mallindine notes, this category, shaped by Western critical discourse, represents an affective categorization by gaming audiences in the United States and Europe.¹³ JRPGs describe both a kind of classed, material-domestic form of play (the middle class, living room console videogame), and also a feeling of 'difference';

11 Malazita, *Enacting Platforms*, and GameDevAdvice, 'Creating ANIMAL WELL, Game Engines, Dunkey, BIGMODE, Finding Challenges, and Patience - Billy Basso', YouTube, 10 June 2024.

12 Jayme Dale Mallindine, 'Ghost in the Cartridge: Nostalgia and the Construction of the JRPG Genre', *Gamevironments* 5 (2016), 80–103 (p. 82).

13 Mallindine, 'Ghost in the Cartridge', p. 82.

a kind of orientalist othering that Western players perceived made distinct their experiences of these games from those produced in the West.

This ludo-nostalgia, which foregrounds Western identity even as it ostensibly describes Japanese games, means that despite their material/platform and global origins, JRPGs now need not be on a console, nor need they be made in Japan or by a Japanese company. Further, quoting games journalist Jason Schreier, Mallindine notes, 'not only are Westerners interested in playing JRPGs, there are also plenty of 'Westerners making JRPGs'.¹⁴ Contemporary game distribution platforms like Steam are now replete with US and European-made pixel-art JRPGs, whose relative technical simplicity allows them to be made by small teams and individual developers. Kickstarter, similarly, features a host of Western JRPG game development campaigns that explicitly leverage the ludo-nostalgia inherent in the genre, with pitches often featuring callbacks to major JRPGs of the 1990s like *Chrono Trigger*, and, in the case of the game *Sea of Stars* (2023, Sabotage Studio), even using backer money to hire Yasunori Mitsuda, a famed composer of 1990s and 2000s JRPG music, to write several of the game's musical tracks.

The RPG Maker engine (in Japan, RPG Tsukūru, or RPG Making Tool) is a set of software suites and plugins developed by a series of Japanese publishers (ASCII, Enterbrain, Gotcha Gotcha Games) since the early 1990s. RPG Maker (whose name, notably, is not *JRPG* Maker, denoting the Western-centric rhetorical stylization of the genre), features high-level tools and user interfaces, de-emphasis on code, and pre-made retro aesthetic assets (such as character portraits and sprites), styled in the mode of late-1980s/early-1990s console JRPGs. Despite the console-centric nature of the JRPG genre, RPG Maker releases have largely been on PCs, with the only three console-based versions of the engine released for Nintendo's Super FamiCom, Sony's PlayStation, and Nintendo's 3DS handheld console.

14 Mallindine, 'Ghost in the Cartridge', p. 81, citing Jason Schreier, 'Proof That American Gamers Really Do Want Japanese RPGs', Kotaku, 8 March 2013.

RPG Maker has featured five major releases of the engine, denoted by the suffixes MV, MZ, VX, 2003, and XP, each of which also receive minor version updates over the course of their lifecycle. Materially, the major version differences represent shifts within *RPG Maker's* architecture and code composition. *RPG Maker MV*, for example, differs from prior engines in being totally rewritten in the programming language Javascript instead of the engine's historical implementation language Ruby. With these shifts come a variance in the affordances of each engine. For instance, while all versions of *RPG Maker* offer a static, turn-based combat system built into the engine for developers to use, only the 2003 and MZ versions of the engine offer a real time-based combat system similar to games like *Chrono Trigger* and *Final Fantasy VI* (Square). Version differences like time-based combat's presence and absence lead to presence of simultaneous overlapping developer and fan communities oriented around each engine release, giving each version of *RPG Maker* a lifecycle beyond its official publisher support.

Similarly, as the underlying engine codebases shift from Ruby to Javascript, each version of the engine offers different material capacities for users to design and implement community-made plugins, or additional fanmade tools that can extend or alter the functionality of *RPG Maker*. Some plugins radically change the way *RPG Maker* functions, such as re-adding the time-dependent combat system from *RPG Maker 2003* into later versions. However, since each major *RPG Maker* release almost entirely rewrites the engine's codebase, the modding community is similarly fragmented, with mod developers often specializing in versions and support for different eras of *RPG Maker*.

The relative accessibility of the engine, the popularity of the JRPG genre, and the platformised infrastructure available for self-distribution of homemade games, such as itch.io and Steam, have created a sizable user base of first-time game developers using and releasing games through *RPG Maker*.¹⁵ This accessibility has led to a trove of games on Steam from novice game developers,

¹⁵ Pierre-Yves Hurel, "Playing *RPG Maker*?" *Amateur Game Design and Video Gaming*. *Proceedings of the Digital Games Research Association and the Foundation for Digital Games 2016* (2016).

accompanied by the predictably variable quality one might expect from novice developers, which in turn has earned the engine a reputation of being ‘for amateurs and hobbyists’¹⁶ and thus not for more serious game development tasks. RPG Maker games have thus become a distinct, almost kitsch subgenre of contemporary JRPGs available in Western markets, a subgenre popularly characterised as having dubious narrative and aesthetic quality.

Felvidek challenges this reputation with unusual graphics, high fidelity cut scenes, and a story far outside the norms of both the stereotypical RPG Maker game and the broader narrative tropes of JRPGs. *Felvidek* places the player in the shoes of Pavol, a knight with a drinking problem in the service of a nobleman named Jozef. Pavol is an eminently flawed figure. Jozef makes it clear in the opening moments of the game that Pavol is regarded as a bit of a loser among the keep’s residents and attributing his drinking habits to being left by his wife Paula. Just prior to seeing this exchange, a cutscene played where Pavol watched an explosion in the distance. After the aforementioned berating, Pavol goes to explore the ruins with a priest from the keep, Matej. The player then takes a top-down god’s eye view of the world where they move Pavol from place to place while Matej follows closely behind (Figure 1).

To this point, mechanically speaking, *Felvidek* would seem to follow what Nicoll and Keogh may characterize as RPG Maker’s grain. The game’s camera perspective mimics that of late-1980s JRPGs; a god’s-eye point of view lays out the game world like a diorama or tapestry. This sort of navigational perspective is common in JRPGs like the *Dragon Quest* (Enix), and *Mother* (Ape Inc.) series, as well as early *Final Fantasy* games. Also similar to these games is *Felvidek*’s dialogue system, where players respond to an overlaid portrait of the character they are talking to while choosing from a finite set of possible responses. Once Matej joins the party, the management windows for manipulating each character inventory, the follow-the-leader style of collective movement, and lack of spatial continuity between indoor and outdoor places all find their provenance in older JRPGs. These are all circum-

¹⁶ Stefan Werning, *Making Games: the Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021), p. 7.

stances where *Felvidek* can be said to have followed RPG Maker's grain and leveraged the tools and techniques in which both the engine and the JRPG genre specialize.



Fig. 1. Top-down view of *Felvidek*, showing a rainy skirmish in a medieval town. The shared sepia-grey palette situates combatants and environment within the work's mundane visual register. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2024; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

The cutscenes, graphical qualities, and overall tone of *Felvidek* are a different matter. The entire game is presented in a lo-fi dithered art style that restricts itself to a handful of colours for each scene. Sprites move with an erratic character. The world and its buildings are often at angles and overlaps that wouldn't make sense in a real or first-person space, but exist here to help the player read the world map from their top-down view. These elements are more closely associated with the emerging PlayStation retroaesthetic of blocky 3D models with jagged, aliased edges¹⁷ than with the bright 16-bit styles of the JRPG. This style is mir-

17 Matt Griffin and Greg Loring-Albright, 'Platforming the Past: Nostalgia, Video Games, and *A Hat in Time*', *Transformative Works and Cultures*, 42 (2024).

rored in the fully pre-rendered 3D cutscenes that play between many of the game's central plot beats. The balance of implacable retro tones with modern narrative techniques place *Felvidek* in a limbo that both calls back to multiple eras of nostalgia for older games, while also utilising colour, mechanical, and narrative choices that simultaneously celebrate and reject game-centred nostalgia and RPG Maker itself.

Of course *Felvidek* is not alone in this balance of affordance and reworking, games like *Mainichi* (Mattie Brice, 2012), *Fear & Hunger* (2018, Happy Paintings) and *Hylics* (2015, Mason Lindroth) all play with the “‘presumptions’ embedded in (RPG Maker’s) ‘structure and paratexts’” and subvert player expectations.¹⁸ But *Felvidek* is perhaps unique in its incorporation of culturally specific cinematic nostalgic techniques into and through a culturally specific game engine. *Felvidek*’s developers have noted the influence of Czechoslovak New Wave Cinema upon the game, with Jozef Pavelka citing Štefan Uher, a member of the Czechoslovak New Wave directors, as inspiration for the game.¹⁹ Czechoslovak New Wave’s own play with the narratological and material affordances of the filmstrip, and its political rejection of the standard ‘grains’ of narrative enforced by Warsaw Pact propagandistic regimes, introduces to game studies ways of rethinking the relationships between authors, cultural context, and the material conditions of production.

This alternative, cinematic emphasis is not meant to reject Nicoll and Keogh’s formulation of grain; a practice-based, cultural mode of game development using engines is in fact emphasised in their work. Nicoll and Keogh frame grain non-deterministically; through design theorist, Don Norman, they note that “this is not to say that cultural software ‘determine’ the creative decisions of their users in any straightforward or linear manner, but rather that cultural software have distinct grains that orient develop-

¹⁸ Nicoll and Keogh, *The Unity Game Engine*, p. 70, citing Alison Harvey, *Feminist Media Studies* (Cambridge: Polity, 2019).

¹⁹ Brozef (Jozef Pavelka), (@brozef_), ‘6/x Reservoir dogs, Twin Peaks, bunch of Slovak literature and movies (Pásla kone na betóne, Neprebudený, Mäso, Pacho Hybský Zbojník, Slovak realist literature), Pulp from Bukowski. Slovak meme culture (Dano Drevo, Lesný duch) Local legends and history. Monty Python. Branca Leone’ Twitter, 14 April 2024.

ers towards particular design standards and methodologies'.²⁰ However, even that characterization of the relationship between engine and developer suggests an agonistic one: that the default settings are objects with both material and cultural weight that, given enough skill and resources, developers can resist against.²¹ This framing of the relationship between engine and author as wrestling for control — can the author creatively overcome the game that the engine affords? — has been a consistently present one in game studies research.²²

Looking towards cinema, however, allows for the development of more collaborative, nonagonistic theories of the assemblage of authors and the material apparatus of production. Film and cinema scholars have long argued for reading film as emerging from an affective and embodied,²³ even 'intimate',²⁴ relation between cinematographer, culture, projector, and the chemical properties of film. Take, for example, film stock and box speed. Choosing a type of film stock shares some qualities in common with choosing an engine. All film, both for cinema and photography, is created to serve a practical use case. Some films (like Ilford's Delta 3200) are made to be used in wider ranges of lighting conditions by being 'faster', meaning the film can chemically fix an image more rapidly, allowing for the more precise capture of movement with less blur. Other stocks are meant to produce sharper photos with less 'filmy' grain (like Kodak's Portra 400) for use cases like portraiture.

The numbers after the film name are a film's 'box speed', or a measure of how quickly the film reacts to light when used as the manufacturer suggests. The faster the film, the less light it needs to capture a photo. The more sensitive a film is to light, the more

20 Nicoll and Keogh, *The Unity Game Engine*, p. 65.

21 James Malazita, 'Engine', in *Keywords in Game Studies*, ed. by Christopher J. Patterson and Amanda Phillips (New York: New York University Press, forthcoming).

22 Jennifer Whitson, 'Voodoo Software and Boundary Objects in Game Development: How Developers Collaborate and Conflict with Game Engines and Art Tools', *New Media & Society*, 20.7 (2018), 2315–32.

23 Jonathan Walley, 'Materiality and Meaning in Recent Projection Performance', *The Velvet Light Trap*, 70 (2012), 18–34.

24 Ulrich Ruedel and Martin Koerber, 'The Materiality of Heritage: Moving Image Preservation Training at HTW Berlin', *Synoptique*, 6.1 (2018), p. 91.

artifacts of its own material will be inscribed in the photo. The flexibility to shoot photos in inflexible lighting situations using higher speed often has the tradeoff of producing a more 'grainy' photo or video. Like the material-cultural reputation developed by RPG Maker, the heavy presence of film grain is often associated with more amateur (or vernacular) photography, implying the user lacked the technical knowledge to properly use the film. However, artists have long played with and subverted these intended usages of film to produce specific, desired aesthetic effects. For instance, photographers can 'push' film by treating it as if the box speed is dramatically higher than the manufacturer intended, using their intimate material knowledge of the film stock to produce intentionally grainy texture.²⁵ Similar practices are found throughout cinema, such as the filming of Paul Thomas Anderson's *Phantom Thread* (2017); the film stock was pushed to give a slight texture to make the movie have a colder, desaturated look.²⁶ This practice is not restricted to analogue film. Digital cameras have their own distinct grain pattern, called 'noise', which represents artifacting present when recording light to a digital sensor. In an interview about Greta Gerwig's 2017 film *Lady Bird*, Sam Levy, the Director of Photography, discusses the film's use of a digital version of noise pushing as 'embracing the technology' to 'tease out' a 'native grain' of high end digital cameras.²⁷ Gerwig's efforts to remain 'true'²⁸ to the materiality of the cinematic apparatus used to make the film (in this case, the Alexa Mini digital camera) also reproduces a similar material nostalgia effect as RPG Maker's ludonostalgic genre conventions. *Lady Bird's* digital noise screens superimposed over analogue film effects mimics some of the textures of digital home video cameras that would have been in use during 2002, when *Lady Bird* takes place. *Lady Bird* temporally reflects Gerwig's own coming-of-age in Sacramento by pushing the native grain of digital cameras (ubiquitous for home video at the time) to materially

25 Eastman Kodak, 'Push/Pull Processing', *Kodak Motion Picture*, n.d.

26 Cinematographers on cinematography, "'Phantom Thread' Camera Tests with Paul Thomas Anderson Commentary", YouTube, 30 July 2020.

27 Chris O'Falt, 'How Greta Gerwig's Brilliant Use of Colors Turned 'Lady Bird' Into an Emotional Nostalgia Trip', *IndieWire*, 13 December 2017.

28 A24 Editors, 'All The Way Home with Barry Jenkins & Greta Gerwig', A24, 28 February 2018.

reconstruct a nostalgia for an imagined classed, domestic videographic format.

The kinds of intimacy and care for the medium of film espoused by *auteur* figures like Gerwig and Levy are not widespread in within game development culture. It would be difficult to find many examples of a game's director fawning over the desire to 'stay true' to the qualities of the Unreal Engine, or Unity, or RPG Maker. Despite this cultural difference, however, we can say that when a developer uses an engine, they are similarly engaging with its material realities and imagined use cases, which, like film's materiality, have technical, social, and aesthetic dimensions. The 'default ways of simulating physics, responding to inputs, casting light, drawing textures, or generating audio' to which Nicoll and Keogh refer as an engine's affordances can all be thought of as an engine's box speed.²⁹ The ways game engines can be 'edited or redesigned on a very low-level' to achieve specific and unique visual, haptic, and aesthetic after 'push' the engine in ways akin to videographers and photographers push film as an idiosyncratic and aesthetic practice.³⁰

What separates videogames and game engines from film stock is that these engines don't just have one box speed, or one presumed vector of usage. Game engines contain a number of speeds. The 'deep remixability' that Nicoll and Keogh describe in game engines isn't just swapping of mechanical parts like camera systems or shader pipelines.³¹ Game developers also remix the affordances available to them to create room for *actual* workflows and design processes they enact. Games such as *Felvidek* use the box speed of *RPG Maker* for its dialogue system, combat menu, and inventory screen, never straying far from the presumed usages and affordances that *RPG Maker* facilitates. But *Felvidek* also pushes and pulls the engine in its presentation, cutscenes, writing, and story to both establish its own voice and draw from practices of the game developers' own media histories and environments.

29 Nicoll and Keogh, *The Unity Game Engine*, p. 67.

30 *Ibid.*, p. 70.

31 *Ibid.*, p. 74.

Felvidek and the Grain of the Czechoslovak New Wave

Czechoslovak New Wave cinema was a countercultural movement of mostly amateur and eclectic film directors in 1960s Czechoslovakia that challenged the Socialist Realism cinema dominant in Eastern Europe at the time. The increasing social liberalization caused by the Prague Spring movement, which was a series of democratic reforms undertaken from within the otherwise totalitarian government, gave Czechoslovak artists licence to experiment with telling complex, mundane, surreal and existential stories about everyday life, featuring meditations on the grey morality of the real world (as opposed to the black and white morality of Socialist Realism), and of collective, communal dynamics that marked life in the modern Czechoslovak state. *Felvidek* builds on and adapts the practices found in Czechoslovak New Wave cinema by pushing both in the direction of nontraditional narratives and idiosyncratic aesthetics in ways that counter common tropes and themes of the JRPG genre, and in turn, of RPG Maker. At the same time, it would be wrong to say that *Felvidek* totally rejects the grain of RPG Maker. Rather, *Felvidek*'s story and gameplay exhibit qualities that are irreducible to either Czechoslovak New Wave or RPG Maker, and which only make sense through reading how those two grains become threaded through one another. By pushing the historical cinematic techniques in idiosyncratic ways and pulling on the affordances assumed by its game engine, *Felvidek* enacts both cultural and material practices that challenge a strongly techno-deterministic reading of the game.

Mundane and Subversive Narratives and Characters

Czechoslovak New Wave's rejection of Socialist Realism was, in part, a rejection of that style's propagandistic use of character and narrative. In being tasked to represent the kind of world to which a Stalinist-socialist state would lead, Socialist Realist directors produced films depicting clear proletariat heroes and bourgeois villains, with narratives designed to resist alternative or subversive interpretation. Czechoslovak New Wave's protag-

onists, in contrast, were lazy, corrupt, dilettante, incompetent, bohemian; representative of the mix of Czechoslovakia's simultaneously increasing cultural liberalization and economic stagnation which marked the Prague Spring. *Felvidek* similarly leaves its characters' moral grounding ambiguous. Pavol is a flawed man. He drinks, is rudely sarcastic, and kills a non-insignificant number of people throughout the game. Matej is judgmental and quick to anger, often falling into bouts of rage and masking them as warranted actions as a priest. These character traits and their repercussions run throughout the game, binding the two main characters together and driving the narrative forward. Over the course of their journey, Pavol and Matej open to each other. Pavol, for instance, admits that he doesn't drink over the loss of his wife Paula, but due to the near-death experience of nearly being executed during a battle. Matej, at this point more friendly with Pavol, shows sympathy for Pavol's anxiety over the situation and refrains from making further negative comments about his drinking.

Narratively and mechanically, the characters of *Felvidek* don't grow or progress in ways more typical of the early JRPGs that RPG Maker facilitates. When characters level up, there aren't new abilities to unlock or attributes to enhance. The growth that Pavol and Matej experience is a strictly mundane one: personal, interpersonal, emotional, and empathic. Czechoslovak New Wave cinema, to quote Lubica Učník, prioritizes the 'representation of idiosyncratic individuals and their personal problems. Film narratives were altered from a prescription of an ideal life to a personal depiction of people struggling with their mundane chores'.³² The two heroes don't become significantly stronger throughout most of the game; armour and weapon boons will marginally increase, but the enemies get harder too. The parity of power makes the stakes of combat in *Felvidek* much higher and conversely grounds the story in a less 'power fantasy' narrative. Mirroring the Czechoslovak New Wave's departure from the Socialist Realist cinematic tradition shaped by the logic of the hero's journey, *Felvidek's* storytelling is more personal and internal than traditional role playing narratives. Its characters

32 Učník, 'Aesthetics or Ethics?' p. 74.

are average, fallible, imperfect protagonists dealing with the society they are embedded in as much as they are their own internal struggles. Pavol and Matej are not mythic heroes to promote communists' futures nor Arthurian figures who draw the sword that saves the world.

Over the course of *Felvidek*'s story, the player learns that a cult group that has been recruiting youths from a nearby town are responsible for the commotion and death that begins the events of the game. While the presence of Czech Hussites is always a concern as the player navigates the countryside, most of the player's story-centred combat quickly shifts to combat with local cultists. Pavol and Matej encounter a disenfranchised member of the cult who has taken to roasting coffee over the head of a demon the cult worships. Originally hoping to use the demon-infused caffeinated ichor to poison Hussites, the cultist quickly turned to poisoning local authorities instead. The coffee, as it turns out, mutates the drinker into a demon. As the story progresses, Pavol and Matej work to balance the defence of their homeland from foreign forces while also fighting an apocalyptic cult within who are fighting for a very different vision of a Slovak future (Figure 2).

Themes of "apocalypse, war, 'liberations' by foreign powers and issues of Slovak identity" are hallmarks of many Slovak film makers, whose life experience drew on the very histories *Felvidek* bases its fiction on.³³ Pavol and Matej fight forces that could end the world within the conflict that might end their country. The ending of *Felvidek* is bittersweet in that, though Pavol and Matej have beaten the cultist plot to seize power, they have not solved the larger Hussite invasion. *Felvidek*'s setting might operate on a historical scale, but the narrative, its characters, and its goals are deeply local and personally apocalyptic.

33 Hames, 'The Czechoslovak New Wave', p. 76.



Fig. 2. Pre-rendered cutscene from *Felvidek*, depicting an armoured human figure confronting a demonic entity in a stone corridor. The image juxtaposes desaturated human space with the saturated colour of the supernatural. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2024; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

There are times when *Felvidek* pushes narrative tropes of Czechoslovak New Wave through the design tropes of JRPGs, such as the sidequest and the minigame. While the JRPG sidequest is often made a figure of fun (after all, why are these heroes stopping to fish or breed racing animals while gods threaten the world?),³⁴ narrative sidequests are used to explore the mundane impacts of mass social and spiritual upheaval. For example, in one such quest the player is tasked with finding a priest in a nearby village. While the priest is nowhere to be seen, there is an old woman in town waiting to give confession. Matej expresses vehement anger at the absent priest and asks for Pavol to wait while he hears the woman. Though the adventure lay elsewhere, the important thing lay there, in that church, hearing and serving a parishioner. Like similar narrative beats in New Wave, the

34 Esra Krabbe, 'How Final Fantasy XVI's Developers Excluded Mini-games to Maximize Immersion', *IGN*, 22 May 2023.

characters in *Felvidek* take time to meditate on a ‘society where (they) must confront (their) choices as always informed by (their) responsibility towards oneself and the society in which (they) live’.³⁵

The Psychoaesthetics of Colour

Of course, *Felvidek*’s society is plagued by fantastical and horrific beasts. *Felvidek* adapts Czechoslovak New Wave colour techniques to highlight and differentiate its more fantastical elements from its mundane ones. Colour was a sociotechnical concern during the Soviet era; Soviet filmmakers were reluctant to adopt colour film because of both the burden it created in lighting and dressing colour sets, as well as the inconsistent results that came with using Russian colour film stocks.³⁶ The results of experiments with colour film produced an often over-saturated and improperly exposed image, and restricted filming conditions to either daytime or unnatural-looking artificial lighting, all of which were considered inappropriate for serious cinema. But over the course of the 1960s, a rapid adoption of colour film was fueled by both New Wave aesthetics and cinema of the ‘fabular or fantastic: screen adaptations of folktales and magical tales (both Russian and non-Russian), adventure films for children and young adults, science-fiction fantasies, and screen adaptations of literary works characterized formally by elements of folk stylization’.³⁷ colour, according to Cavendish, comes to operate as a form of material-aesthetic visual and political resistance: ‘it verges on a form of spiritual emancipation, even a mode of escapism, which heralds a reluctance, if not refusal, to engage with modern Soviet reality’.³⁸ Examples of colour film in Czechoslovak New Wave can be seen in films like Jaromil Jireš’s *Valerie and Her Week of Wonders* (1970),

35 Učník, ‘Aesthetics or Ethics?’, p. 40.

36 Philip Cavendish, “‘Risk Versus Conformity’: Soviet Color Film, 1956–1982”, in *Global Film Color: The Monopack Revolution at Midcentury*, ed. by Sarah Street and Joshua Yumibe (New Brunswick, New Jersey: Rutgers University Press, 2024), pp. 66–79, p. 67.

37 *Ibid.*, p. 72

38 *Ibid.*, p. 73

a story of a young girl wandering through dream-like sequences full of monsters, strange men, and vampires. As opposed to more grounded new wave stories, like *The Valley of the Bees* (1968), the colourful aesthetics of *Valerie* lend a kind of magical, fantastical energy compared to its contemporaries.

Felvidek, in an adaptation of the dynamic of black and white versus colour film, uses colour to draw out the purely fictional elements from its more historically grounded (though still fictional) backdrop. Pavol, Matej, normal town folk, the Hussites, and mundane landscapes are predominantly rendered in black and white or sepia tones grounding them as more naturalistic, serious, or real. The cultists, on the other hand, are often rendered in shades of blues and purple, standing out from the rest of the game's colour palette. The more fantastical the character or environment, the more vivid and saturated the rendering becomes (Figures 3a and 3b).



Fig. 3a. Pre-rendered cutscene showing two hooded cultists before a burning building at night. Their saturated blue colouring marks them as figures of supernatural estrangement within the game's palette system. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2024; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

In other RPG Maker games, the shift of tones and saturation could be written off as inconsistency in an amateur project. *Felvidek*, however, pushes this cultural grain of RPG Maker, leaning into and drawing out this amateurish quality to visually signal a narrative shift of the psychological effect from more mundane (and consequently colour-muted) cultists early in the player's journey, towards garish demonic mutations and fire-headed demons. colour is also used to show a unity of humanity across political boundaries; rather than being styled in demonic pal-ettes, the grey tones used for Hussites are nearly identical to the rendering of the men-at-arms of whom Pavol is occasionally in charge.



Fig. 3b. Turn-based combat encounter with 'Alpa', rendered in vivid purple and gold against a desaturated interior. The contrast between enemy colour and the party's greyscale portraits highlights the distinction between mundane and supernatural registers. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2024; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

The ongoing shifting of colours in *Felvidek* mirrors Věra Chytilová's *Daisies* (1966), a story about two young women, both named Marie, who go on a series of carefree and hedonistic adventures.

Daisies uses numerous experimental editing and sound techniques to reflect the carefree, messy, and disorganised life of the story's main characters, including oscillating between black and white and colour filmstock numerous times over the film's length. The swapping of film stocks versus other visuals is a clear correlation to the psychological state of the Maries. One moment, both women are dancing and laughing in the rich colours of some nightclub or mansion; the next, the space snaps to grey as one of the girl's purses spills, or after one Maria asks the other if they are truly happy.

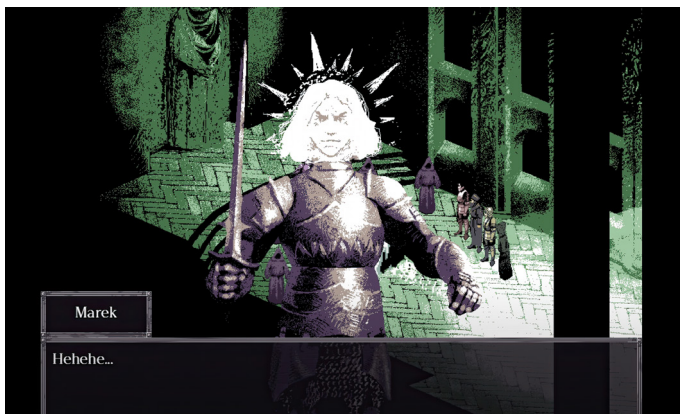


Fig. 4a. Marek in a later scene, wearing a luminous spiked crown and rendered in a muted grey-green palette. Read with Fig. 4b, the image shows how familiarity draws even supernatural figures into the visual register of the everyday. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2023; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

Felvidek's palette delineation between fantastical and mundane beings and characters is not only a delineation for the player; it folds together the player's screen and the affective experiences of the character party. The character and environmental colour palettes seen by the player represent the party's shifting subjective perception, not an objective or fixed property of the gameworld or aestheticized camera view. In other words, if a character is hued in *Felvidek*, it is because *Pavol and Matej* perceive them as somehow disconnected from their expectations of reality. Take, for example,

the shifting colour representations of Marek, the primary antagonist of the game with whom Pavol and the party repeatedly meet, battle, and drink. Marek begins the game as an unfamiliar figure to Pavol: mystical, mysterious, and depicted in the same bluish palette the cultists are. But by the end of the story, even as Marek becomes imbued with immortal powers, his palette shifts closer to the same grey tones by which Pavol and Matej would perceive the average townsman. Despite Marek's growing mystical capacities, his hue reflects how he has become familiar to Pavol and Matej, and how their comprehensions of reality have grown to incorporate the fantastical and the demonic as mundane (Figures 4a and 4b).

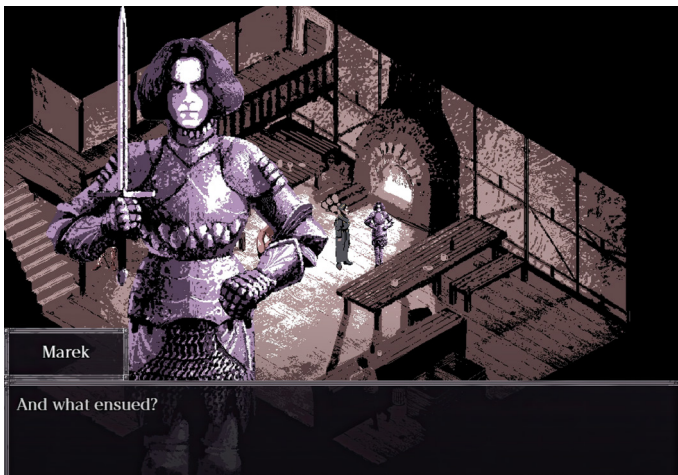


Fig. 4b. Marek during an earlier encounter with the party, rendered in a saturated violet-purple palette within a dialogue sequence. The colour contrast marks him as uncanny and unfamiliar within the party's perceptual world. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2023; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

The use of colour representation to depict interior perception in *Felvidek* is reaffirmed by Paula, Pavol's estranged wife. Pavol's awareness of the cult begins when Paula poisons a messenger Pavol is tasked with finding. Paula's colouring places her in an unstable position between the muted palette of familiar charac-

ters and the more saturated register associated with the cultist group. (Figure 5).

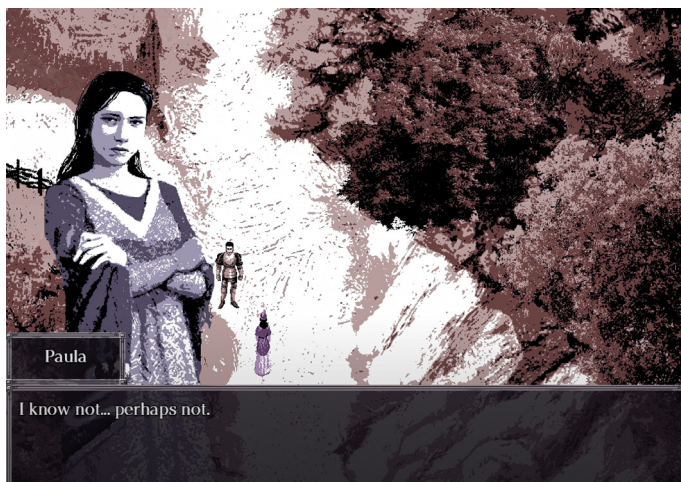


Fig. 5. Paula in dialogue with Pavol, rendered in a muted blue-grey palette, with a violet cultist figure visible in the background. The frame places familiar and uncanny colour registers in direct visual tension. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2023; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

In the story's conclusion, Pavol saves Paula from the local villagers hoping to burn her over accusations of being a witch and for the deaths she caused on behalf of the cult. Pavol, still hoping to live a life with her, takes Paula away from the village and asks her plainly, 'dost ye still love me at all?' Paula replies uneasily, 'I know not... perhaps not'. After hearing both this and that she doesn't regret what Pavol has endured because of her, Pavol loses the haunted smile he sported through the entire game.³⁹ Even with this revelation, Paula remains an unfamiliar colour in a mundane scene; a fictional love life for Pavol, something that will never be real.

³⁹ Most notably Paula stabs Pavol in the chest at some point in an attempt to kill him; so it's reasonable to assume Pavol would have a hard time denying he has been pretty thoroughly burdened by this whole endeavour.

Narrative Focus on Group Interaction

In aligning itself with RPG Maker's JRPG battle templates, *Felvidek* uses a turn-based party combat system where players choose the actions of each party member. The turn-based nature of this kind of combat means the player inhabits each party member individually and sequentially, with the narrative effect of presenting each individual combatant making diegetically individual decisions that only make sense in the context of being non-diegetically connected through the player.

Visually, the retro JRPGs referenced by RPG Maker represent this turn-based combat in one of two occasionally overlapping ways: in third-person or first person. In third-person view, common in the *Final Fantasy* series, party members and enemy sprites are grouped together on different parts of the screen, and have short animations or flashes that indicate action. Like pistons in an engine, each character will jump into the middle, take whatever action the player queued for them, and then jump back to the party to make room for the next character. In first person combat, exemplified by the early *Dragon Quest* games, party sprites are absent from the screen, with the player instead looking 'head on' at the enemies, as though they were standing behind an invisible party. Attacks are portrayed as spell animations or slashes and stab effects layered on top of the enemy sprites, with no visual representation of the party member who delivered the attack. Some titles, like *Phantasy Star III* (Sega), mix the two, by presenting a first-person viewpoint but where party members briefly appear on the screen to make their attacks, as though they leapt out from behind the view of the player camera. Different versions of RPG Maker have oscillated their combat systems between third-person or first-person viewpoints over time. Despite RPG Maker MV, the version of the engine used to make the game, defaulting to third-person combat, *Felvidek* takes a first-person approach to camera perspectives for its combat. (Figure 6).



Fig. 6. Turn-based combat encounter in which the HUD indicates Ida's action, while the semi-first-person view foregrounds Pavol's arm and weapon. The image makes visible the tension between collective party mechanics and protagonist-centred visual framing. Screenshot from *Felvidek* (Jozef Pavelka and Vlado Ganaj, 2023; Windows PC: Tutto Passa); footage source: Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', online video recording, YouTube, 1 April 2024.

However, *Felvidek's* first-person battle system visually combines the JRPG first-person view with that of *Felvidek's* other ludic inspiration: the blocky 3D First-Person Shooter (FPS) of the PlayStation era. When a player attack happens, instead of watching each party member jump into focus, an animation of hands and arms of characters reach from the screen's edge towards the enemies. The animations are uncanny, though. Although all of the attack animations are frame-by-frame sequential images superimposed above the enemy sprites, some appear to be made of blocky 3D models, and some appear to be sequential images taken from video of a real actor. Similarly, while the arms that appear can be clad in armour or robes, implying, for example, that an attack is made from the plate mail-clad Pavol or the robed Matej, these actions disregard diegetic perspective by tying characters' bodies to particular moves instead of connecting them to which character is 'taking their turn'. For instance, if the player chooses

to use a character's turn to attack, Pavol's armoured gauntlet will always visually represent delivering the blow, 'even when Matej is the one carrying out the attack command.

Felvidek thus blends and slides among different characters as if the player were inhabiting a collective *ur*-body with a shared set of eyes. The game's visual perspective in combat de-centres the party's physical placement on a battlefield in favour of a player's collective perspective of a party of individuals acting as one. Here, *Felvidek* uses the visual language of JRPGs and FPSs to reinforce its focus on collective narrative, mirroring the visual and narrative styles of Czechoslovak New Wave and its focus on 'interactions within a group rather than in studies of individual protagonists'.⁴⁰ In playing *Felvidek*, the player mechanically, visually, and narratively inhabits all of these characters simultaneously, blending their bodies, their abilities, and their actions into a single controlling perspective. In its instability of body and perspective, *Felvidek*'s cast of characters is transformed into an irreducible ensemble; one that can't be broken apart to moments of sequential inhabitation or control.

Conclusion

Felvidek shows the range of decisions and labour involved in practice game developers make when working to connect their work to the histories and materialities of other media. These choices go beyond just accepting or resisting the agencies of hardware and software in the game development process, but also include nondeterministic material-cultural-aesthetic relationships with a broad array of media apparatuses and cultural infrastructures, including with game engines themselves.

Nicoll and Keogh's metaphor of wood grain succinctly captures how game engines are designed with a purpose, one that both constrains and enables particular capacities in the game development process. But wood is, we argue, the wrong material grain to use in building our understanding of how software impacts game development. Carpentry and woodworking are an inherently

40 Iordanova, *Cinema of the Other Europe*, p. 97.

subtractive process. We cut boards down to size, chamfer edges into contours, sand down surfaces to smooth finishes, and plane panels to make them flat. These pieces may get glued or doweled together, but the 'grain' is always 'cut'. But games are not the result of whittling engines or sawing libraries. They are built up and around the tools these pieces of software provide.

Game engines, game libraries, or any other pieces of software are tools *for building upon*. The design process these pieces of software imagine — their default settings meant to streamline production — work by assuming some of that labour for the developer; the supposed appeal of game engines lies in their ability to handle tasks developers would rather not build from scratch. RPG Maker assumes the labour of creating game mechanics that align with nostalgic imaginations of retro Japanese role-playing games. Unity and Unreal assume the work of rendering and object management so that developers can focus on gameplay design, asset creation, and level design. Libraries like *Raylib* and *SDL* assume the patterns of abstracting hardware so that developers can spend effort architecting low level management systems without needing to worry about differences in operating systems.

Far from being a subtractive relationship, *Felvidek* isn't hewn away from RPG Maker. *Felvidek's* recapitulation of the aesthetics and techniques of Czechoslovak New Wave highlight that engines are a substrate that one fills with their own practice and history in order to subsume the game engine *into* the assemblage of a videogame. Like a piece of blank film, *Felvidek* uses the material specificities of RPG Maker to capture aspects of JRPGs, New Wave cinema, and Slovakian history. Replacing the metaphor of wood grain with that of film grain refocuses that while engines still have a material reality that impacts development practices, that material reality is less one of 'affordance and constraint' and more of 'character and texture'. The practices by which developers inherit, leverage, run from, and exaggerate that texture are numerous. They are specific to particular practices, contexts, and experiences.

Bibliography

- A24 Editors, 'All The Way Home with Barry Jenkins & Greta Gerwig', A24, 28 February 2018 <https://a24films.com/notes/2018/02/episode-01-all-the-way-home-with-barry-jenkins-greta-gerwig> [accessed 18 January 2025]
- Cavendish, Philip, "Risk Versus Conformity": Soviet Color Film, 1956–1982', in *Global Film Color: The Monopack Revolution at Midcentury*, ed. by Sarah Street and Joshua Yumibe (New Brunswick, New Jersey: Rutgers University Press, 2024), pp. 66–79
- Cinematographers on cinematography, "Phantom Thread" Camera Tests with Paul Thomas Anderson Commentary', YouTube, 30 July 2020 <https://www.youtube.com/watch?v=Uu5jVmlZBhE> [accessed 18 January 2025]
- Eagle, Herbert, 'Andrzej Wajda: Film Language and the Artist's Truth', in *Cross Currents 1: A Yearbook of Central European Culture*, ed. by Ladislav Matějka and Benjamin Stolz (Ann Arbor, Michigan: University of Michigan Press, 1982), pp. 339–53
- Eastman Kodak, 'Push/Pull Processing', *Kodak Motion Picture*, n.d. <https://www.kodak.com/en/motion/page/push-pull-processing/> [accessed 18 January 2025]
- GameDevAdvice, 'Creating ANIMAL WELL, Game Engines, Dunkey, BIG-MODE, Finding Challenges, and Patience — Billy Basso', YouTube, 10 June 2024 <https://www.youtube.com/watch?v=WERinxHhbho> [accessed 18 January 2025]
- Griffin, Matt, and Greg Loring-Albright, 'Platforming the Past: Nostalgia, Video Games, and *A Hat in Time*', *Transformative Works and Cultures*, 42 (2024) <https://journal.transformativeworks.org/index.php/twc/article/view/2461> [accessed 18 January 2025]
- Hames, Peter, 'The Czechoslovak New Wave', in *Traditions in World Cinema*, ed. by Linda Badley, R. Barton Palmer and Steven Jay Schneider (Edinburgh: Edinburgh University Press, 2005), pp. 67–79, <https://doi.org/10.1515/9780748626267-009> [accessed 18 January 2025]
- Harvey, Alison, *Feminist Media Studies* (Cambridge: Polity, 2019)
- Hurel, Pierre-Yves, "Playing RPG Maker?" Amateur Game Design and Video Gaming', in *Proceedings of the 1st International Joint Conference of DiGRA and FDG* (2016), pp. 1–10
- Iordanova, Dina, *Cinema of the Other Europe: The Industry and Artistry of East Central European Film* (London: Wallflower Press, 2003)
- Keogh, Brendan, 'Situating the Videogame Maker's Agency through Craft', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 374–88, <https://doi.org/10.1177/13548565211056123> [accessed 18 January 2025]

- Krabbe, Esra, 'How Final Fantasy XVI's Developers Excluded Mini-games to Maximize Immersion', *IGN*, 22 May 2023 <https://www.ign.com/articles/how-final-fantasy-xvis-developers-excluded-mini-games-to-maximize-immersion> [accessed 18 January 2025]
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- , 'Engine', in *Keywords in Game Studies*, ed. by Christopher J. Paterson and Amanda Phillips (New York: New York University Press, forthcoming)
- Mallindine, Jayme Dale, 'Ghost in the Cartridge: Nostalgia and the Construction of the JRPG Genre', *Gamevironments*, 5 (2016), 80–103
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), <https://doi.org/10.1007/978-3-030-25012-6>
- O'Falt, Chris, 'How Greta Gerwig's Brilliant Use of Colors Turned "Lady Bird" Into an Emotional Nostalgia Trip', *IndieWire*, 13 December 2017 <https://www.indiewire.com/awards/industry/lady-bird-greta-gerwig-color-sam-levy-1201907175/> [accessed 18 January 2025]
- Pavelka, Jozef (@brozef_), '6/x Reservoir dogs, Twin Peaks...', *X* (formerly Twitter), 14 April 2024 https://x.com/brozef_/status/1779637467706011952 [accessed 18 January 2025]
- Ruedel, Ulrich, and Martin Koerber, 'The Materiality of Heritage: Moving Image Preservation Training at HTW Berlin', *Synoptique*, 6.1 (2018), 91–96
- Schreier, Jason, 'Proof That American Gamers Really Do Want Japanese RPGs', *Kotaku*, 8 March 2013 <http://kotaku.com/5989507/proof-that-american-gamers-really-do-want-japanese-rpgs> [accessed 18 January 2025]
- Učník, Lubica, 'Aesthetics or Ethics? Italian Neorealism and the Czechoslovak New Wave Cinema', in *Italian Neorealism and Global Cinema*, ed. by Laura E. Ruberto and Kristi M. Wilson (Detroit, Michigan: Wayne State University Press, 2007), pp. 54–72
- Walley, Jonathan, 'Materiality and Meaning in Recent Projection Performance', *The Velvet Light Trap*, 70 (2012), 18–34, <https://doi.org/10.1353/vlt.2012.0017> [accessed 18 January 2025]
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- Whitson, Jennifer R., 'Voodoo Software and Boundary Objects in Game Development: How Developers Collaborate and Conflict with Game Engines and Art Tools', *New Media & Society*, 20.7 (2018), 2315–32, <https://doi.org/10.1177/1461444817715020> [accessed 18 January 2025]
- Zhain Gaming, 'FELVIDEK Gameplay Walkthrough FULL GAME No Commentary + Ending', YouTube, 1 April 2024, <https://www.youtube.com/watch?v=WFNZFgUkbbI> [accessed 18 January 2025]

Ludography

- Ape Inc., *Mother* (Nintendo, 1989), Famicom
 Brice, Mattie, *Mainichi* (Mattie Brice, 2012), Windows PC
 Enix, *Dragon Quest* (Enix, 1986), Famicom
 Haverinen, Miro, *Fear & Hunger* (Happy Paintings, 2018), Windows PC
 Lindroth, Mason, *Hylics* (Mason Lindroth, 2015), Windows PC
 Pavelka, Jozef, and Vlado Ganaj, *Felvidek* (Tutto Passa, 2024), Windows PC
 Sabotage Studio, *Sea of Stars* (Sabotage Studio, 2023), Windows PC; Nintendo Switch; PlayStation 4; PlayStation 5; Xbox One; Xbox Series X/S
 Sega, *Phantasy Star* (Sega, 1987), Sega Master System
 —, *Phantasy Star III: Generations of Doom* (Sega, 1990), Sega Mega Drive
 Square, *Final Fantasy* (Square, 1987), Famicom
 —, *Final Fantasy VI* (Square, 1994), Super Nintendo Entertainment System
 —, *Chrono Trigger* (Square, 1995), Super Nintendo Entertainment System

Filmography

- Anderson, Paul Thomas, dir., *Phantom Thread* (New York: Focus Features, 2017)
 Chytilová, Věra, dir., *Daisies (Sedmikrásky)* (Prague: Filmové studio Barrandov and Československý film, 1966)
 Gerwig, Greta, dir., *Lady Bird* (New York: A24, 2017)
 Jireš, Jaromil, dir., *Valerie and Her Week of Wonders (Valerie a týden divů)* (Prague: Filmové studio Barrandov, 1970)
 Vlášil, František, dir., *The Valley of the Bees (Údolí včel)* (Prague: Filmové studio Barrandov, 1968)

SERAFÍN ÁLVAREZ

GAME ENGINES BEYOND THE PLAYER: LIVE SIMULATIONS AS RADICAL INACTION

This chapter investigates how contemporary artists use video game engines to create ‘live simulations’ — autonomous, digital worlds that unfold in real-time without player input. By appropriating elements from traditional video games while deliberately excluding direct player control, live simulations profoundly reconfigure the conventional relationship between player and game. This deliberate exclusion of player agency, which I term ‘radical inaction’, invites viewers to observe rather than intervene in self-governing computational ecologies. In this way, radical inaction serves as a stance that is both aesthetic and subversive, challenging player-centric and instrumental paradigms within mainstream game culture.

To explore these ideas, the discussion draws on two recent artworks that exemplify key aspects of live simulations, reappearing throughout the chapter to illustrate different dimensions of the analysis. Jakob Kudsk Steensen’s *Berl-Berl* (2021–ongoing) digitally reconstructs Berlin’s ancient wetlands as an autonomous virtual ecosystem spanning multiple LED walls (Fig. 1). Created through months of fieldwork in Berlin-Brandenburg’s remaining swamps and collaborations with the Museum für Naturkunde Berlin, sound artist Matt McCorkle, and singer Arca, the work combines carefully digitised specimens, environmental and vocal recordings, and sophisticated procedural systems into what Kudsk

Steensen describes as a ‘living instrument’.¹ Meanwhile, *Supreme* (2021) by artist duo Xenoangel (Marija Avramovic and Sam Twidale) presents an autonomous digital world inspired by esoteric philosophies and mythologies, symbiosis and animistic thought. Displayed across two screens, this ‘World Beast’ is a giant, flying creature that hosts an entire ecosystem on its back, home to non-human ‘Critters’ that interact with each other and with their world through behaviours dictated by slow neural networks. These Critters attempt to harmonise with the World Beast through what the artists term ‘slow thinking’.²



Fig. 1. Jakob Kudsk Steensen, *Berl-Berl*, 2021–ongoing, real-time computer simulation; thirteen synchronised computers, twenty-nine speakers, and nine LED walls; macro photogrammetry, procedural generation, and spatial audio. Collaboration with the Museum für Naturkunde Berlin, sound artist Matt McCorkle, and singer Arca. Commissioned by LAS Art Foundation. Installation view, Halle am Berghain, Berlin, 2021.

Although their workflows and project scales differ — a contrast deliberately chosen to reflect a broader range of production scales and working methods within artist-produced live simulations, from Kudsk Steensen’s larger, specialised teams and resources to

- 1 Jakob Kudsk Steensen, ‘Dreaming up a Digital Swamp: Jakob Kudsk Steensen on How He Created an Immersive World inside Berlin’s Most Sought-after Club’, *Kill Screen*, 20 August 2021.
- 2 Sam Twidale, ‘Slow Thinking’, *CCCB LAB*, 13 September 2022.

Xenoangel's more modest two-person production model — both pieces share core qualities: continuous autonomous operation, real-time rendering, procedural behaviours, carefully crafted visual and sound design, simulations of non-human life forms and processes, and a focus on ecological and animistic themes that transcend human timescales. These qualities open the door for a posthumanist reading that situates both *Berl-Berl* and *Supreme*, along with other artist-produced live simulations, within broader conversations on nonhuman agency, autonomous computational systems, and alternative modes of digital world-making. *Berl-Berl* and *Supreme* exemplify a growing tendency among contemporary artists who use game engines for non-interactive world-building. Through close analysis of their aesthetic strategies and conceptual implications, this chapter shows how live simulations expand the creative potential of game engines beyond conventional, player-driven paradigms.

Drawing from recent theoretical discussions on agency and autonomy — particularly Sonia Fizek's notion of 'playing at a distance',³ Paolo Ruffino's critique of the human-system divide in his analysis of nonhuman games,⁴ Alenda Y. Chang's ecological approach to video games,⁵ and in contrast to Alexander Galloway's call for 'radical action' via transformative gameplay⁶ — this chapter situates live simulations within broader cultural and theoretical contexts. Additionally, by comparing live simulations to other artistic forms and non-interactive media — including film, painting, idle games, the demoscene, and Artificial Life Art — this chapter defines the unique conceptual and aesthetic territory that they inhabit. Central to the analysis is the deliberate exclusion of player agency: a gesture examined both for its political implications — as a critique of player-centric and instrumental

3 Sonia Fizek, *Playing at a Distance: Borderlands of Video Game Aesthetic* (Cambridge, Massachusetts: MIT Press, 2022).

4 Paolo Ruffino, 'Nonhuman Games: Playing in the Post-Anthropocene', in *Death, Culture and Leisure: Playing Dead*, ed. by Matt Coward-Gibbs (Bingley: Emerald, 2020), 11–25, doi:10.1108/978-1-83909-037-020201008.

5 Alenda Y. Chang, *Playing Nature: Ecology in Video Games* (Minneapolis: University of Minnesota Press, 2019).

6 Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006).

logics — and for its aesthetic potential to foster non-instrumental, contemplative forms of spectatorship and to explore alternative, open-ended temporalities. Ultimately, this chapter argues that live simulations not only expand the creative possibilities of game engines but also contribute to ongoing debates in game studies, media art, and ecological thought, prompting us to fundamentally reconsider interaction, agency, ecological relationships and the potentials of digital world-making.

2. *Setting the Stage: Background and Context*

2.1. *Breaking open the toolbox: Popularisation of video game technologies*

Over the past two decades, previously restrictive game development pipelines have opened up dramatically. In the 1990s and early 2000s, professional studios typically built proprietary tools and depended on publisher agreements for access to software development kits.⁷ This ‘aggressive formalisation’⁸ favoured large, well-funded enterprises, while publishers and an enthusiast press shaped a narrow definition of ‘gamer’, emphasising action-oriented gameplay.

In the 2000s and 2010s, however, accessible engines and tools such as Unity, Unreal, and Twine greatly lowered financial and technical barriers to entry, enabling a wider demographic to develop games with very diverse motivations, fostering communities of ‘everyday gamemakers’⁹ who prioritise personal or experimental projects over commercial imperatives.¹⁰ This shift

7 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), pp. 23–24.

8 Brendan Keogh, ‘From Aggressively Formalised to Intensely in/Formalised: Accounting for a Wider Range of Videogame Development Practices’, *Creative Industries Journal*, 12.1 (2019), 14–33.

9 Christopher James Young, ‘Game Changers: Everyday Gamemakers and the Development of the Video Game Industry’ (unpublished doctoral thesis, University of Toronto, 2018).

10 Anna Anthropy, *Rise of the Videogame Zinesters: How Freaks, Normals, Amateurs, Artists, Dreamers, Drop-Outs, Queers, Housewives, and Peo-*

broadened who makes games, who plays them, and how games are defined, leading to myriad new styles, genres, and objectives. Within this broader spectrum we find numerous contemporary artists using game engines in their practices.

2.2. *Hacking the game: Early video game art*

Fewer artists made their own games before engines became widely accessible, yet some hacked or modded existing titles. Figures like JODI, Cory Arcangel, Anne-Marie Schleiner, and Eddo Stern deconstructed game mechanics, visual representations, and narrative structures to expose the medium's formal properties and to comment on broader sociocultural issues," with exhibitions like *Cracking the Maze: Game Plug-ins and Patches as Hacker Art* and *Games: Computerspiele von KünstlerInnen* playing a significant role in positioning these works within the broader field of media art. These interventions laid crucial groundwork for later artistic explorations of game engines, establishing critical methodologies that would influence subsequent generations of digital artists working with video game technologies. Generally speaking, video game art mods introduced intentional dysfunctions or incoherences, often limiting or completely eradicating player interactivity.

2.3. *Breaking the rules: countergaming*

Alexander Galloway¹² analysed these disruptive artist-made video game modifications under the term 'countergaming', a movement that existed in opposition to and outside mainstream gaming, pointing out some of its characteristics in relation to

ple like *You Are Taking Back an Art Form* (New York: Seven Stories Press, 2012).

11 *Gamescenes: Art in the Age of Videogames*, ed. by Matteo Bittanti and Domenico Quaranta (Monza: Johan & Levi Editore, 2006); *Videogames and Art*, ed. by Andy Clarke and Grethe Mitchell (London: Intellect Books, 2007); Stephan Schwingeler, 'Interference as Artistic Strategy: Video Game Art between Transparency and Opacity', in *Intermedia Games—Games Inter Media: Video Games and Intermediality*, ed. by Michael Fuchs and Jeff Thoss (London: Bloomsbury Academic, 2019), pp. 189–204.

12 Galloway, *Gaming*.

more conventional video games, with which they often conflict violently. According to his detailed analysis, artist-made game mods operated as a form of cultural resistance, typically manifesting through interventions in the original games' visual design and manipulations of their underlying engine, but usually neglected gameplay to the point of disappearance.

From Galloway's perspective, these countergaming practices, although visually avant-garde, were reactionary in terms of gameplay, since many hindered or eliminated gameplay rather than advancing it. Building on his analysis of video games through the concept of 'gamic action', Galloway ultimately called for radical action in gaming — new grammars of action, alternative algorithms, a critique of gameplay itself, rather than merely subverting existing games visually. We will return to this later on, departing from Galloway's call to propose a different approach that we will call 'radical inaction'.

2.4. *Small mechanics, big worlds: Limited gameplay in contemporary video game art*

The two decades following Galloway's analysis have witnessed significant growth in indie game development, leading to several explorations of experimental gameplay.¹³ In parallel, as game engines became more accessible and artists grew increasingly literate in the medium, the practice of modifying pre-existing games gradually gave way to artists developing their own.¹⁴

Despite this shift, the gameplay in many contemporary artist-produced video games remains quite limited, with player actions often confined to navigation or exploration. Examples abound in works by Cassie McQuater, LuYang, Theo Triantafyllidis, Alice Bucknell, Danielle Brathwaite-Shirley, Gabriel Massan, Lawrence

13 See, for example, Anthropy, *Rise of the Videogame Zinesters*; Jesper Juul, *A Casual Revolution: Reinventing Video Games and Their Players* (Cambridge, Massachusetts: MIT Press, 2010).

14 Sofia Romualdo, 'Videogame Art and the Legitimation of Videogames by the Art World', in *Proceedings of the Third Conference on Computation, Communication, Aesthetics & X*, ed. by Alison Clifford, Miguel Carvalhais, and Mario Verdicchio (Universidade do Porto, 2015), pp. 151–67 (p. 163).

Lek, Keiken, and many others, who tend to focus on building evocative game worlds rather than experimenting with gameplay.

Some artists even bypass gameplay entirely, creating what Ian Cheng — a leading figure in this area — describes as ‘video games that play themselves’,¹⁵ commonly known as ‘live simulations’, turning game engines away from player-centric interactivity and towards open-ended world-building.

3. *Live Simulations*

3.1. *Autonomous worlds: Defining live simulations*

By ‘live simulations’, I refer to media artworks that employ game engines to generate autonomous digital worlds in real-time. While they utilise video game technologies and aesthetics, they deliberately exclude player interaction, fundamentally reconfiguring traditional player-game relationships by creating self-sustaining environments that operate independently of human input.

Live simulations are characterised by several key elements: real-time rendering, continuous operation without human intervention, emergent behavioural patterns driven by algorithmic processes, open-ended narrative structures, varying degrees of procedural generation and emergent phenomena. This combination of features produces digital environments that simulate life-like qualities while remaining fundamentally nonhuman in their operation, offering an alternative model of engagement rooted more in observation and contemplation than in player action.

¹⁵ ‘Ian Cheng Interview: A Portal to Infinity’, 2017, YouTube; Ian Cheng, *Emissaries Guide to Worlding: How to Navigate the Unnatural Art of Creating an Infinite Game by Choosing a Present, Storytelling Its Past, Simulating Its Futures, and Nurturing Its Changes*, ed. by Rebecca Lewin, Joseph Constable, and Veronica So (London: Koenig Books/Serpentine Galleries, 2018); Ian Cheng, *Emissary’s Guide to Worlding*, ed. by Veronica So and Nick Sung (Los Angeles: Metis Suns, 2018); Zoya Dare, ‘Locating the Viewer of Digital Art: A Case Study of Ian Cheng’s Emissaries (2015–2017)’ (unpublished master’s thesis, McGill University, 2018).

The autonomous nature of live simulations produces the illusion of living agents within a dynamically responding world. *Supreme's* Critters and *Berl-Berl's* ecosystem operate according to their own internal logics, indifferent to human presence or input. No human input controls them; instead, automated processes determine how their worlds unfold. This focus on non-human processes and removal of human agency raises fundamental questions about the nature of agency in computational systems, which will be explored further in Section 3.5.

3.2. *Dynamic still lifes: comparison with other art forms*

The departure from player interaction brings live simulations closer to traditional moving-image art forms like video art and animation. However, whereas most moving-image works involve pre-recorded or pre-rendered content that follows a fixed temporal structure, live simulations are generated in real-time, a process that artist and media art researcher Alexandra Anikina describes as 'a unique synthesis of computational logic and filmic experience'.¹⁶ By being rendered in real-time, and varying to different degrees with each iteration, live simulations foreground ongoing, live processes, aligning them in some respects with performance art. They are, quite literally, happening 'live'.

If their real-time quality brings live simulations closer to performance, their unfixed and potentially infinite duration aligns them, somewhat paradoxically, with painting. Live simulations often lack a predetermined beginning, middle, or end. They operate continuously, allowing viewers to enter and exit at any moment without missing a linear narrative arc or definitive conclusion. In discussing Theo Triantafyllidis' live simulations, contemporary art critic and curator Domenico Quaranta draws an analogy between live simulations and pre-modernist painting's ability 'to imprison the infinite within a finite surface, and to generate timelessness using an object that exists in time'.¹⁷ Like paint-

¹⁶ Alexandra Anikina, 'Procedural Films: Algorithmic Affect in Research Media Art Practice' (unpublished doctoral thesis, Goldsmiths, University of London, 2020), p. 11.

¹⁷ Domenico Quaranta, 'Theo Triantafyllidis: Live Simulation', *Fabbula*, 2023.

ings, live simulations invite viewers to linger indefinitely, encouraging an open-ended mode of attention not governed by runtime.

Paul Atkinson and Farzad Parsayi call this kind of open-ended engagement an ‘aesthetic contemplation (that) is pictorially, conceptually, and formally open, where the time of viewing is determined by the spectator rather than by a fixed duration inherent in the work itself’.¹⁸ Live simulations evoke a parallel open-endedness through their perpetual unfolding by animating complex systems that can, in principle, persist forever. Although camera movements within these simulations often guide viewers’ gazes — akin to cinematic techniques — and thus limit the freedom of exploration one might have with a static canvas, the ongoing procedural behaviours and potentially endless runtime recreate the patient stillness of a painting.

Interestingly, moments of stillness and contemplation are also present in more conventional video games. For example, Ian Bogost recounts an experience in the first-person shooter *Resistance: Fall of Man*, where, after intense combat, the player is left to spend as much or as little time as he or she wants exploring a detailed, accurate re-creation of The Manchester Cathedral, reflecting on the environment.¹⁹ Rainforest Scully-Blaker terms such episodes moments of ‘stillness’, where voluntary inaction arises from the game’s aesthetic.²⁰ This sort of reflective interlude is an integral quality of so-called ‘walking simulators’, which similarly prioritise exploration over conventional gameplay challenges. While these moments may be fleeting in conventional video games, live simulations make them their primary mode of experience. Later sections of this text will discuss how this emphasis on contemplation and expanded temporalities underpins the aesthetic dimensions of live simulations, setting them apart from traditional interactive media.

18 Paul Atkinson and Farzad Parsayi, ‘Video Games and Aesthetic Contemplation’, *Games and Culture*, 16.5 (2021), 519–37.

19 Ian Bogost, *How to Do Things with Videogames* (Minneapolis: University of Minnesota Press, 2011), pp. 28–29.

20 Rainforest Scully-Blaker, ‘Stasis and Stillness: Moments of Inaction in Videogames’, in *Proceedings of DiGRA 2018 Conference: The Game Is the Message*, 2018.

3.3. Forging worlds against the grain: Unique affordances of game engines

Game engines offer a powerful suite of tools for creating complex worlds that artists repurpose to create live simulations, often leveraging their capacities in ways that diverge from conventional game design. As Teodora Sinziana Fartan observes, recent years have witnessed increased artistic interest in game engines as ‘creative frameworks of choice for conjuring worlds’.²¹ Several key affordances make game engines so compelling for many contemporary artists, especially those creating live simulations:

- **Dynamic systems:** Engines such as Unity and Unreal enable simulated physics, weather, ecosystems, and other phenomena, allowing artists to design autonomous worlds whose elements behave according to programmed rules in ways that appear spontaneous or lifelike.
- **Real-time rendering:** Unlike traditional animation or video art, game engines continuously update visual and audio elements. This enables live simulations to unfold perpetually, foregrounding their distinct temporal and narrative openness.
- **Malleability and accessibility:** A video game is a collage of assets,²² and game engines make these assets highly manipulable and malleable — 3D objects, textures, lights, sounds, scripts, the speed at which time moves, the force of gravity, and an infinite number of image post-processing effects, among many other aspects. From an artistic standpoint, the malleability and the modular and customisable nature of game engines,²³ as well as their relative accessi-

21 Teodora Sinziana Fartan, ‘Rendering Post-Anthropocentric Visions: Worlding as a Practice of Resistance’, *A Peer-Reviewed Journal About*, 12.1 (2023), 43–60 (p. 44).

22 See, for example, Stefan Werning, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021).

23 Although game engines can be customised in seemingly any direction, it is important to emphasise, as Nicoll and Keogh argue, that game engines — though they refer specifically to Unity, their point applies to many others — are, like all cultural software, not neutral tools. From their default interfaces to their platform-based business models, they impose a particular

bility compared to historical game development pipelines, grant artists tremendous flexibility to construct intricate and dynamic simulated digital worlds.

- **Interactivity potential:** Game engines are inherently designed for real-time user input, yet live simulations typically exclude active player participation. This deliberate choice of repurposing an intrinsically interactive technology to craft non-interactive, autonomous worlds underscores their focus on algorithmic autonomy and contemplative experiences, rather than on immediate responsiveness to human commands.
- **Agent behaviour systems:** Game engines provide effective tools for implementing automated behaviours and artificial intelligence — systems traditionally used in commercial video game development to create non-player characters (NPCs). Built-in or easily integrated features like pathfinding algorithms, navigation meshes, behaviour trees, and machine learning modules allow artists to repurpose these game-oriented tools to populate their live simulations with autonomous agents that navigate and interact within virtual environments, rather than serving a player.

The relationship between artists and these technologies is more nuanced than simple appropriation, and many media artists have not only adopted commercial tools but also actively shaped them. For instance, Rebecca Allen — a significant historical example for the purposes of this chapter, developed her own engine and an artificial life software system, *Emergence*.²⁴ Numerous contemporary artists customise game engines and other software to fit their particular needs, repurposing functionalities in ways unintended by their original developers or developing their own tools. This approach reveals the fluid boundary between ‘tool user’ and ‘tool maker’, revealing a reciprocal interplay in which artists co-define the affordances and cultural significance of (digital) technologies,

politics of software development (*The Unity Game Engine and the Circuits of Cultural Software*).

²⁴ See, for example, Rebecca Allen, ‘Rebecca Allen on Kraftwerk, Video Games and Artificial Life’, *Serpentine Galleries*, 17 September 2020.

negotiating cultural values, redistributing power, and cultivating novel forms of digital expression.

Game scholar Stefan Werning describes game creation tools not as neutral instruments, but as ‘cognitive filters’ that shape how developers think about and structure their creative work.²⁵ Live simulations make these filtering effects visible by working against them, highlighting how deeply interactivity and player agency are encoded in the tools’ default affordances. Yet in doing so, they also demonstrate the malleability of these tools beyond their intended purposes, suggesting alternative possibilities that transcend conventional gaming paradigms.

Expanding upon these affordances and customisations, Fartan draws on Deleuze and Guattari’s concept of ‘minor literature’ — the way a minority group within a major language deterritorialises that language, turning it into a vehicle for political and collective expression²⁶ — to propose that artists’ ‘(mis)use’ of game engines can function as ‘minor tech’. While game engines are typically structured around industrialised, distributed, large-scale production pipelines geared towards economic value, Fartan argues that smaller teams or individuals can deploy them in more modest, decentralised and deterritorialised ‘minor’ ways.²⁷

Echoing the Marxist call to reclaim the means of production, Fartan suggests that ‘seizing the means of rendering’ may challenge the entrenched industrial logics of capital-driven game design. In this view, live simulations represent more than just formal experimentation: they become platforms for resisting the economic and epistemological imperatives of mainstream gaming, opening up possibilities for aesthetic, political, and ecological explorations that exceed entertainment, productivity and commercial objectives.²⁸

In *Supreme*, Xenoangel developed their own neural network and genetic algorithm system by adapting and modifying scripts originally made to implement AI techniques in game develop-

25 Werning, *Making Games*, p. 10.

26 Gilles Deleuze and Félix Guattari, *Kafka: Toward a Minor Literature*, trans. by Dana Polan, *Theory and History of Literature*, vol. 30 (Minneapolis: University of Minnesota Press, 1986).

27 Fartan, ‘Rendering Post-Anthropocentric Visions’.

28 *Ibid.*, p. 56.

ment, making them deliberately slow, with each tick of the neural network through which the Critters learn coinciding with an event in the game world. In *Berl-Berl*, Kudsk Steensen and his team use a sophisticated integration of multiple computational systems in which thirteen computers, twenty-nine speakers, and nine LED walls are connected to each other to coordinate both localised events and global atmospheric effects. This system creates complex feedback loops where visual elements trigger specific audio responses.

While it goes beyond the scope of this particular research, it is useful to look beyond contemporary art at how artists in performance, music, and other disciplines are experimenting with game engines, further underscoring that engines are less neutral toolkits and more dynamic, evolving platforms that artists co-opt for various ends.

3.4. *No buttons to press: Spectating the simulation play itself*

Live simulations, as autonomous systems running in real-time without player input, can be fruitfully situated within broader theoretical discussions of automated play. This category challenges conventional understandings of player agency in digital games and taps into the cultural fascination with systems that run themselves. While sharing qualities with other automated or non-interactive forms, the specific approach taken by artist-created live simulations using game engines requires careful distinction.

For instance, building on Staffan Björk and Jesper Juul's analysis of zero-player games, live simulations share certain operational qualities with setup-only games and games played by AI opponents.²⁹ However, whereas zero-player games often maintain different degrees of traditional game structures (goal-oriented design, win/failure conditions, beginning/end states, progression systems, decision-making patterns...), live simulations deliber-

29 Staffan Björk and Jesper Juul, 'Zero-Player Games or: What We Talk about When We Talk about Players', in *The Philosophy of Computer Games Conference* (presented at The Nature of Player Experience, Madrid, 2012).

ately eschew these elements in favour of open-ended, perpetually unfolding algorithmic ecosystems.

Idle games, while featuring automation and minimal direct interaction, retain clear progression systems and quantifiable goals centred on resource accumulation, and are often characterised by a frenetic tempo. Player agency, though limited, usually revolves around optimising these automated systems for efficiency and rewards, contrasting sharply with the stillness and deliberate exclusion of goal-oriented mechanics and player optimisation in works like *Berl-Berl* or *Supreme*.

The demoscene, by contrast, produces impressive non-interactive, real-time audiovisual demonstrations showcasing technical skill and visual spectacle within specific hardware or software constraints. However, these are pre-scripted sequences with fixed durations, rather than emergent, open-ended digital ecosystems.

Finally, while sharing interests in autonomy and emergence with A-Life art, live simulations are specifically characterised by their use of commercial game engines and their engagement with video game aesthetics. And although they simulate lifelike qualities, they do not share the scientific, biological focus — often centred on evolutionary dynamics — that defines A-Life's distinct genealogy.

Although these various forms share certain non-interactive or automated qualities, the specific technological platforms, conceptual frameworks, and artistic aims set the live simulations examined in this chapter apart. They engage with automation as a method of cultivating open-ended, ecologically resonant aesthetic systems.

3.5. *Reframing agency: From player control to algorithmic autonomy*

It is useful to read this departure from direct player control through the lens of recent shifts in game studies seeking to reconceptualise agency beyond the human player. For instance, digital games and media theorist Sonia Fizek, whose work is especially relevant to this analysis, notes that much of game studies historically fixates on a 'binary worldview' where humans are the agents

and games are acted upon,³⁰ and examines forms of engagement that challenge traditional notions of direct control and immediate agency, fruitfully conceptualising these less conventional gaming experiences as ‘playing at a distance’ or ‘dis-play’.³¹ By removing player interaction, live simulations produce what she describes as a form of mediated distance, where the focus shifts to observing the unfolding algorithmic processes, creating a space for critical reflection on the typically player-centric nature of video games.³² Specifically, live simulations resonate with her research on automated play — the partial or entire automatising of actions usually undertaken by human players, challenging the traditional subject–object boundary between the active human player and the acted-on, nonhuman game, thereby highlighting the agency of the computational system itself.³³ This type of reading also recalls what Aleena Chia and Paolo Ruffino identify as a move away from viewing agency as solely afforded by the game-player circuit. Instead, they argue that agency in digital play is not a singular, inherent quality but rather a complex and dynamic phenomenon arising from the interplay of various material, technological, and interpretive forces co-constituted by multiple human and non-human actors and systems.³⁴

Live simulations further complicate traditional gaming paradigms through their emphasis on NPCs and autonomous algorithmic behaviours. Unlike conventional games where NPCs primarily exist to support or challenge the player character’s journey, live simulations present worlds where all entities are NPCs, interacting according to programmed behaviours without hierarchical reference to a central, human player agent. In *Supreme*, this manifests through its various types of Critters who inhabit the World Beast — itself an NPC — and interact with each other through their own internal logics. While *Berl-Berl* does not fea-

30 Fizek, *Playing at a Distance*, p. 55.

31 *Ibid.*

32 *Ibid.*

33 Sonia Fizek, ‘Automated State of Play: Rethinking Anthropocentric Rules of the Game’, *Digital Culture & Society*, 4.1 (2018), 201–14; Fizek, *Playing at a Distance*.

34 Aleena Chia and Paolo Ruffino, ‘Special Issue Introduction: Politicizing Agency in Digital Play after Humanism’, *Convergence*, 28.2 (2022), 309–19.

ture what we would normally call NPCs, it achieves something similar through its use of automated virtual cameras to guide viewers through an environment where everything moves and morphs according to its own rhythms, independently of human intervention.

From the viewer's point of view, this focus on internal system dynamics, rather than player interaction, echoes Aubrey Anable's observations about how viewer engagement shifts when games operate without human input. In her analysis of Cory Arcangel's automated game art mods,³⁵ Anable notes that when viewers stand 'completely outside the cybernetic loop' and are denied the possibility of playing, they are forced to 'contemplate the games as systems' rather than as instruments of player agency.³⁶ This shift from interaction to contemplation represents a fundamental reconfiguration of the player-game relationship, moving away from the classical game studies emphasis on interactivity and meaningful player choice as the primary locus of meaning.

By removing the possibility of 'fixing' or 'solving' the simulation through player intervention, these works challenge what Fizek describes as the 'modern Western rhetoric of play as progress, power, and the self';³⁷ and align with what Paolo Ruffino identifies as a critique of the 'implied separation between user and system' that has historically dominated game studies discourse.³⁸ This deliberate decentring of the human, recognising more distributed forms of computational and ecological agencies, connects automated play to broader posthumanist critiques of anthropocentric design.

The relationship between live simulations and automated play thus extends beyond mere technical considerations of who or what drives the action. Although game engines were originally devised to develop video games which, in turn, empower players and enhance interactivity, live simulations use them to pro-

35 Specifically, *Various Self Playing Bowling Games*, an art installation featuring six bowling video games rigged to play autonomously, without human input. Aubrey Anable, *Playing with Feelings: Video Games and Affect* (Minneapolis: University of Minnesota Press, 2018).

36 Anable, *Playing with Feelings*, p. 126 (my emphasis).

37 Fizek, *Playing at a Distance*, p. xii.

38 Ruffino, 'Nonhuman Games', p. 15.

duce ecosystems of algorithmic agents whose behaviours and interactions unfold independently of human intervention. This autonomy produces a particular form of aesthetic experience that, paradoxically, becomes possible because of the technological affordances of game engines while simultaneously refusing their conventional application towards player empowerment through mastery and choice. Ultimately, this reframing of agency — moving beyond player mastery and embracing observation of autonomous systems — refuses the conventional application of game engines towards player empowerment. It opens up possibilities, as film and media scholar Alenda Y. Chang puts it, ‘to create entirely new sets of relations, outside of those based on dominance or manipulation’,³⁹ setting the theoretical stage for understanding the critical potential of ‘radical inaction’ explored in the next section.

4. *Radical Inaction*

4.1. *Unplaying games: Introducing radical inaction and its political significance*

As previously discussed, Galloway critiqued early artistic game modifications for neglecting gameplay. He found them ‘essentially progressive in visual form but reactionary in actional form’, because they rewrite the games they modify ‘as a sort of primitive animation lacking any of the virtues of game design’.⁴⁰ In his view, counter gaming is apolitical, because it does not aim to create better, or different, gameplay. Galloway ultimately called for ‘radical action’ in gaming — new modes of player action and interaction that could create genuinely different gameplay.

Building on, yet diverging from, Galloway’s call, this text proposes ‘radical inaction’ as a contrasting concept that reframes the deliberate refusal of player interaction in live simulations as a radical gesture. Seeing this exclusion as a purposeful reconfiguration of player-game relationships allows us to recognise how

39 Chang, *Playing Nature*, p. 23.

40 Galloway, *Gaming*, p. 125.

it challenges fundamental assumptions about video games and disrupts the traditional demand for constant user engagement that characterises digital culture more broadly. Radical inaction, therefore, is not a mere lack of gameplay, but a deliberate exclusion of player control. It reimagines observation itself as a non-interventionist form of engagement — a new grammar of inaction that invites us to envision alternative, non-human-centric ecological relationships that decentre human control.

Supreme and *Berl-Berl* demonstrate different approaches to this radical inaction. In *Supreme*, the behaviours of both the massive World Beast and the Critters that inhabit it emerge from neural networks operating at rhythms that deliberately exceed human perception, completely indifferent to human presence, positioning the work in opposition to both standard gaming paradigms and broader capitalist imperatives of productivity and instant gratification. Similarly, *Berl-Berl* reconstructs Berlin's ancient wetlands as a self-sustaining digital environment that unfolds across multiple screens. Automated camera movements guide viewers through this landscape, where changes in vegetation, weather, and seasonal conditions occur at their own randomised pace. The political implications of this radical inaction extend beyond questions of player agency to challenge how digital environments are typically represented. Alenda Y. Chang critiques how most video games relegate environments to 'background scenery' that remains 'inert, the functional equivalent of theater flats or greenscreen technology' while favouring 'clichéd landscapes' that abandon 'any attempts at regional specificity'.⁴¹ *Berl-Berl* directly addresses this through Kudsk Steensen's 'hyper-local' approach,⁴² centring on Berlin's wetlands, foregrounding the environment itself as the primary agent. Through months of fieldwork in the remaining wetlands of Berlin-Brandenburg, careful macro photogrammetry of local specimens, collaboration with the Museum für Naturkunde Berlin, and incorporation of Sorbian folklore, the work aligns with what Chang calls for: a 'meaningfully local' digital environment that takes 'seriously the goal of

⁴¹ Chang, *Playing Nature*, pp. 21–22.

⁴² 'Jakob Kudsk Steensen: Nature That We Have Forgotten' (Halle am Berghain, Berlin, 2021), 9 November 2021.

environmental realism — not solely in terms of visual rendering, but also in sound design, weather, species density and distribution, and the arrangement of organic and inorganic actors in complex interrelation'.⁴³ By removing player interaction, the work shifts focus from environment-as-backdrop to environment-as-subject, creating a space where ecological specificity and regional history are central. The digital wetland becomes not just visually impressive scenery but an active presence with its own temporal rhythms, sonic patterns, and cultural significance.

In both cases, the environment is an active system. This emphasis on autonomous world-building underscores the political and aesthetic significance of removing player agency. As previously discussed, by using video game technologies while removing direct player interaction, these works decentre human agency and challenge the pervasive myths of interactivity, instrumentalism, rationality, and player mastery often central to video game culture⁴⁴ — where the player character typically exists at the centre of a video game world designed for the player character to explore, exploit and conquer. This exclusion shifts focus from anthropocentric gameplay towards the contemplation of autonomous algorithmic ecologies (i.e., computational systems that operate autonomously, according to their own internal logics), foregrounding simulations where algorithmic systems, not players, determine behaviour.

Returning to counter gaming, we can recall theorist and artist Anne-Marie Schleiner's observation that, in JODI's game mods, 'output far exceeds input. Or the program becomes the performer, I am no longer player god in control — I must concede some of my agency to the code'.⁴⁵ Live simulations carry this logic even further, inviting human viewers to witness a game world governed exclusively by its algorithmic rules, an autonomous, complex system with its own intrinsic logics and behaviours that operate without their intervention, offering instead an experience grounded in observation and co-existence. In *Berl-Berl*, this mani-

43 Chang, *Playing Nature*, p. 22.

44 Ruffino, 'Nonhuman Games'.

45 Anne-Marie Schleiner, '2 Reviews: Untitled Game and Ego Image Shooter', *Nettime*, 3 December 2002.

feats — beyond its autonomous nature — through its attention to wetland ecosystems and what curator Emma Enderby describes as ‘the emotion of a swamp, its sensibility, history and mythology’.⁴⁶ *Supreme* achieves this through its focus on symbiosis and interdependence, as its Critters attempt to harmonise with their world through an autonomous, ongoing process of learning and adaptation.

Artists making live simulations are not just creating autonomous digital worlds, but are also reconfiguring game engines into tools of minor tech for alternative world-making with political, ecological, and social implications, creating speculative, computational ‘minor worlds’ that deterritorialise the major, dominant logics of game engine technologies, challenging industrialised, entertainment-centric, large-scale capitalist approaches to utilising these.⁴⁷ The withdrawal of player agency, central to ‘radical inaction’, becomes a means of techno-artistic resistance, disrupting the prevailing narratives of digital interaction that privilege human control. Instead, live simulations foster alternative modes of relating to technology that move beyond entertainment, instrumental logic and mastery towards ecological awareness. In this way, depriving the player of the ability to intervene in the game world, and relegating them instead to the role of observer, becomes a political gesture.

The inaction of live simulations should not be understood as passive withdrawal but as an active mode of critical engagement. These works expose the anthropocentric foundations of digital media while simultaneously imagining alternative possibilities. By linking game studies to ecological and posthumanist perspectives, Ruffino illustrates how the assumed separation between humans and the worlds they inhabit parallels the divide between players and the games they master. Live simulations dismantle this divide by eliminating player control entirely — thus exposing the cultural fiction that humans must always occupy the centre of digital or physical ecosystems. As Ruffino provocatively suggests, a game played without human intervention evokes a world where human beings are no longer central. ‘A future Earth with-

46 ‘Berl-Berl, behind the Scenes Video for LAS’, 30 October 2022.

47 Fartan, ‘Rendering Post-Anthropocentric Visions’.

out humans is (...) possible, and a video game that plays by itself helps us to imagine this unimaginable scenario'.⁴⁸ This statement is not a dystopian warning, but a speculative exercise in decentring human experience. Live simulations invite us to rethink our relationship with technology and the planet itself, suggesting that true radical potential might lie not in mastering these systems, but in learning to coexist with them.

4.2. *Stillness in motion: Aesthetic dimensions*

By shifting the audience's role from active participant in conventional video games to attentive observer, live simulations foreground aesthetic and affective experience. Art critic, curator, and writer Nora N. Khan argues that 'a simulation is crucially different from a game since I'm not actively taking part or playing a role within its bounds, but it does exert an important pressure, namely, to become a more active viewer'.⁴⁹ In conventional video games, objects and environments are evaluated primarily for their usefulness — collectible items, locations that offer a favourable position, paths that lead to the next level, and so on. This instrumental gaze is deeply ingrained in conventional gameplay loops, wherein progress and mastery hinge on the player's interaction with the game world.⁵⁰ As Juul notes, conventional gameplay demands that 'much of our energy is spent rationally optimizing our strategies under time pressure', leaving little room to 'look at objects for *anything* but their practical utility in the game'.⁵¹ Yet such a utilitarian perspective sits uneasily with the aesthetic tradition, which presupposes a non-functional relationship between

48 Ruffino, 'Nonhuman Games', p. 18.

49 Nora N. Khan, 'No End State: Ian Cheng's Live Simulations' (presented at the New Ways to See: Digital Art Criticism Now, Whitney Museum of American Art, New York, 30 November 2016).

50 See Nicholas O'Brien, 'Lingering Patience', *Rhizome*, 29 October 2013, <https://rhizome.org/editorial/2013/oct/29/lingering-patience/>; Jesper Juul, 'The Aesthetics of the Aesthetics of the Aesthetics of Video Games: Walking Simulators as Response to the Problem of Optimization', in *12th International Conference on the Philosophy of Computer Games Conference* (Copenhagen, 2018); Atkinson and Parsayi, 'Finding a Time to See'.

51 Juul, 'The Aesthetics of the Aesthetics of the Aesthetics of Video Games' (emphasis in the original).

the viewer and the object of contemplation.⁵² Live simulations deliberately subvert this instrumental relationship with the game world.

In *Berl-Berl*, the digital environment exists purely to be observed and contemplated, resisting any form of utilitarian interaction, and the work's soundscape merges environmental recordings of local amphibians with processed vocals that echo ancient wetland songs once used to navigate these swamps, a layered audio composition that enhances the contemplative experience.

Similarly, *Supreme* creates an otherworldly ecosystem that privileges observation over interaction. The work presents an alien landscape populated by hybrid creatures whose forms and sounds suggest organic life while remaining fundamentally unrecognizable. Fragments of text appear periodically — thoughts or dialogue from the inhabitants, pieces of mythology about artifacts they find — but these never cohere into a traditional narrative. Instead, they contribute to an atmospheric experience that invites open-ended interpretation.

Because live simulations replace interactive tasks with observation, they can better accommodate open-ended aesthetic engagement — a mode of perceiving that is traditionally undercut by the demands of gameplay. Discussing player experience in what she refers to as 'low-interactivity games', Xiaoding Zhou suggests that the 'blankness of mechanics and gameplay' creates space for awareness and subjective associations, allowing players, or viewers, to let their mind wander and co-create meaning through imagination rather than action.⁵³

Returning to Alexander Galloway once again, live simulations are reminiscent of what he described as 'ambience act': the state of rest or equilibrium in which some video games enter when the player stops actively controlling them, but the game continues to run indefinitely autonomously, producing machine-driven micro-movements and environmental changes. He describes the video game *Shenmue*, for instance, as persisting in 'a gently stirring

52 Atkinson and Parsayi, 'Finding a Time to See'.

53 Xiaoding Zhou, 'An Exploration of Interactions and Design Implications of Low-Interactivity Games' (unpublished master's thesis, Uppsala Universitet, 2023), p. 28.

rhythm of life' when the player is absent, highlighting the game's day-night cycles, weather changes, and NPCs. In this ambient mode, the game continues to function, but the player's input is suspended, allowing the game world to exist 'as a purely aesthetic object'.⁵⁴ Both *Berl-Berl* and *Supreme* are built around this kind of ambient micromovements and changes. Sonia Fizek's distinction between two interconnected types of ambience in video games, operational and affective, further reveals how background computational processes executed automatically (operational ambience) and slow, contemplative styles of play (affective ambience) shape a more reflective engagement with digital environments.⁵⁵ In live simulations, where user input is removed, both forms of ambience merge to foreground a contemplative experience unburdened by goal-oriented actions or time pressures.

Another way live simulations foster aesthetic contemplation is by aligning themselves more closely with exhibition practices typically found in art galleries and museums — where live simulations are often displayed — rather than gaming conventions. As Atkinson and Parsayi argue, 'placing a work in that space brings it into a particular aesthetic discourse and visual regime' where 'visual and formal properties take precedence over narrative and gameplay aspects'.⁵⁶ Both *Supreme* and *Berl-Berl*, and many other artist-made live simulations, exemplify this approach through their careful attention to visual and sonic composition, their resistance to traditional narrative structures, their emphasis on creating environments that reward sustained attention without requiring active participation, and the care taken in their physical installation.

Overall, live simulations cultivate an aesthetic that values slowness and contemplation over action, competition and progress. By detaching the viewer from instrumental interactions and grounding the experience in observing autonomous computational processes, they highlight how the very technologies intended to foster interactivity can be redirected towards reflective, even

54 Galloway, *Gaming*, pp. 8–12.

55 Fizek, *Playing at a Distance*, pp. 37–46.

56 Paul Atkinson and Farzad Parsayi, 'Institutionalized Aesthetics: Video Games and the Contemporary Art Gallery', *Games and Culture* 2024, 2024, 1–21 (3–4).

meditative, forms of digital engagement — placing them firmly within the realm of aesthetic, art-historical discourse. While conventional video games can, of course, provide aesthetic experiences, these must constantly negotiate ludic demands. Live simulations resolve this tension by eliminating interactivity entirely, allowing the viewer to stand outside the action in favour of pure observation.

4.3. *Beyond human timelines: Temporal aesthetics and ecological awareness*

Unlike conventional video games that structure time around player action and progression, or traditional time-based media that follow fixed durations, live simulations cultivate multiple, overlapping temporalities that exceed human rhythms while inviting sustained contemplation. As Ian Cheng observes, these works can ‘occupy attention across a spectrum’, accommodating both brief encounters and extended engagement. A viewer might experience the work for mere seconds, glancing at a moving image that never quite repeats itself; spend hours observing its gradual evolution, much like watching children play in a park through a window; or track the unfolding trajectories of individual characters and their interactions.⁵⁷

In *Supreme*, this manifests through the Critters’ slow learning process as they attempt to synchronise with the World Beast’s rhythms. When the World Beast periodically sings, each Critter attempts to respond, trying to learn the expected rhythm through neural networks that evolve over extended periods. This learning process may span the entire duration of an exhibition,⁵⁸ forcing viewers to accept their inability to witness the system’s complete evolution or to comprehend the purpose of the Critters. This aligns with what the artists term ‘slow thinking’ — a reflective mode of thought that resists the speed and immediacy characteristic of our times.⁵⁹ Inspired by geological processes rather

⁵⁷ Ian Cheng Interview.

⁵⁸ Sam Twidale, ‘The Song of the World Beast’, *Audiokinetic*, 9 February 2022.

⁵⁹ Twidale, ‘Slow Thinking’.

than calibrated to human perception, this approach positions its deliberately slow computational rhythms in explicit opposition to both human-centred time and the accelerated temporalities of Western societies — ‘something less human, less capitalist, less instant’.⁶⁰ Furthermore, *Supreme* operates simultaneously at multiple temporalities through its dual-screen presentation. Two synchronised screens present contrasting views of this autonomous digital ecosystem — one showing the massive World Beast, the other following the Critters’ activities (Fig. 2). This setup creates a perpetual tension between two different points of view that show two distinct time scales in parallel, that of the world and that of its inhabitants.

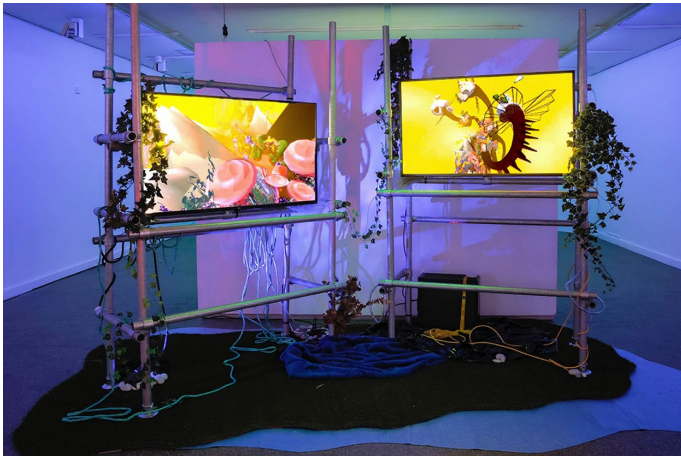


Fig. 2. Xenoangel (Marija Avramovic and Sam Twidale), *Supreme*, 2021, two-channel real-time computer simulation; custom neural network and genetic algorithm system; slow neural networks calibrated to geological rather than human timescales. Installation view, Espace Van Gogh, Paris.

Berl-Berl creates similar temporal variety, as viewers may witness brief moments of seasonal change or extended periods of microscopic detail, using thirteen synchronised computers to generate varying paces and movements through its digital wet-

60 Marija Avramovic, quoted in the video description of ‘Xenoangel - Supreme (Slow Thinking)’, 2022.

land. Barbara London describes how ‘the tallest screen is related to landscape painting, and presents a slow, holistic view of the world. The smaller screens present multiple detailed views of the swamp landscape, ranging from the intimate scale of a plant to the ethereal. The virtual world allows perspectives otherwise inaccessible to humans’.⁶¹ Kudsk Steensen further explains how each computer moves ‘through the landscape at different paces and in different movements, depending on what screen a computer is connected to, and if it is supposed to feel more intimate or removed and objective, giving different ways of perceiving and feeling connected to the digital swamp’.⁶² This orchestration of multiple viewpoints and speeds creates what the artist describes as a ‘living instrument’,⁶³ a complex, responsive system where changes in one part of the installation trigger responses throughout. The work’s soundscape further complicates this temporal layering by merging contemporary environmental recordings with processed vocals that echo ancient wetland songs — connecting past and present through sound while the visuals shift between microscopic detail and broader environmental patterns.

Both works demonstrate how live simulations can cultivate spans of time that resist both the immediate gratification of conventional gameplay and the fixed temporalities of traditional media. These durations emerge from the tension between technological processes (real-time rendering, automated cameras, neural networks) and natural rhythms (geological time, environmental cycles, biological growth). By embracing timescales that exceed human perception while remaining perpetually present and observable, live simulations create spaces where multiple temporalities can coexist and overlap.

This approach to time aligns with what Timothy Morton describes as the ‘temporal undulation’ — the experience of grappling with vastly different timescales inherent in ecological awareness when contemplating environmental processes that

61 Barbara London, ‘Navigating the Ineffable’, in *Jakob Kudsk Steensen: Berl-Berl*, ed. by Emma Enderby (London: Koenig Books/LAS, 2021), pp. 149–60 (p. 158).

62 Kudsk Steensen, ‘Dreaming up a Digital Swamp’.

63 *Ibid.*

both precede and exceed human timescales.⁶⁴ Live simulations make this undulation tangible by creating digital environments that operate simultaneously at multiple temporal registers, from the immediate updates of real-time rendering to the slow pace of the processes they present.

Supreme explicitly engages with Morton's thinking, using it as theoretical foundation for its slow thinking system.⁶⁵ The work's dual-screen presentation — simultaneously showing the massive World Beast and its inhabitants — echoes Morton's concept of 'hyperobjects': phenomena so massively distributed in time and space that they exceed traditional scales of human perception. Through its focus on symbiosis and interdependence, *Supreme* creates what Xenoangel calls 'a looking glass at our present interconnected ontology',⁶⁶ inviting viewers to contemplate ecological relationships that transcend individual entities or moments.

Berl-Berl approaches ecological awareness through its attention to wetlands as complex systems that have shaped human settlement while exceeding human temporalities. The work connects past and present while highlighting the environmental transformations that threaten these ecosystems. Its multiple synchronised screens and spatialised audio create an opportunity to observe and contemplate unfolding processes that operate beyond human agency. As Aliya Say writes, '*Berl-Berl's* generous offering is not distraction and entertainment, but the exploration of our connectedness to the more-than-human beings and forces, our embeddedness and dependence on our ecological home'.⁶⁷

4.4. *Points of contention: Counterarguments*

64 Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World*, Posthumanities, 27 (Minneapolis: University of Minnesota Press, 2013), pp. 55–68.

65 See the video description of *Xenoangel - Supreme (Slow Thinking)*; Twidale, 'Slow Thinking'.

66 In the work's description on the artists' website Marija Avramovic and Sam Twidale, 'XENOANGEL Artifacts of Mutual Importance to Marija Avramovic and Sam Twidale', *Xenoangel*.

67 Aliya Say, 'The Digital Sensorium, The Vegetal Metaverse', *Jakob Kudsk Steensen*, 2022.

Despite the arguments made thus far, theoretical and definitional challenges arise when considering live simulations within broader debates on game definitions, non-human agency, and aesthetic values. This section addresses key counterarguments while examining how live simulations both complicate and enrich our understanding of digital media.

The most immediate consideration centres on whether live simulations can be meaningfully classified as video games at all, even if they use game engines and adopt video game aesthetics. Classical game studies definitions emphasise interactivity, meaningful player choice, goal-oriented behaviour, and fun as constitutive elements of the medium,⁶⁸ while live simulations deliberately exclude these elements. However, this definitional challenge reveals more about the limitations of our existing taxonomies than about live simulations themselves. By excluding human players, live simulations redirect our attention to often-overlooked forms of algorithmic agency and automated processes that are fundamental to all video games. As Fizek suggests, this shift helps expose how mainstream video game rhetoric emphasising player mastery and optimisation often obscures the complex computational ecologies that make such experiences possible.⁶⁹ Moreover, the boundaries of what constitutes a video game have evolved considerably, with genres like walking simulators and idle games — in which human interaction is minimised or even optional — proving that the video game medium is already evolving beyond conventional definitions centred on player agency and challenge even within successful commercial video games.

In a similar way, a further objection is that the turn towards aesthetic contemplation at the expense of gameplay represents a conservative approach, echoing Galloway's critique of early

68 Chris Crawford, *The Art of Computer Game Design* (Berkeley, California: Osborne/McGraw-Hill, 1984); Espen J. Aarseth, *Cybertext: Perspectives on Ergodic Literature* (Baltimore: Johns Hopkins University Press, 1997); Jesper Juul, 'The Game, the Player, the World: Looking for a Heart of Game-ness', in *Level Up: Digital Games Research Conference Proceedings*, ed. by Marinka Copier and Joost Raessens (Utrecht, The Netherlands: Utrecht University, 2003), pp. 30–45; Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, Massachusetts: MIT Press, 2004).

69 Fizek, *Playing at a Distance*.

artistic game modifications for their tendency to privilege visual contemplation over the aesthetic potential of gameplay;⁷⁰ or what Juul, speaking of walking simulators, refers to as ‘an attempt at fixing games such that they become a better fit for our templates of aesthetics, and art’ rather than developing new aesthetic paradigms specific to the medium’s interactive nature.⁷¹ These critiques raise valid questions about whether live simulations represent an innovative expansion of video game possibilities or a retreat into more conventional aesthetic experiences. However, I contend that live simulations’ withdrawal of player action constitutes not a conservative retreat but rather opens up a field of aesthetic and political possibilities. By deliberately stripping away traditional gameplay mechanics, these works don’t simply make games more like conventional art forms. They reveal alternative aesthetic and political possibilities inherent to real-time simulation technology. The focus on observation, emergent systems, and non-human agency challenges both traditional gaming paradigms and conventional artistic experience. Where traditional games celebrate human mastery and agency, and traditional art often presents fixed artefacts for contemplation, live simulations create a unique hybrid: dynamic worlds that unfold according to their own rules, positioning the human observer as witness rather than master. This isn’t about making games more palatable to the art world, but about expanding our understanding of what real-time virtual worlds can be and do. By using game engines to create experiences that consciously oppose familiar gameplay loops, live simulations pioneer an aesthetic space where computational processes unfold independently of user input, encouraging a different form of attentive, observational engagement. These works reveal how computational systems can be both authored and autonomous, creating spaces for contemplation that emerge from the very technologies typically used to maximise player agency.

Lastly, another consideration is whether the agency attributed to algorithms in live simulations is truly meaningful or merely programmed, since these simulations, generally speaking, execute a series of predetermined scripts and randomisation procedures,

70 Galloway, *Gaming*.

71 Juul, ‘The Aesthetics of the Aesthetics of the Aesthetics of Video Games’.

offering no genuine algorithmic agency. While this observation is technically accurate (hence the term ‘simulation’), it perhaps misses broader implications of these works. They foreground the tension between programmed behaviour and emergent complexity that exists in all digital systems. Rather than claiming true autonomy, they invite us to reconsider human-machine relationships beyond simple binaries of control and submission. Borrowing Ian Bogost’s concept of ‘procedural rhetoric’ — the practice of using rule-based computational processes persuasively to convey arguments or ideas⁷² — I maintain that, even without direct player interaction, live simulations, through their very procedures, help us imagine and speculate about forms of non-human agency. The feeling of liveliness that emerges from *Supreme* and *Berl-Berl* demonstrates how seemingly deterministic processes can produce genuinely unexpected outcomes. When *Supreme*’s Critters attempt to harmonise with the World Beast through their learned behaviours, or when *Berl-Berl*’s automated cameras reveal previously unseen details of its digital wetlands, they produce moments that, while ultimately rooted in code, exceed simple predictability. The fact that these agents’ behaviours are programmed does not negate their ability to surprise, to generate novel configurations, or to prompt critical and aesthetic reflections on non-human temporalities and agencies.

5. Conclusion

Live simulations illustrate how game engines can be repurposed beyond the conventional demands of interactivity and control. By removing player agency, they reveal underlying ecological possibilities and challenge the pervasive player-centric and instrumental logic of video game culture.

This chapter has introduced ‘radical inaction’ as a conceptual lens to understand how observation, rather than intervention, can generate aesthetic, political, and ecological meaning. Works like *Berl-Berl* and *Supreme* demonstrate that digital worlds do not

72 Ian Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Massachusetts: MIT Press, 2007).

need human mastery to be alive, compelling, or affective. As Nora N. Khan writes of Ian Cheng's live simulations, these artists work 'using behaviour as a sculptural material',⁷³ shaping not just environments, but the systems that animate them.

Their radical inaction stands as both a critique of anthropocentric game design and a proposition for new forms of world-making — suggesting pathways for computational media to foster not mastery over worlds, but perhaps a more symbiotic coexistence with them. They show us that, in the absence of human control, digital worlds can still thrive and resonate with deeply ecological modes of thinking and being.

Bibliography

- Aarseth, Espen J., *Cybertext: Perspectives on Ergodic Literature* (Baltimore: Johns Hopkins University Press, 1997)
- Allen, Rebecca, 'Rebecca Allen on Kraftwerk, Video Games and Artificial Life', *Serpentine Galleries*, 17 September 2020, <https://www.serpentinegalleries.org/art-and-ideas/rebecca-allen/> [accessed 1 March 2025]
- Anable, Aubrey, *Playing with Feelings: Video Games and Affect* (Minneapolis: University of Minnesota Press, 2018)
- Anikina, Alexandra, 'Procedural Films: Algorithmic Affect in Research Media Art Practice' (unpublished doctoral thesis, Goldsmiths, University of London, 2020), <https://doi.org/10.25602/GOLD.00030126> [Accessed 1 March 2025]
- Anthropy, Anna, *Rise of the Videogame Zinesters: How Freaks, Normals, Amateurs, Artists, Dreamers, Drop-Outs, Queers, Housewives, and People like You Are Taking Back an Art Form* (New York: Seven Stories Press, 2012)
- Atkinson, Paul, and Farzad Parsayi, 'Video Games and Aesthetic Contemplation', *Games and Culture*, 16.5 (2021), 519–37, <https://doi.org/10.1177/1555412020914726> [accessed 1 March 2025]
- , 'Institutionalized Aesthetics: Video Games and the Contemporary Art Gallery', *Games and Culture*, 2024, vol. 21, issue 2, <https://doi.org/10.1177/15554120241246839> [accessed 1 March 2025]
- Avramovic, Marija, and Sam Twidale, 'XENOANGEL Artifacts of Mutual Importance to Marija Avramovic and Sam Twidale', *Xenoangel*, n.d., <https://xenoangel.com/> [accessed 4 December 2024]

73 Khan, 'No End State'.

- 'Berl-Berl, Behind the Scenes Video for LAS', 30 October 2022, <https://vimeo.com/765424027> [accessed 4 December 2024]
- Bittanti, Matteo, and Domenico Quaranta, eds., *Gamescenes: Art in the Age of Videogames* (Monza: Johan & Levi Editore, 2006)
- Björk, Staffan, and Jesper Juul, 'Zero-Player Games or: What We Talk about When We Talk about Players', in *The Philosophy of Computer Games Conference* (presented at The Nature of Player Experience, Madrid, 2012)
- Bogost, Ian, *How to Do Things with Videogames* (Minneapolis: University of Minnesota Press, 2011)
- , *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Massachusetts: MIT Press, 2007)
- Chang, Alenda Y., *Playing Nature: Ecology in Video Games* (Minneapolis: University of Minnesota Press, 2019)
- Cheng, Ian, *Emissaries Guide to Worlding: How to Navigate the Unnatural Art of Creating an Infinite Game by Choosing a Present, Storytelling Its Past, Simulating Its Futures, and Nurturing Its Changes*, ed. by Rebecca Lewin, Joseph Constable, and Veronica So (London: Koenig Books/Serpentine Galleries, 2018)
- Chia, Aleena, and Paolo Ruffino, 'Special Issue Introduction: Politicizing Agency in Digital Play after Humanism', *Convergence*, 28.2 (2022), 309–19, <https://doi.org/10.1177/13548565221100135> [accessed 4 December 2024]
- Clarke, Andy, and Grethe Mitchell, eds., *Videogames and Art* (London: Intellect Books, 2006)
- Crawford, Chris, *The Art of Computer Game Design* (Berkeley, California: Osborne/McGraw-Hill, 1984)
- Dare, Zoya, 'Locating the Viewer of Digital Art: A Case Study of Ian Cheng's Emissaries (2015-2017)' (unpublished master's thesis, McGill University, 2018)
- Deleuze, Gilles, and Félix Guattari, *Kafka: Toward a Minor Literature*, trans. by Dana Polan, *Theory and History of Literature*, vol. 30 (Minneapolis: University of Minnesota Press, 1986)
- Fartan, Teodora Sinziana, 'Rendering Post-Anthropocentric Visions: Worlding as a Practice of Resistance', *A Peer-Reviewed Journal About*, 12.1 (2023), 43–60, <https://doi.org/10.7146/aprja.v12i1.140437> [accessed 4 December 2024]
- Fizek, Sonia, 'Automated State of Play: Rethinking Anthropocentric Rules of the Game', *Digital Culture & Society*, 4.1 (2018), 201–14, <https://doi.org/10.25969/mediarep/13532> [accessed 4 December 2024]
- , *Playing at a Distance: Borderlands of Video Game Aesthetic* (Cambridge, Massachusetts: MIT Press, 2022)
- Galloway, Alexander R., *Gaming: Essays on Algorithmic Culture* (Minneapolis, Minnesota: University of Minnesota Press, 2006)

- 'Ian Cheng Interview: A Portal to Infinity', 2017, <https://www.youtube.com/watch?v=TO6Luilc4Bo> [accessed 4 December 2024]
- 'Jakob Kudsk Steensen: Nature That We Have Forgotten' (Halle am Berghain, Berlin, 2021), 9 November 2021, <https://vimeo.com/643921178> [accessed 4 December 2024]
- Juul, Jesper, *A Casual Revolution: Reinventing Video Games and Their Players* (Cambridge, Massachusetts: MIT Press, 2010)
- , 'The Aesthetics of the Aesthetics of the Aesthetics of Video Games: Walking Simulators as Response to the Problem of Optimization', in *12th International Conference on the Philosophy of Computer Games Conference* (Copenhagen, 2018), <https://www.jesperjuul.net/text/aesthetics3/> [accessed 4 December 2024]
- , 'The Game, the Player, the World: Looking for a Heart of Gameness', in *Level Up: Digital Games Research Conference Proceedings*, ed. by Marinka Copier and Joost Raessens (Utrecht, The Netherlands: Utrecht University, 2003), pp. 30–45
- Keogh, Brendan, 'From Aggressively Formalised to Intensely in/Formalised: Accounting for a Wider Range of Videogame Development Practices', *Creative Industries Journal*, 12.1 (2019), 14–33, <https://doi.org/10.1080/17510694.2018.1532760> [accessed 4 December 2024]
- Khan, Nora N., 'No End State: Ian Cheng's Live Simulations' (presented at the New Ways to See: Digital Art Criticism Now, Whitney Museum of American Art, New York, 30 November 2016), <https://www.youtube.com/live/TAGoFaR98cE> [accessed 4 December 2024]
- Kudsk Steensen, Jakob, 'Dreaming up a Digital Swamp: Jakob Kudsk Steensen on How He Created an Immersive World inside Berlin's Most Sought-after Club', *Kill Screen*, 20 August 2021, <https://killscreen.com/dreaming-up-a-digital-swamp/> [accessed 4 December 2024]
- London, Barbara, 'Navigating the Ineffable', in *Jakob Kudsk Steensen: Berl-Berl*, ed. by Emma Enderby (London: Koenig Books/LAS, 2021), pp. 149–60
- Morton, Timothy, *Hyperobjects: Philosophy and Ecology after the End of the World*, Posthumanities, 27 (Minneapolis: University of Minnesota Press, 2013)
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019)
- O'Brien, Nicholas, 'Lingering Patience', *Rhizome*, 29 October 2013, <https://rhizome.org/editorial/2013/oct/29/lingering-patience/> [accessed 4 December 2024]
- Quaranta, Domenico, 'Theo Triantafyllidis: Live Simulation', *Fabbula*, 2023, <https://fabbula.com/bubble/theo-triantafyllidis-live-simulation-essay-by-domenico-quaranta-themefabbula2018/> [accessed 4 December 2024]

- Romualdo, Sofia, 'Videogame Art and the Legitimation of Videogames by the Art World', in *Proceedings of the Third Conference on Computation, Communication, Aesthetics & X*, ed. by Alison Clifford, Miguel Carvalhais, and Mario Verdicchio (Porto, Portugal: Universidade do Porto, 2015), pp. 151–67
- Ruffino, Paolo, 'Nonhuman Games: Playing in the Post-Anthropocene', in *Death, Culture and Leisure: Playing Dead*, ed. by Matt Coward-Gibbs (Bingley: Emerald, 2020), pp. 11–25, <https://kclpure.kcl.ac.uk/portal/en/publications/nonhuman-games-playing-in-the-post-anthropocene/> [accessed 4 December 2024]
- Salen, Katie, and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, Massachusetts: MIT Press, 2004)
- Say, Aliya, 'The Digital Sensorium, The Vegetal Metaverse', *Jakob Kudsk Steensen*, 2022, <http://www.jakobsteensen.com/the-digital-sensorium-thevegetal-metaverse> [accessed 4 December 2024]
- Schleiner, Anne-Marie, '2 Reviews: Untitled Game and Ego Image Shooter', *Nettime*, 3 December 2002, <https://nettime.org/Lists-Archives/nettime-bold-0203/msg00295.html> [accessed 4 December 2024]
- Schwingeler, Stephan, 'Interference as Artistic Strategy: Video Game Art between Transparency and Opacity', in *Intermedia Games—Games Inter Media: Video Games and Intermediality*, ed. by Michael Fuchs and Jeff Thoss (London: Bloomsbury Academic, 2019), pp. 189–204
- Scully-Blaker, Rainforest, 'Stasis and Stillness: Moments of Inaction in Videogames', in *Proceedings of DiGRA 2018 Conference: The Game Is the Message*, 2018, <https://dl.digra.org/index.php/dl/article/view/937> [accessed 4 December 2024]
- Twidale, Sam, 'Slow Thinking', *CCCB LAB*, 13 September 2022, <https://lab.cccb.org/en/slow-thinking/> [accessed 4 December 2024]
- , 'The Song of the World Beast', *Audiokinetic*, 9 February 2022, <https://www.audiokinetic.com/en/blog/the-song-of-the-world-beast/> [accessed 31 December 2024]
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- 'Xenoangel - Supreme (Slow Thinking)', YouTube, 17 May 2022, <https://www.youtube.com/watch?v=1Ybc-rHcUNE> [accessed 4 December 2024]
- Young, Christopher James, 'Game Changers: Everyday Gamemakers and the Development of the Video Game Industry' (unpublished doctoral thesis, University of Toronto, 2018), <http://hdl.handle.net/1807/89734> [accessed 4 December 2024]
- Zhou, Xiaoding, 'An Exploration of Interactions and Design Implications of Low-Interactivity Games' (unpublished master's thesis, Uppsala universitet, 2023), <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1768814&dsid=-4500> [accessed 4 December 2024]

DOUG STARK

ON SIMEMA: THE RADICAL PASSIVITY
OF SELF-PLAYING GAMES

We (...) need an active culture around how to induce growth, how to change our mind about something, how to relate to change, how to hold contradictory perspectives, how to face uncertainty without hiding behind analytics or hiding behind a master, how to find crumbs of curiosity when we feel most anxious. How to initiate our own modest mutations and outgrow our self. I call all of this the neurological gym. It is my name for the thing we have been conveniently calling art.

Ian Cheng, *Live Simulations*, 2015¹

At first glance, Will Freudenheim's *Schema* is a standard video game exhibit.² Tucked away at the back of a gallery, a laptop attends an otherwise lonesome monitor, and its two controllers extend an invitation – interact? I don't take up the offer just yet. One must first survey the surroundings and answer the crucial question: Am I about to embarrass myself in front of an audience? Confident that the computer is my only company, I reach for the pad.

In my hesitancy to start the game, it's progressed without me. What I thought was a screensaver, a demo that'd end when I pressed a button, is *Schema* itself: An ethereal grey blob meanders

1 Elodie Evers and Ian Cheng, 'In Conversation with Ian Cheng', in *Live Simulations*, ed. by Elodie Evers, Gregor Jansen, Irina Raskin, and Ian Cheng (Leipzig: Spector Books, 2015), pp. 102–15 (p. 115).

2 Will Freudenheim, *Schema* (Video game) (2023).

through a forest of hazy, vegetal shades, the almost hand-drawn pastels evoking a ‘cozy’ aesthetic.³ Sometimes fast, sometimes slow, our intrepid adventurer shifts between bi- and quadrupedal locomotion, occasionally interacting with its sylvan surroundings – especially those shiny spheres in the grass. When the creature encounters a ‘pearl’, it does what is best characterised as a ‘little dance’;⁴ and the jewel joins an on-screen inventory.

In lieu of instructions, it seems pearl-gathering is the goal of the game. And even if it isn’t, I want to see more dancing. So, as we near another treasure, I attempt to steer the creature by mashing the D-pad. It blithely walks on by. We approach another, but at the last moment, it skitters away. A third pearl... we miss again. Talk about an ‘uneasy collaboration between human and machine’.⁵ Now, the creature seems to be as irritated as I am, its movements resembling those of a grumpy child. I feel bad. It’s my fault you’re not getting those pearls, my friend. Please don’t be mad.

While I was right to take the blame, it was a few more minutes before I realised that the creature wasn’t angry because of the pearls; it was angry because I was making it angry. In *Schema*, we are quite literally *Playing with Feelings*.⁶ What usually commands spatial navigation amounts to emotional manipulation. Whenever I press a directional button, I am not telling it where to go; I am changing how it feels – from aroused to placid on one scale, from extroverted to introverted on the other – and this psychic disposition dictates how the creature engages with its environment: anxiously, aggressively, inquisitively. To play with any intention, therefore, one must become ‘attuned’ to three representations, or schemas, of affect that map onto the AI state machine:⁷ a facial diagram that recalls *Tron*, a graph where a dynamic conglomerate

3 Agata Waszkiewicz and Martyna Bakun, ‘Towards the Aesthetics of Cozy Video Games’, *Journal of Gaming & Virtual Worlds*, 12.3 (2020), 225–40.

4 Technical terms discussed with the artist.

5 Ian Bryce Jones, ‘Do the Locomotion: Obstinate Avatars, Dehiscent Performances, and the Rise of the Comedic Video Game’, *The Velvet Light Trap*, 77 (2016), 86–99 (p. 89).

6 Aubrey Anable, *Playing with Feelings: Video Games and Affect* (Minneapolis: University of Minnesota Press, 2018).

7 James Ash, ‘Technologies of Captivation: Videogames and the Attunement of Affect’, *Body & Society*, 19.1 (2013), 27–51.

of bubbles marks the emotional coordinate, and the creature's own animated expressions. With the rise of 'AI companions' like *Replika*, we're used to the prospect of machines learning to feel like us. But in this case, we must learn to feel like a machine.

What if, instead of getting AI to think like us, we tried to think like an AI? This is a question that animates Freudenheim's oeuvre, and for Ian Cheng, another artist who employs game engines to create AI-driven works, it is precisely the foreign nature of AI agents that makes them agents of change. Confronted with a pattern of thought so distant from ours that it challenges our comprehension, we overcome the disparity through intellectual resistance training. That's why Cheng considers art a 'neurological gym'⁸ – a mental training environment that can transform how we think. Freudenheim intended *Schema* to be an exercise in distributed cognition because, in many ways, contemporary artificial intelligence is a swarm intelligence.⁹ All local inputs are mediated by a Twitch chat interface that enables other players to weigh in and watch remotely. I wasn't alone after all. Truly, the emotional spectra were a collective achievement. A sense of relief: I'm not entirely responsible for aggravating the avatar.

Posthuman Passivity?

We can consider this attempt to unsettle human habits of thought a form of posthumanism. Posthumanism characterizes a range of approaches critical of assumptions about the human's autonomy, exceptionality, and duality in favour of a 'philosophy of mediation' that foregrounds the matrix of relations that conditions reality.¹⁰ Over the past few decades, scholars working in various fields have attempted to reconceptualize faculties typically attributed to individual humans – action, perception, creativity, and so on – as, instead, emergent properties of sys-

8 Evers and Cheng, 'In Conversation with Ian Cheng', p. 115.

9 William Morgan and Will Freudenheim, *Interplay* (Munich: Caldo Worldwide, 2024).

10 Francesca Ferrando, *Philosophical Posthumanism* (London: Bloomsbury, 2020), p. 22.

tems that enfold the ‘non-human’.¹¹ It’s no surprise, therefore, that game studies has started following suit,¹² especially when it comes to challenging one of the field’s most well-worn concepts: agency.¹³

Psychologists have long understood play to be the joy ‘of being a cause’,¹⁴ and the fact that the player must do something to progress a video game struck early game scholars as a defining feature of the new medium.¹⁵ From this perspective, video games that involve more watching than doing mark a break from tradition – one researchers have rendered in posthuman fashion. In *Playing at a Distance*, Sonia Fizek contends that games eliciting ‘little direct or close action’ require new forms of analysis that don’t hinge on ‘concepts such as participation, interaction, ergodicity, and human agency’.¹⁶ Along these lines, Bo Ruberg argues that Brent Watanabe’s *San Andreas Deer Cam*, which entails watching a computer-controlled deer roam *Grand Theft Auto V*, is a ‘work of queer posthumanism’.¹⁷ Similarly, Ian

11 Erich Hörl, ed., *General Ecology: The New Ecological Paradigm*, trans. by Nils F. Schott (New York: Bloomsbury, 2017).

12 E.g., Conor McKeown, ‘Playing with Materiality: An Agential-Realist Reading of Sethbling’s Super Mario World Code-Injection’, *Information, Communication and Society*, 21.9 (2018), 1234–45; Frans Mäyrä, ‘The Player as a Hybrid: Agency in Digital Game Cultures’, *GAME: The Italian Journal of Game Studies*, 8 (2019) <https://www.gamejournal.it/the-player-as-a-hybrid-agency-in-digital-game-cultures/>; Paolo Ruffino, ‘Nonhuman Games: Playing in the Post-Anthropocene’, in *Death, Culture and Leisure: Playing Dead*, ed. by M. Coward-Gibbs (Bingley: Emerald, 2020), pp. 11–25; Justyna Janik, ‘Intra-Acting Bio-Object: A Post-Human Approach to the Player-Game Relation’, *Journal of Gaming & Virtual Worlds*, 13.1 (2021), 21–39.

13 Aleena Chia and Paolo Ruffino, ‘Politicizing Agency in Digital Play After Humanism’, *Convergence*, 28.2 (2022), 309–19.

14 Karl Groos, *The Play of Man* (New York: D. Appleton & Company, 1901), p. 44.

15 Espen Aarseth, *Cybertext: Perspectives on Ergodic Literature* (Baltimore: Johns Hopkins University Press, 1997); Janet H. Murray, *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (New York: Free Press, 1997); Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006).

16 Sonia Fizek, *Playing at a Distance* (Cambridge, Massachusetts: MIT Press, 2022), pp. x–xi.

17 Bo Ruberg, ‘After Agency: The Queer Posthumanism of Video Games That Cannot Be Played’, *Convergence*, 28.2 (2022), 413–30 (p. 413). <https://doi.org/10.1177/13548565221094257>.

Bogost interprets David O'Reilly's minimally interactive *Mountain*, in which one mostly looks at a mountain, as an alienating experience of 'the chasm between your own subjectivity and the unfathomable experience of something else'.¹⁸ In both cases, the human player is no longer centre stage. Some form of artifice occupies the starring role – a phenomenon that, according to Fizek, reveals play to be 'neither a human nor a nonhuman act'. Instead, it 'emerges out of complex material, human and nonhuman... entanglements'.¹⁹

Is it truly posthuman to watch a video game? Despite eliciting little to no interaction from us, are these simulated spectacles not very much for us? And don't we already have a name for non-interactive, moving images that play themselves? Arguments about the posthuman nature of passive play veer close to claiming that it's radical to watch a movie – and perhaps it is. But in emphasizing the break from video game tradition, we neglect the instructive continuities between self-playing games and cinema, continuities that, I contend, help clarify why passive spectatorship can take us outside ourselves. Instead of treating works like *Schema* as a new form of gaming, therefore, this essay starts from the premise that self-playing games are fruitfully conceived of as forms of 'post-cinema'.²⁰

Our age seems to be 'post-everything'.²¹ Akin to 'turns' and 'paradigm shifts', scholars typically add the 'post-' prefix – post-modern, postcolonial, posthuman, and so on – to make sense of change without positing a clean break, and to assert distance from ancestors without losing the genealogical thread.²² Post-cinema is likewise employed to describe twenty-first century moving-

18 Ian Bogost, 'You Are Mountain', *The Atlantic*, 17 July 2014.

19 Fizek, *Playing at a Distance*, pp. xvi–xvii.

20 Steven Shaviro, *Post-Cinematic Affect* (Winchester, UK: Zero Books, 2010); Shane Denson and Julia Leyda, eds., *Post-Cinema: Theorizing 21st-Century Film* (Falmers, UK: REFRAAME Books, 2016); Dominique Chateau and José Moure, *Post-Cinema: Cinema in the Post-Art Era* (Amsterdam: Amsterdam University Press, 2020).

21 Herman Paul and Adriaan van Veldhuizen, eds., *Post-Everything: An Intellectual History of Post-Concepts* (Manchester: Manchester University Press, 2021).

22 Kwame Anthony Appiah, 'Is the Post- in Postmodernism the Post- in Postcolonial?', *Critical Inquiry*, 17.2 (1991), 336–57 (p. 342).

image media that, while meaningfully distinct from traditional, twentieth-century cinema, perpetuate their forebears' traits.²³ Economic and technological developments underpin these aesthetic continuities. If the 'cinematic mode of production' named the last century's predominant means of extracting value from entertainment,²⁴ then post-cinema captures the media machinations of contemporary capitalism.²⁵

Let's be clear. One could treat all video games as post-cinematic media,²⁶ and plenty of game researchers have. But where others have focused on cutscenes,²⁷ cameras,²⁸ and various other stylistic transactions between films and games,²⁹ this essay focuses on the passivity of what I have elsewhere called *simema*: 'When the player becomes a spectator, the NPC... an actor, the video game... a movie, and the cinema... a ceaseless simulation'.³⁰ Unlike those films recorded in game engines known as machinima (machine +

23 Denson and Leyda, *Post-Cinema: Theorizing 21st-Century Film*, p. 2.

24 Jonathan Beller, *The Cinematic Mode of Production: Attention Economy and the Society of the Spectacle* (Hanover, NH: Dartmouth College Press, 2006).

25 Shaviro, *Post-Cinematic Affect*.

26 Shane Denson, *Discorrelated Images* (Durham: Duke University Press, 2020), pp. 10–14, 214–223.

27 Rune Klevjer, 'In Defense of Cutscenes', in *Computer Games and Digital Cultures Conference Proceedings*, ed. by Frans Mäyrä (Tampere: Tampere University Press, 2002), pp. 191–202; Rune Klevjer, 'Cut-Scenes', in *The Routledge Companion to Video Game Studies*, ed. by Mark J. P. Wolf and Bernard Perron (New York: Routledge, 2023), pp. 378–385.

28 Will Brooker, 'Camera-Eye, CG-Eye: Videogames and the "Cinematic"', *Cinema Journal*, 48.3 (2009), 122–28; Selim Krichane, 'When Seeing Is Playing: The History of the Videogame Camera', *Game Studies*, 21.2 (2021).

29 Geoff King and Tanya Krzywinska, eds., *Screenplay: Cinema/Videogames/Interfaces* (London: Wallflower Press, 2002); Gretchen Papazian and Joseph Michael Sommers, eds., *Game On, Hollywood!: Essays on the Intersection of Video Games and Cinema* (Jefferson, NC: McFarland, 2013); Selim Krichane, 'Jeux Vidéo et Cinéma', in *Introduction aux Théories des Jeux Vidéo*, ed. by Sébastien Genvo and Thomas Philippette (Liège: Presses universitaires de Liège, 2023).

30 Doug Stark, 'Simema: The Aesthetics of Autoplay in Freudenheim's Schema', in *Interplay*, Will Freudenheim and William Morgan (Munich: Caldo Worldwide, 2024).

cinema),³¹ simema (simulation + cinema) refers to works primarily performed live.³²

Do we need another neologism? What's wrong with 'zero-player game',³³ 'self-playing game',³⁴ 'autoplay',³⁵ or 'live simulation?'³⁶ I begin by explaining the stakes of simema, which is not intended to replace these terms, but to place them in conversation with discourse on a medium we seem to have left behind. On the contrary, I argue that film theorists have much to say about being passively subjected to the 'alien' patterns of AI because some conceived of the cinematograph as, itself, a form of artificial intelligence.³⁷ Cheng's *Emissaries*³⁸ and Freudenheim's *Schema* then serve as examples of video game-based, AI-driven, passively consumed artworks that, in turn, work on our brains. For Gilles Deleuze, both the promise and peril of cinema derive from its special relationship with the brain, and this essay attempts to update his theory for what we might think of as *brain engines*. But first, what does it mean for passivity to be radical?

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- 31 Henry Lowood and Michael Nitsche, eds., *The Machinima Reader* (Cambridge, Massachusetts: MIT Press, 2011); Jenna Ng, ed., *Understanding Machinima: Essays on Filmmaking in Virtual Worlds* (New York: Bloomsbury Publishing USA, 2013).
 - 32 Much like analogue, which became part of our vernacular in response to digital, the rise of live can only be understood in tension with recorded. Of course, recordings frequently mediate our access to performance art. It's important to note that the human intentionality the artist seeks to divest herself of by delegating creativity to an AI reasserts itself when she films and edits a documentary of the live simulation. Philip Auslander, *Liveness: Performance in a Mediatized Culture*, 2nd edn (New York: Routledge, 2023).
 - 33 Staffan Björk and Jesper Juul, 'Zero-Player Games or: What We Talk About When We Talk About Players', paper presented at the *Philosophy of Computer Games Conference* (Madrid, 2012).
 - 34 Sonia Fizek, 'Self-Playing Games: Rethinking the State of Digital Play', paper presented at the *Philosophy of Computer Games Conference* (2017).
 - 35 Sonia Fizek, 'Autoplay: Gaming in the Age of Automation', *Journal of Gaming & Virtual Worlds*, 10.3 (2018), 243–58.
 - 36 Evers and Cheng, 'In Conversation with Ian Cheng', p. 113.
 - 37 Luciana Parisi, 'The Alien Subject of AI', *Subjectivity*, 12.1 (2019), 27–48. <https://doi.org/10.1057/s41286-018-00064-3>.
 - 38 Ian Cheng, *Emissaries* (Digital art series) (2015–2017). <https://iancheng.com/emissaries>.

Radical Passivity, or Your Brain on Cinema

At the turn of the millennium, one could speak of ‘cinema envy’.³⁹ Video game scholars yearned to discuss their object in the same rigorous register film critics developed in the twentieth century. But today, it’s quite the opposite – the cinephile must fight to frame their foray into film as a felicitous enterprise in a world where new media predominate. Shane Denson and Julia Leyda contend that post-cinema provides an instructive alternative to new media, for it asks us to ‘think about the relation (rather than mere distinction) between older and newer media regimes’. They write:

Post-cinema is not just after cinema, and it is not in every respect ‘new’, at least not in the sense that new media is sometimes equated with digital media; instead, it is the collection of media, and the mediation of life forms, that ‘follows’ the broadly cinematic regime of the twentieth century – where ‘following’ can mean either to succeed something as an alternative or to ‘follow suit’ as a development or a response in kind.⁴⁰

Of course, this argument constitutes ‘a response in kind’, too – an attempt to preserve the relevance of film research. Post-cinema is as much a symptom as a diagnosis of our changing media landscape.

When claiming that film pertains to interactive media, it’s tempting to hang one’s hat on the notion that watching has always been active. Consider Bertolt Brecht. Although speaking of theatre, his work encouraged many to prize reflexivity: his ideal audience is akin to that of a boxing match, who, instead of passively observing the spectacle, adopt something of a critical stance, chatting amongst themselves about how the boxer should’ve bobbed, not weaved.⁴¹ Such ‘active audiences’ have

39 Eric Zimmerman, ‘Do Independent Games Exist?’, in *Game On: The History and Culture of Videogames*, ed. by Lucien King (New York: Universe Publishing, 2002), pp. 120–29.

40 Denson and Leyda, *Post-Cinema*, p. 2.

41 John Willett, ed., *Brecht on Theatre: The Development of an Aesthetic*, revised edn (London: Eyre Methuen Ltd., 1978), p. 8.

often been figured as antidotes to cinematic subjection, which mid- to late-twentieth-century film critics were very suspicious of. Semiotic, psychoanalytic, and Marxist approaches not only presumed but condemned ‘the passivity of the spectator’ as a vulnerable vector for feelings that ultimately produce an ‘ideological effect’.⁴²

Over the past few decades, however, one is more likely to think of the dizzying number of ‘turns’ to affect,⁴³ which, in the context of film theory, often stress that what appears inert is eminently engaged, our affects always active even when we’re sedentary.⁴⁴ Allowing us to reclaim the force of feeling as our own, the success of affect theory was due in no small part to the degree it ‘was distinguished from passive spectatorship and, thereby, distanced from the spectre of ideology’.⁴⁵ Bubbling beneath such agentive assertions is, I’d hazard, a deep desire to render watching political, or at least ethical, for without a sense of participation, of democracy, how can the liberal psyche claim that cinema is good?

And yet, dressing cinema up in active wear seems to cover one of its most striking features. There’s something unique about setting oneself in front of a screen, suspending animation, and submitting to the moving image. Instead of trying to rescue the reel via the activity of affect, I want to make recourse to another discourse, one that, on the contrary, doubles down on the power of passivity. We could go back to Hugo Münsterberg, arguably the first film theorist, who conceptualized cinema as a ‘photoplay’, a

42 David Bordwell, *Narration in the Fiction Film* (London: Routledge, 2013), p. 29.

43 Ruth Leys, ‘The Turn to Affect: A Critique’, *Critical Inquiry*, 37.3 (2011), 434–72; *The Ascent of Affect: Genealogy and Critique* (Chicago: University of Chicago Press, 2017).

44 Laura U. Marks, *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses* (Durham: Duke University Press, 2000); Vivian Sobchack, *Carnal Thoughts: Embodiment and Moving Image Culture* (Berkeley: University of California Press, 2004); Eugenie Brinkema, *The Forms of the Affects* (Durham: Duke University Press, 2014); *Life-Destroying Diagrams* (Durham: Duke University Press, 2022); Shane Denson, *Post-Cinematic Bodies* (Durham: Duke University Press, 2023); Shaviro, *Post-Cinematic Affect*.

45 Gregory Flaxman, ‘Once More, with Feeling: Cinema and Cinesthesia’, *SubStance*, 45.3 (2016), 174–189 (p. 185). <https://doi.org/10.1353/sub.2016.0028>.

kind of automatic theatre that hijacks our attention, forcing us to look at and connect particular images.⁴⁶ Or we might invoke filmmaker Jean Epstein who characterised cinema as an 'intellectual robot'.⁴⁷ But I'm going to focus on Deleuze's work on film, which depicts cinema as a 'spiritual automaton' that, by entering into composition with our own mental processes, can make us think anew.⁴⁸

The rhizomatic roots of Deleuze's thesis reach back to the seventeenth century. In the aftermath of René Descartes, classical philosophy was decidedly devoted to the dualism of mind and body, *res cogitans* and *res extensa*. For Baruch Spinoza and Gottfried Wilhelm Leibniz, this distinction between material bodies and immaterial ideas remained irreducible, and yet, both philosophers insist these discrete domains necessarily run 'parallel'.⁴⁹ The respective autonomy of mind and body does not prevent but rather permits the correspondence of mind and matter, thoughts and things, which are, in essence, both separate and inseparable.

Spinoza and Leibniz consider God the prime mover: The series of material bodies in space derives from a divine mechanism. But for our more secular purposes, both philosophers suggest that the series of immaterial ideas expresses a corresponding logic. The movement of bodies engenders an automatism of thought *qua* spirit. Thus, Spinoza introduces 'spiritual automaton' to name the procedure whereby the mind unspools a sequence of ideas that, while autonomous, proceed in lockstep with materiality. In Leibniz's terms, this spiritual automaton amounts to a 'law of

46 Hugo Münsterberg, *The Photoplay: A Psychological Study* (1916; repr. New York: Routledge, 2016).

47 Jean Epstein, *The Intelligence of a Machine*, trans. by Christophe Wall-Romana (1946; repr. Minneapolis: University of Minnesota Press, 2012), p. 311.

48 Gilles Deleuze, *Cinema 2: The Time-Image*, trans. by Hugh Tomlinson and Robert Galeta (Minneapolis: University of Minnesota Press, 1989), pp. 148–73.

49 Gilles Deleuze, *Spinoza: Practical Philosophy*, trans. by Robert Hurley (San Francisco: City Lights, 2001), pp. 81–3; Gottfried Wilhelm Leibniz, 'Reflections on the Doctrine of a Universal Spirit', in *Philosophical Papers and Letters*, 2nd edn, ed. by Leroy E. Loemker (Dordrecht, Netherlands: D. Reidel Publishing, 1969), pp. 554–60.

program', one implanted so deep in the soul that it's practically unconscious.⁵⁰

What does this have to do with cinema? Pace Spinoza, moving images do not prompt a series of ideas we can deduce back to God, nor do they, pace Leibniz, induce a succession of modifications to the soul that express a preordained harmony. When Deleuze turns to these figures, it is the correspondence of material operations and immaterial ideas that explains why 'cinema not only puts movement in the image, it also puts movement in the mind'.⁵¹ The material unfolding of the cinematograph induces a parallel automatism of the spectator's thoughts that effectively displaces her organic brain with an artificial brain.

This theory seems less highfalutin when we remember how film produces the illusion of motion – by presenting a sequence of static, pre-recorded images at a standard frame rate, typically at 24 frames per second (fps). The brain's persistence of vision retains each image momentarily, while what's known as the phi phenomenon interprets the incremental changes between frames as smooth, continuous movement. This seamless playback convinces the spectator's mind that they are watching real motion, even though each frame is a separate, frozen slice of time. Movies produced by a game engine like Unity work on our brains in the same way. Graphics processing units (GPU) render frames dynamically – constantly calculating the positions, movements, lighting, textures, and physics of every object in the scene – at around 60 fps and then display on electronic screens or convert into light patterns for projection, ideally at an equivalent refresh rate (Hz). The human brain merges these discrete frames into a cohesive moving image. Despite their technical differences, therefore, both celluloid and digital images exploit the viewer's perceptual limitations to simulate motion, effectively hijacking our brains.

50 Gregory Flaxman, 'This Is Your Brain on Cinema: Antonin Artaud', in *Film as Philosophy*, ed. by Bernd Herzogenrath (Minneapolis: University of Minnesota Press, 2017), pp. 83–104.

51 Gilles Deleuze, 'The Brain Is the Screen: An Interview with Gilles Deleuze', trans. by Marie Therese Guirgis, in *The Brain Is the Screen: Deleuze and the Philosophy of Cinema*, ed. by Gregory Flaxman (Minneapolis: University of Minnesota Press, 2000), pp. 365–73 (p. 366).

If this is starting to sound like narcosis, then it'll come as no surprise that Deleuze invokes possession, delusion, vision, hypnotism, trance, and hallucination to reckon with how films take hold of the brain. In each case, we are animated by another logic, our brains and bodies commandeered by a force that is not our own. And just as brain scans represent but fail to capture the experience of being on drugs, there is something ineffable about being on cinema, if you will, that casts human autonomy into question. 'What do I think?' becomes 'What is this thing that thinks inside me?' *Cogito ergo sum* rings hollow.

Our engagement with the world – and, moreover, a virtual world – is typically defined by our ability to act in it. The 'spiritual automaton' of cinema interrupts this 'sensory-motor' logic – monkey see, monkey do – with a logic of inaction: monkey see, monkey contemplate. In other words, it is by suspending our everyday selves, our habitual associations between words and things, images and concepts, perceptions and actions, that passive spectatorship allows an alternate, cinematic pattern to inhabit our minds. Faced with 'Hitler and Hollywood, Hollywood and Hitler'. Deleuze couldn't avoid the fact that 'the spiritual automaton became fascist'. Nonetheless, he remained committed to the 'possibility of thinking in cinema through cinema', to the force of its 'neuro-physiological vibrations', to the image's potential to 'produce a shock, a nerve-wave which gives rise to thought'.⁵²

Instead of condemning passivity, therefore, we should consider it ambivalent. Both cinema's promise of revelation and peril of indoctrination take *impuissance* or powerlessness as a predicate. Only then can the moving image make 'the brain its streaming device'. We may later reflect on the experience, but in the moment, emphasises Gregory Flaxman, 'we see, hear, feel, and finally think on the basis of an alien intelligence', a 'prosthetic brain' immanent to our own. Insofar as this fundamentally foreign force challenges our habits, inspiring us to think differently, we may, for better or worse, speak of a 'radical passivity'.⁵³

52 Deleuze, *Cinema 2*, p. 165.

53 Flaxman, 'Once More, with Feeling', p. 186.

Brain Engines: Cheng's Emissaries

Having majored in both Cognitive Science and Art Practice at UC Berkeley, Ian Cheng is deeply concerned with the brain. A Little Hans for our age, he recounts that watching a horse on YouTube inspired him to make AI-driven art. As Cheng says:

This is a truly alive moment for me because we see for the first time, by chance, how a horse's behaviour and habits suddenly encounter (an exercise) ball's material behaviour and physics. When I watch this encounter, I feel like I am seeing the exact moment of an organism behaviourally growing in real time. It's traumatic because certain sacred behaviours and habits start to break. But also exhilarating and miraculous, because nature's software is mutating before you and not taking a hundred million years to enact that change. I like to think the horse's brain rewired a bit after that episode.⁵⁴

We can think of Cheng's work as an attempt to transmit, not just represent, this moment of behavioural breakage, of brain rewiring. On the one hand, he stages scenes of evolution, where we can see this development happening in real-time, and on the other, he puts the audience through their paces, stimulating a concomitant process of transformation.

Cheng employs the game engine Unity to actualize a world with emergent properties. Indeed, he disavows the director, favouring a model of artistic practice that involves taking on various 'masks', each embodying different dimensions of the creative process.⁵⁵ These roles cohere into something more akin to a team of gardeners than designers, 'nurturing growth without dictating direction'.⁵⁶ Instead of creating a virtual environment with an overarching order in mind, therefore, Cheng works from the bottom-up: Fragments of C# shape the behaviour of individual objects; a set of laws programmed separately modify the overall physics. This huge accumulation of AI agents and virtual forces

54 Cheng, 'In Conversation', p. 108.

55 Ian Cheng, *Emissaries: Guide to Worlding* (New York: Metis Suns, 2018).

56 Rob King, 'Emissary of Another Intelligence: Ian Cheng and the Art of AI', *JCMS: Journal of Cinema and Media Studies*, 64.1 (2024), 183–88 (p. 185).

reacting to, interacting with, and learning from one another produces a performance as indeterminate for the artist as it is for the audience.

We could interpret many of Cheng's works like *Entropy Wrangler*, *BOB (Bag of Beliefs)*, and the *Emissaries Trilogy* as 'video games that learn, stupidly, to play (themselves)', but he seems to prefer the term live simulation.⁵⁷ From crossing a road as a child to conducting a mock job interview as an adult, and from testing a car for aerodynamics to training an athlete at altitude, Cheng understands simulation to be a form of 'drafting reality' where we play out the future in order to shape it. If simulation is this 'private game we devise when the aliveness of a situation is too complex to really know', then

live simulation is playing this game in public and not letting it end when the game gets good. Darwin said the greatest live simulation is nature herself, who incessantly tries and fails aloud, never stopping at perfection. But nature is often too fast, too slow, too big, too small, for us. We desire a live simulation at scale with human spacetime, but unending in its variety and blind to our barometers of quality. A live simulation that we can feel, but that does not give a fig for us.⁵⁸

Cheng is no stranger to the work of James P. Carse. Whereas simulation constitutes what the philosopher terms a 'finite game' – which is played to achieve a pre-established goal, like performing well in an interview – the live simulation constitutes an 'infinite game', where there is no end but 'to keep everyone in play'.⁵⁹ Akin to Darwin's nature, the live simulation has no grand plan; its only goal is to perpetuate itself.

To reiterate, Fizek and others have argued that such experiments in game design decentralise the human. But why does 'playing at a distance' lend itself to inhabiting a posthuman point of view?⁶⁰ Is it as simple as frustrating what we expect to do with

57 Cheng, 'In Conversation', p. 111.

58 *Ibid.*, pp. 113–14.

59 James P. Carse, *Finite and Infinite Games: A Vision of Life as Play and Possibility* (New York: Ballantine Books, 1987), p. 8.

60 Fizek, *Playing at a Distance*.

a video game, namely something? Regarding the final episode of Cheng's trilogy, *Emissary Sunsets the Self*, Denson makes an important clarification. The experience of being 'sidelined and strangely disembodied' stems not so much from the negation of player control as the work's liminal status. Without the 'interactive potential' of what seems to be a video game, it'd just be an animation, and without the subversion of that potential, it may as well be *The Sims*. The tension between these two poles of the digital image leaves us suspended in a peculiar place, somewhere between activity and passivity. Hence the sense of dislocation: We don't know what we're supposed to be, player or spectator.⁶¹

And yet, unlike my first encounter with *Schema*, I was under no illusion that I was supposed to do something with Cheng's *Emissaries* when I saw it at the MoMA PSi over the course of the summer 2017. Like so many other gallery installations, it was clearly a set of projections, and if I hadn't adhered to the techniques of the observer, the security guard certainly would've enforced them. Surely there's a point at which we know all too well when a game engine-driven work will involve more spectating than playing? And at that point, there is no interactive expectation to subvert; we're reconciled to watching. This essay proposes that self-playing games or live simulations are meaningfully conceptualized as simema because they reprise the spectatorial submission that grants the moving image its power over us. My contention is that this passivity is a necessary, but not sufficient, condition for accommodating new (maybe posthuman) images of the world.

The primary image *Emissaries* impresses upon our brains is of cognition itself. *Emissary in the Squat of Gods* depicts a primitive group negotiating a harsh, volcanic environment. Reacting to rather than reflecting on stimuli, their actions dramatize what Julian Jaynes calls the 'bicameral mind': when cognitive functions were divided between one part of the brain that 'spoke' (often perceived as the voice of a god) and another part that listened and obeyed.⁶² This internal communication lacked introspective

61 Shane Denson, 'From Sublime Awe to Abject Cringe: On the Embodied Processing of AI Art', *Journal of Visual Culture*, 22.2 (2023), 146–75 (156–58) <https://doi.org/10.1177/14704129231194136>.

62 Julian Jaynes, *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Boston: Houghton Mifflin, 1976).

consciousness and was guided by auditory hallucinations attributed to deities. The emissary in this episode represents the transitional figure, beginning to question and interpret these commands, symbolizing the emergence of individual consciousness from a bicameral state.

On the surface, *Emissary Forks at Perfection* is about another phase of human evolution, circa 2013, when we started saying wow, such, and very far too much. Our emissary is a highly intelligent Shiba Inu tasked with keeping ‘a revived human talking about his memories before he dies. This requires staying close and batting away the other failed Shiba forks who distract the human.’⁶³ The mission is supposed to offer a corrective to a society that’s become so rigid in its values that it’s incapable of dealing with a new disruptive force. Such forces, argues Jaynes, led to the breakdown of the bicameral mind, for unquestioning obedience to divine commands became unsustainable. Doge, of all figures, embodies the emergence of consciousness as an adaptive tool for solving problems.

Because consciousness is learned and culturally scaffolded, Jaynes speculates that it could transcend biological constraints. The final instalment, *Emissary Sunsets the Self*, presents a future world where artificial intelligence and human consciousness intersect. Tired of its own disembodied existence, MotherAI experiments with taking on a material form, sending out a yellow liquid – this episode’s emissary – into the biotic realm to take possession of the living. It’s easy to interpret this work as post-human art: Not only are we, quite literally, after the human, but this synthetic image of cognition, this ‘sunset of the self’, reflects distributed understandings of intelligence that don’t figure some transcendental subject as the hermetic seat of agency; cognition is explicitly a collective achievement of brain, body, and environment.

What I find most striking, however, is that each episode is equally about being possessed – by deities, by norms, and, ultimately, by AI. Recalling what Deleuze considers the fundamental impotence of thought (*impuissance*), there always seems to be

63 Cheng quoted in Jayce Clayton, ‘One Take: Ian Cheng’s *Emissaries*’, *Frieze*, 22 April 2017.

an ulterior logic operative within us, even if it's us who made the other up. Indeed, cognitive scientists like Thomas Metzinger propose that our minds rely on fabricated simulations all the time. Consciousness creates a mental model of itself and its relations to others. These models, and only these models, allow us to discern an I. To those who believe in a true, unitary self, Metzinger's argument amounts to saying that 'nobody ever was or had a self', and from this perspective, any attempt to cleanly separate representation and reality is futile: an element of simulation inflects every phase of cognition; intelligence is always a little artificial.⁶⁴

Placing Metzinger in conversation with Wilfred Sellars, Luciana Parisi contends that there are, nevertheless, at least two orders of reality at play in a simulation. She writes: 'The scientific image – what simulations are materially constituted by – and the manifest image – the conceptual framework by which the material constitution can be reflected upon, evaluated, (and) reasoned according to certain rules'.⁶⁵

If our mental simulations are parallel processed with the material operation of the brain, then it's not much of a leap to understand computer-driven simulations in the same way. After all, what we see of a simulation likewise results from an algorithmic rule set – the AI's own conceptual framework – that works in tandem with the material process of computation.⁶⁶ What happens when the simulations of this new 'prosthetic brain' become our own?⁶⁷

After Bernard Stiegler, we might say that there's no such thing as an image without an object and, by extension, a mental model without an external referent.⁶⁸ Our sense of the brain co-evolves with externalizations of it. The discourse on 'neural networks' provides a case in point, encouraging many to understand cog-

64 Thomas Metzinger, *Being No One: The Self-Model Theory of Subjectivity* (Cambridge, Massachusetts: MIT Press, 2004), pp. 107–305.

65 Luciana Parisi, 'Simulations', in *Live Simulations*, ed. by Elodie Evers, Gregor Jansen, Irina Raskin, and Ian Cheng (Leipzig: Spector Books, 2015), pp. 125–33 (p. 133).

66 *Ibid.*, p. 129.

67 Flaxman, 'Once More, with Feeling', p. 186.

68 Bernard Stiegler, 'The Discrete Image', in *Echographies of Television: Filmed Interviews*, by Jacques Derrida and Bernard Stiegler, trans. by Jennifer Bajorek (London: Polity, 2002), pp. 145–63.

nition as, itself, computational.⁶⁹ But mind modelling is not the preserve of scientific inquiry. According to Patricia Pisters, contemporary cinema is constantly communicating through ‘neuro-images.’ Viewers no longer look through someone’s eyes; they move through a mental landscape.⁷⁰ Take *Inception*, Christopher Nolan’s magisterial *Paprika* rip-off. As the characters infiltrate the subconscious of their targets, we journey through a series of brain worlds. Our point of view isn’t really a view at all; it’s more like a *point of mind*. The same could be said of James Cameron’s *Avatar*, where a remotely controlled human brain inhabits an alien body. Again, the images we see are not a representation of what a human perceives with its eyes. We watch consciousness in action – a mental simulation in film form.

Consciousness in action is precisely what *Emissaries* renders, and it should be clear why such game engine-based works are uniquely capable of capturing cognition. Unlike static frames stored on physical media, AI-driven works generate each frame in real-time, meaning that the sequence is not pre-determined; it’s continuously created – just like our brains. These synthetic images provide a ‘processual analogy’ for the genesis of thought that helps us grasp the logic of cognition.⁷¹

But it’s not all new. The passive premise of cinema endures. Submitting to the moving image, we, too, are possessed by an AI, a spiritual (automaton) guide that leads our minds away from Cartesian models of fixed rationality to arrive at a more systemic, ecological understanding of cognition. It is in this sense that we might think of *Emissaries* itself as the ‘emissary of another intelligence’,⁷² and, moreover, the game engine as a *brain engine* – the latest edition of that prosthetic organ we call cinema. Of course, this is not to claim that every viewer who walks by is entranced by the stochastic spectacle. In the gallery, passivity is

69 Ranjodh Singh Dhaliwal, Theo Lepage-Richer, and Lucy Suchman, *Neural Networks* (Berlin: Meson Press, 2024).

70 Patricia Pisters, *The Neuro-Image: A Deleuzian Film-Philosophy of Digital Screen Culture* (Stanford: Stanford University Press, 2012).

71 Jean-Hugues Barthélémy, ‘Glossary: Fifty Key Terms in the Works of Gilbert Simondon’, in *Gilbert Simondon: Being and Technology*, ed. by Arne de Boever et al. (Edinburgh: Edinburgh University Press, 2012), pp. 204–5.

72 King, ‘Emissary of Another Intelligence’, p. 188.

an active decision, a wilful divestment of will, a choice to enter the neurological gym. You can lead a horse to an exercise ball, but you can't make it think.

Conclusion: Accommodating An Alien Schema

In 1958, mathematician Seymour Papert travelled to Geneva to study under the eminent play theorist Jean Piaget. When Papert returned to MIT, he used Piaget's insights into child development to create digital learning environments called 'microworlds'.⁷³ The idea was simple: As Piaget argued, children make sense of the world through play, so why not teach math and physics the same way? The issue with scientific concepts is that they often appear abstract, but Papert believed computer simulations could make them concrete – virtual objects we could manipulate, experiment with, and ultimately internalize.

At the heart of Piaget's theory are two processes: assimilation and accommodation. Assimilation occurs when a child fits new information into their existing mental structures. Accommodation follows when those structures transform to incorporate the new information.⁷⁴ Let's say a child knows that humans control their bodies. When she sees a tree moving, she might assume it waves its branches like people wave their arms. This is assimilation. Learning about the wind confounds such assumptions. If integrating the notion of external causality ends up transforming the child's cognitive framework, she undergoes accommodation.

Inspired by these ideas, Will Freudenheim created *Schema*, which we can interpret as a game that asks us to accommodate a posthuman perspective. Unlike simulations that strive for realism, *Schema* embodies what Noah Wardrip-Fruin sees as the future of game design: 'We aren't finding greater authorial power in closer approximations of everyday reality;' 'we're finding it in models that are deliberately artificial'. That's how com-

73 Evan Donahue, 'All the Microworld's a Stage: Realism in Interactive Fiction and Artificial Intelligence', *American Literature*, 95.2 (2023), 229–54.

74 Seymour Papert, 'You Can't Think About Thinking Without Thinking About Thinking About Something', *Contemporary Issues in Technology and Teacher Education*, 5.3/4 (2005), 366–367 (p. 366).

puters create ‘exciting new roles for us’.⁷⁵ Indeed, *Schema* doesn’t so much simulate human cognition – arguably what *Emissaries* achieves – as it does depict machine cognition in a form humans can grasp. The game’s ‘dehiscent performance’ encapsulates this goal.⁷⁶ Like a seed pod bursting open unpredictably, the *Schema* creature veers off in unexpected directions, emphasizing its independence from human intentionality, and the stubborn, perhaps even capricious nature of generative AI. Our exciting new role is somewhere in the wings.

The inescapable fact that we can only ever join *Schema* in progress heightens the feeling that we are transient strangers in a world that functions perfectly well without us. Our interventions are fleeting, their impact ephemeral. Freudenheim’s decision to stream *Schema* over Twitch underscores this alienation: though undoubtedly designed for human consumption, the game spends most of its time performing for an absent audience. And yet, this estrangement raises a disquieting question: what work doesn’t perform for no one? Consider the gallery security camera, which endures more hours of art in a single week than a human could witness in a lifetime.

If the collective intelligence underpinning *Schema* seems too subtle to detect during its active cycles, the nighttime symphony offers a moment of clarity. As the day unfolds, the creature methodically populates an inventory with pearls, its movements a synthesis of its own autonomy, player influence, and algorithmic mediation. When night falls, these pearls coalesce into a musical score. The resulting performance is authored by a diffuse network of agents: online users, in-person participants, machine algorithms, and the game-world itself. Each iteration is unique, an ephemeral composition that embodies *Schema*’s distributed creativity.

This collaborative dynamic echoes the *Musikalisches Würfelspiel*, or musical dice games, of eighteenth-century Germany. These aleatory techniques, which generated compositions through

75 Noah Wardrip-Fruin, *Expressive Processing: Digital Fictions, Computer Games, and Software Studies* (Cambridge, Massachusetts: MIT Press, 2009), pp. 18–9.

76 Jones, ‘Do the Locomotion’, p. 89.

mechanical operations, directly challenged Romantic ideals of the human as the singular wellspring of artistic creativity. As Roger Moseley explains, such practices suggested that mechanical systems were fully capable of producing the new.⁷⁷ Freudenheim's *Schema* not only revives this provocation but extends it, adapting it to the age of generative AI. Creativity becomes a collective act, redefining composition as an emergent interplay of forces, both human and nonhuman.

The reader may note an air of quantum critical theory in the foregoing paragraphs, and the game's oscillation between activity and passivity certainly seems to reflect Karen Barad's thesis that relations define their terms. Instead of debating whether we watch or play *Schema* – as if player and spectator are stable roles determined beforehand – it'd be more apt to say that we occupy both roles at different points. As *Schema* unfolds, our relationship with the creature changes, and the nature of that relationship determines our subject position: Sometimes, when the game is responsive, we are the player; other times, especially when night falls, we can only be the spectator, and even listener when we leave the room but still hear the tune. *Schema* explicitly places our status in flux, suggesting that the line between playing a video game and watching a video game may, in general, not be so clear-cut. For what is much video game play but watching a screen to see your cause take effect?

Certainly, there are moments in *Schema* that cater to the joy of 'being a cause', wherein action and effect align in a gratifying circuit. But by redistributing play across a more-than-human assemblage, *Schema* troubles the very notion of singular causality, fracturing it into a network of interwoven forces. In this dissolution of the individual agent, another kind of pleasure emerges – one less tied to mastery or control and more to a sense of being swept up in something larger, something irreducible to the human subject. One might even call it, albeit hesitantly in our secular age, grace.

Ultimately, Freudenheim's *Schema* exceeds the scholarly imperative to decentre the human, a gesture that has become

77 Roger Moseley, *Keys to Play: Music as a Ludic Medium from Apollo to Nintendo* (Berkeley: University of California Press, 2016), pp. 121–77.

nearly obligatory in today's academy. Rather than merely theorising this decentring, the game aestheticizes it. In *Schema*, play means colluding with an anthropotechnical entanglement – a system where the human and the nonhuman interpenetrate, their boundaries blurred. By giving form to this entanglement, *Schema* figures play as a site of philosophical engagement, making the forces and flows that constitute the posthuman condition palpable. This is not simply a critique of human agency but an invitation to reimagine the nature of participation as something distributed, collective, and profoundly ecological.

When compared to literature and cinema, writes Patrick Crogan, video games rarely ask us to accommodate new ideas because we're constantly assimilating events to the goal of mastery. Within this framework, the pleasure of gaming arises through repetition – a recursive engagement with history, reshaped and replayed to refine one's command over contingency. In this ergodic temporality, the event loses its singularity, its capacity to disrupt or surprise. Instead, it is reduced to a predictable aporia, a recognizable obstacle designed to be resolved through play.⁷⁸ We can understand the popularity of this experience as a 'cultural counterpart to neoliberalism', where docile bodies become voluntary servants, and the society of spectacle becomes the 'society of the game'.⁷⁹ Put differently, the problem with video games is not that we are rendered submissive, as critics feared of cinema; it's that we are too often in control.

In this context, passivity offers a counterpoint – but not one we should celebrate arbitrarily. While passive play quite literally decentres human agency when contrasted with other video games, we risk rendering posthumanism a somewhat myopic theoretical programme if we claim that watching a screen we expected to interact with counts as radical art – especially when inert spectatorship has been the norm for the past century. In light of film theory, I have argued that it'd be more apt to understand passivity as a necessary but not sufficient condition for

78 Patrick Crogan, *Gameplay Mode: War, Simulation, and Technoculture* (Minneapolis: University of Minnesota Press, 2011), p. 85.

79 Patrick Jagoda, *Experimental Games: Critique, Play, and Design in the Age of Gamification* (Chicago: University of Chicago Press, 2020), pp. 3–40.

encountering alterity. In other words, a game engine-based work has to do something compelling with its spectatorial submission; it has to make us accommodate something new.

For Deleuze, the best films are, in essence, accommodation machines. Following Henri Bergson, he proposes that we never perceive a thing in its entirety, ‘we perceive only what we are interested in perceiving, or rather what it is in our interest to perceive, by virtue of our economic interests, ideological beliefs, and psychological demands.’⁸⁰ But by entering into a circuit with the brain, cinema intervenes in this selective economy of perception, exposing us to the otherwise imperceptible, unsettling our habits of mind, and forcing the formation of a new cognitive schema.

If we extend Deleuze’s analysis into the post-cinematic domain – particularly the computer-driven spectacles I have called *simema* – we see an evolution of this transformative power. Beyond the hands-on, interactive play Papert considers central to learning, Deleuze suggests that the hands-off, radically passive form of mental play cinema sets in motion is no less fundamental to the adventure of ideas – an adventure that, in the case of *Emisaries* and *Schema*, ends up leaving anthropocentric coordinates behind. On the way, Cheng’s neurological metaphor falls apart. When it comes to the cinematic arts, you don’t hit the gym. The gym hits you.

Bibliography

- Aarseth, Espen, *Cybertext: Perspectives on Ergodic Literature* (Baltimore: Johns Hopkins University Press, 1997)
- Anable, Aubrey, *Playing with Feelings: Video Games and Affect* (Minneapolis: University of Minnesota Press, 2018)
- Appiah, Kwame Anthony, ‘Is the Post- in Postmodernism the Post- in Postcolonial?’, *Critical Inquiry*, 17.2 (1991), 336–57
- Ash, James, ‘Technologies of Captivation: Videogames and the Attunement of Affect’, *Body & Society*, 19.1 (2013), 27–51
- Auslander, Philip, *Liveness: Performance in a Mediatized Culture*, 2nd edn (New York: Routledge, 2023)

80 Deleuze, *Cinema 2*, p. 20.

- Barthélémy, Jean-Hugues, 'Glossary: Fifty Key Terms in the Works of Gilbert Simondon', in *Gilbert Simondon: Being and Technology*, ed. by Arne de Boever and others (Edinburgh: Edinburgh University Press, 2012), pp. 204–5
- Beller, Jonathan, *The Cinematic Mode of Production: Attention Economy and the Society of the Spectacle* (Hanover, New Hampshire: Dartmouth College Press, 2006)
- Björk, Staffan, and Jesper Juul, 'Zero-Player Games or: What We Talk About When We Talk About Players', paper presented at the Philosophy of Computer Games Conference, Madrid, 2012
- Bogost, Ian, 'You Are Mountain', *The Atlantic*, 17 July 2014 <https://www.theatlantic.com/entertainment/archive/2014/07/you-are-mountain/374543/> [accessed 26 December 2023]
- Bordwell, David, *Narration in the Fiction Film* (London: Routledge, 2013)
- Brinkema, Eugenie, *The Forms of the Affects* (Durham: Duke University Press, 2014)
- , *Life-Destroying Diagrams* (Durham: Duke University Press, 2022)
- Brooker, Will, 'Camera-Eye, CG-Eye: Videogames and the "Cinematic"', *Cinema Journal*, 48.3 (2009), 122–28
- Carse, James P., *Finite and Infinite Games: A Vision of Life as Play and Possibility* (New York: Ballantine Books, 1987)
- Chateau, Dominique, and José Moure, *Post-Cinema: Cinema in the Post-Art Era* (Amsterdam: Amsterdam University Press, 2020)
- Cheng, Ian, *Emissaries* (Digital art series, 2015–2017) <https://iancheng.com/emissaries> [accessed 26 December 2023]
- , *Emissaries: Guide to Worlding* (New York: Metis Suns, 2018)
- Chia, Aleena, and Paolo Ruffino, 'Politicizing Agency in Digital Play After Humanism', *Convergence*, 28.2 (2022), 309–19 <https://doi.org/10.1177/13548565221100135>
- Clayton, Jayce, 'One Take: Ian Cheng's Emissaries', *Frieze* (22 April 2017) <https://www.frieze.com/article/one-take-ian-chengs-emissaries> [accessed 4 January 2025]
- Croghan, Patrick, *Gameplay Mode: War, Simulation, and Technoculture* (Minneapolis: University of Minnesota Press, 2011)
- Deleuze, Gilles, *Cinema 2: The Time-Image*, trans. by Hugh Tomlinson and Robert Galeta (Minneapolis: University of Minnesota Press, 1989)
- , 'The Brain Is the Screen: An Interview with Gilles Deleuze', trans. by Marie Therese Guirgis, in *The Brain Is the Screen: Deleuze and the Philosophy of Cinema*, ed. by Gregory Flaxman (Minneapolis: University of Minnesota Press, 2000), pp. 365–73
- , *Spinoza: Practical Philosophy*, trans. by Robert Hurley (San Francisco: City Lights, 2001)
- Denson, Shane, *Discorrelated Images* (Durham: Duke University Press, 2020)

- , 'From Sublime Awe to Abject Cringe: On the Embodied Processing of AI Art', *Journal of Visual Culture*, 22.2 (2023), 146–75 <https://doi.org/10.1177/14704129231194136>
- , *Post-Cinematic Bodies* (Durham: Duke University Press, 2023)
- Denson, Shane, and Julia Leyda, eds., *Post-Cinema: Theorizing 21st-Century Film* (Falmers, UK: REFRAIME Books, 2016)
- Dhaliwal, Ranjodh Singh, Theo Lepage-Richer, and Lucy Suchman, *Neural Networks* (Berlin: Meson Press, 2024)
- Donahue, Evan, 'All the Microworld's a Stage: Realism in Interactive Fiction and Artificial Intelligence', *American Literature*, 95.2 (2023), 229–54
- Epstein, Jean, *The Intelligence of a Machine*, trans. by Christophe Wall-Romana (1946; repr. Minneapolis: University of Minnesota Press, 2012)
- Ferrando, Francesca, *Philosophical Posthumanism* (London: Bloomsbury, 2020)
- Fizek, Sonia, 'Self-Playing Games: Rethinking the State of Digital Play', paper presented at the Philosophy of Computer Games Conference, 2017
- , 'Autoplay: Gaming in the Age of Automation', *Journal of Gaming & Virtual Worlds*, 10.3 (2018), 243–58 https://doi.org/10.1386/jgvw.10.3.203_1
- , *Playing at a Distance. Borderlands of Video Game Aesthetics* (Cambridge, Massachusetts: MIT Press, 2022)
- Flaxman, Gregory, 'Once More, with Feeling: Cinema and Cinesthesia', *SubStance*, 45.3 (2016), 174–89 <https://doi.org/10.1353/sub.2016.0028>
- , 'This Is Your Brain on Cinema: Antonin Artaud', in *Film as Philosophy*, ed. by Bernd Herzogenrath (Minneapolis: University of Minnesota Press, 2017), pp. 83–104
- Freudenheim, Will, *Schema* (Video game, 2023) <https://caldo-worldwide.com/pages/will-freudenheim-schema-sub> [accessed 15 March 2025]
- Galloway, Alexander R., *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006)
- Groos, Karl, *The Play of Man* (New York: D. Appleton & Company, 1901)
- Hörl, Erich, ed., *General Ecology: The New Ecological Paradigm*, trans. by Nils F. Schott (New York: Bloomsbury, 2017)
- Ivers, Elodie, and Ian Cheng, 'In Conversation with Ian Cheng', in *Live Simulations*, ed. by Elodie Evers, Gregor Jansen, Irina Raskin, and Ian Cheng (Leipzig: Spector Books, 2015), pp. 102–15
- Jagoda, Patrick, *Experimental Games: Critique, Play, and Design in the Age of Gamification* (Chicago: University of Chicago Press, 2020)
- Janik, Justyna, 'Intra-Acting Bio-Object: A Post-Human Approach to the Player–Game Relation', *Journal of Gaming & Virtual Worlds*, 13.1 (2021), 21–39

- Jaynes, Julian, *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Boston: Houghton Mifflin, 1976)
- Jones, Ian Bryce, 'Do the Locomotion: Obstinate Avatars, Dehiscent Performances, and the Rise of the Comedic Video Game', *The Velvet Light Trap*, 77 (2016), 86–99
- King, Geoff, and Tanya Krzywinska, eds., *ScreenPlay: Cinema/Videogames/Interfaces* (London: Wallflower Press, 2002)
- King, Rob, 'Emissary of Another Intelligence: Ian Cheng and the Art of AI', *Journal of Cinema and Media Studies*, 64.1 (2024), 183–88
- Klevjer, Rune, 'In Defense of Cutscenes', in *Computer Games and Digital Cultures Conference Proceedings*, ed. by Frans Mäyrä (Tampere: Tampere University Press, 2002), pp. 191–202
- , 'Cut-Scenes', in *The Routledge Companion to Video Game Studies*, ed. by Mark J. P. Wolf and Bernard Perron (New York: Routledge, 2023), pp. 378–85
- Krichane, Selim, 'When Seeing Is Playing: The History of the Videogame Camera', *Game Studies*, 21.2 (2021)
- , 'Jeux Vidéo et Cinéma', in *Introduction aux Théories des Jeux Vidéo*, ed. by Sébastien Genvo and Thomas Philipette (Liège: Presses universitaires de Liège, 2023)
- Leibniz, Gottfried Wilhelm, 'Reflections on the Doctrine of a Universal Spirit', in *Philosophical Papers and Letters*, 2nd edn, ed. by Leroy E. Loemker (Dordrecht: D. Reidel Publishing, 1969), pp. 554–60
- Leyes, Ruth, 'The Turn to Affect: A Critique', *Critical Inquiry*, 37.3 (2011), 434–72
- , *The Ascent of Affect: Genealogy and Critique* (Chicago: University of Chicago Press, 2017)
- Lowood, Henry, and Michael Nitsche, eds., *The Machinima Reader* (Cambridge, Massachusetts: MIT Press, 2011)
- Marks, Laura U., *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses* (Durham: Duke University Press, 2000)
- Mäyrä, Frans, 'The Player as a Hybrid: Agency in Digital Game Cultures', *GAME: The Italian Journal of Game Studies*, 8 (2019) <https://www.gamejournal.it/the-player-as-a-hybrid-agency-in-digital-game-cultures/> [accessed 4 January 2025]
- McKeown, Conor, 'Playing with Materiality: An Agential-Realist Reading of Sethbling's Super Mario World Code-Injection', *Information, Communication and Society*, 21.9 (2018), 1234–45
- Metzinger, Thomas, *Being No One: The Self-Model Theory of Subjectivity* (Cambridge, Massachusetts: MIT Press, 2004)
- Morgan, William, and Will Freudenheim, *Interplay* (Munich: Caldo Worldwide, 2024)
- Moseley, Roger, *Keys to Play: Music as a Ludic Medium from Apollo to Nintendo* (Berkeley: University of California Press, 2016)

- Münsterberg, Hugo, *The Photoplay: A Psychological Study* (1916; repr. New York: Routledge, 2016)
- Murray, Janet H., *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (New York: Free Press, 1997)
- Ng, Jenna, ed., *Understanding Machinima: Essays on Filmmaking in Virtual Worlds* (New York: Bloomsbury Publishing USA, 2013)
- Papazian, Gretchen, and Joseph Michael Sommers, eds., *Game On, Hollywood!: Essays on the Intersection of Video Games and Cinema* (Jefferson, NC: McFarland, 2013)
- Papert, Seymour, 'You Can't Think About Thinking Without Thinking About Thinking About Something', *Contemporary Issues in Technology and Teacher Education*, 5.3/4 (2005), 366–67
- Parisi, Luciana, 'Simulations', in *Live Simulations*, ed. by Elodie Evers, Gregor Jansen, Irina Raskin, and Ian Cheng (Leipzig: Spector Books, 2015), pp. 125–33
- , 'The Alien Subject of AI', *Subjectivity*, 12.1 (2019), 27–48 <https://doi.org/10.1057/s41286-018-00064-3>
- Paul, Herman, and Adriaan van Veldhuizen, eds., *Post-Everything: An Intellectual History of Post-Concepts* (Manchester: Manchester University Press, 2021)
- Pisters, Patricia, *The Neuro-Image: A Deleuzian Film-Philosophy of Digital Screen Culture* (Stanford: Stanford University Press, 2012)
- Ruberg, Bo, 'After Agency: The Queer Posthumanism of Video Games That Cannot Be Played', *Convergence*, 28.2 (2022), 413–30 <https://doi.org/10.1177/135485652211094257>
- Ruffino, Paolo, 'Nonhuman Games: Playing in the Post-Anthropocene', in *Death, Culture and Leisure: Playing Dead*, ed. by M. Coward-Gibbs (Bingley: Emerald, 2020), pp. 11–25
- Shaviro, Steven, *Post-Cinematic Affect* (Winchester, United Kingdom: Zero Books, 2010)
- Sobchack, Vivian, *Carnal Thoughts: Embodiment and Moving Image Culture* (Berkeley: University of California Press, 2004)
- Stark, Doug, 'Simema: The Aesthetics of Autoplay in Freudenheim's Schema', in *Interplay*, by Will Freudenheim and William Morgan (Munich: Caldo Worldwide, 2024)
- Stiegler, Bernard, 'The Discrete Image', in *Echographies of Television: Filmed Interviews*, by Jacques Derrida and Bernard Stiegler, trans. by Jennifer Bajorek (London: Polity, 2002), pp. 145–63
- Wardrip-Fruin, Noah, *Expressive Processing: Digital Fictions, Computer Games, and Software Studies* (Cambridge, Massachusetts: MIT Press, 2009)
- Waszkiewicz, Agata, and Martyna Bakun, 'Towards the Aesthetics of Cozy Video Games', *Journal of Gaming & Virtual Worlds*, 12.3 (2020), 225–40 https://doi.org/10.1386/jgvw_00023_1

- Willett, John, ed., *Brecht on Theatre: The Development of an Aesthetic*, revised edn (London: Eyre Methuen Ltd., 1978)
- Zimmerman, Eric, 'Do Independent Games Exist?', in *Game On: The History and Culture of Videogames*, ed. by Lucien King (New York: Universe Publishing, 2002), pp. 120–29

JOHN HEALY

‘AT FIRST I WANTED TO DESIGN THE EXTERIOR, BUT FIGURED THAT IT WOULD MOST LIKELY NOT BE SHOWN IN-GAME’: GAME ENGINES AS SITES FOR CREATIVITY AND CONSTRAINT IN HIGHER EDUCATION

This chapter explores the role of game engines in higher education as tools central to many game design and development programmes. The number of game design and development programmes offered at university level has grown significantly in recent years.¹ As Keogh and Hardwick outline, many game programmes exhibit a tension between technical and creative aspects of the development process.² This reflects wider scholarship about the role of higher education in the reproduction of work cultures in society.³ Student learning often takes place within and through game engines and many employers view competency with game engines as an important criterion for graduate roles.⁴ However,

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- 1 Alison Harvey, ‘Becoming Gamesworkers: Diversity, Higher Education, and the Future of the Game Industry’, *Television & New Media*, 20.8 (2019), 756–66.
 - 2 Brendan Keogh and Taylor Hardwick, ‘Creative, Technical, Entrepreneurial: Formative Tensions in Game Development Higher Education’, *Games and Culture*, 19.6 (2024; first published online 29 May 2023), 804–26.
 - 3 Mark Deuze, Chase Bowen Martin, and Christian Allen, ‘The Professional Identity of Gameworkers’, *Convergence: The International Journal of Research into New Media Technologies*, 13.4 (2007), 335–53, doi:10.1177/1354856507081947; Johanna Weststar and Louis-Étienne Dubois, ‘From Crunch to Grind: Adopting Servitization in Project-Based Creative Work’, *Work, Employment and Society*, 37.4 (2023; first published online 12 February 2022), 972–90.
 - 4 Raimond-Hendrik Tunnel and Ulrich Norbistrath, ‘A Survey of Estonian Video Game Industry Needs’, *Journal of Education and Learning*, 11.5 (2022), p. 183.

these tools simultaneously serve to facilitate creativity while constraining the design process.⁵ By examining how game engines provide a site for the development of both technical and creative skill sets, educators may better appreciate the impact that software tools can have on the development of student competencies.

Drawing on interviews with five game design lecturers in Ireland and the UK, in addition to a six-week observational study conducted with students learning game development with a commercial game engine, this chapter provides an empirical account of the role of engines in game development education. The interview participants included a range of career stages from junior to senior lecturers to gather a diverse range of perspectives on the use of game engines within their teaching. During the observational study, student groups developed a project and negotiated the technical and creative challenges of a design brief. Data gathered in the form of interview transcripts, fieldnotes and development logs (DevLogs) was analysed using thematic analysis.

Educators discussed the challenges of guiding students who often rushed to implement their designs in-engine prematurely and who were at times designing for the constraints of the game engine as opposed to through it. For the students, game engines were seen to simultaneously create a broad design possibility space while limiting their creativity through both their own experience and the engine features. As a result, the struggle between the student designer's intent and their implementation can become the defining feature of their learning experience.

The chapter provides insights into the role of game engines in the classroom and into the student experience of designing within and through such software. It also adds to the broader discussions on how software can shape creative practice and the tensions inherent in fields combining creative and technical skill sets.

5 Brendan Keogh, 'Situating the Videogame Maker's Agency through Craft', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 374–88; Jennifer R. Whitson, 'Voodoo Software and Boundary Objects in Game Development: How Developers Collaborate and Conflict with Game Engines and Art Tools', *New Media & Society*, 20.7 (2018), 2315–32.

Situating Game Engines in Game Development Education

Game development education refers to higher education programmes aimed at preparing students to become game developers, often focused on commercial game production. While such programmes are relatively new within academia, there has been significant growth in the number of programmes offered at the university level in recent years. Harvey suggests that these programmes often aim to enculturate students into the game industry by applying approaches such as ‘industry speakers in the classroom to organised game jams, trips to conferences, and assessment activities specifically oriented towards a particular console, software, or engine (where programs have sponsorship deals with companies).’⁶ By emulating the practices of the commercial game industry we risk reinforcing negative work habits and industry norms such as crunch (excessive working hours for a prolonged period of time) that have been shown to be damaging to those within the industry itself.⁷ In addition to this, Ashton suggests that the close alignment with industry practices may limit creative output by constraining the *imaginaries* of students to align with established commercial genre approaches.⁸ The term imaginaries used by Ashton refers to the cultural studies concept that explores how people may imagine the world in a way that is shaped by personal experience as well as cultural and historical factors in relation to game design.

A further issue within game development education is how the multidisciplinary nature of the field impacts pedagogical approaches. A number of authors have outlined the challenges of teaching game development within higher education due to the

6 Harvey, ‘Becoming Gamesworkers’, p. 760.

7 Weststar and Dubois, ‘From Crunch to Grind’; Alison Harvey, ‘Passion, Pipelines, And Precarity: Working Lives in Games from the Perspective of Higher Education’, *AoIR Selected Papers of Internet Research*, 15 September 2021.

8 Daniel Ashton, ‘Thinking with Games: Exploring Digital Gaming Imaginaries and Values in Higher Education’, *Journal of Media Practice*, 10.1 (2009), 57–68.

mix of disciplines involved in the creation of games.⁹ The disciplines involved in game development can include, but are not limited to, game design, programming, 2D and/or 3D art, audio and narrative design. The primary tools employed within game development education that serve to bring the elements of the game together are game engines such as *Unity*¹⁰, *Unreal*¹¹ or *Godot*.¹² In addition to these larger game engines, smaller tools such as Twine and PICO-8 may also be employed by educators due to the constraints they impose on users leading to potentially more creative outcomes.¹³ While the use of game engines is common within academia there is room for further consideration of how these complex pieces of software impact student learning and the creative process they employ. Within other fields, there is more research to draw on that may be relevant to the context of game development education. Within engineering design, for example, the use of computer-aided design (CAD) software in the design process has been shown to impact creativity. In particular, an overreliance on CAD software and using it too early in the design process has been found to limit creative output.¹⁴

To consider how software may support and constrain creative output the concept of affordance may provide useful insights.

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- 9 Lasse Juel Larsen, 'Juicing the Game Design Process: Towards a Content Centric Framework for Understanding and Teaching Game Design in Higher Education', *Educational Media International*, 55.3 (2018), 231–54; José P. Zagal, *Ludoliteracy: Defining, Understanding, and Supporting Games Education* (Pittsburgh: ETC Press, 2010); Danny Godin Guillaume Roux-Girard, and Sébastien Savard, 'Game Development Praxiography: A Methodological Approach to Setup a Knowledge Brokering Pipeline Between Higher Education Institutions and the Game Development Industry', *The Computer Games Journal*, 9.1 (2020), 15–27; Keogh and Hardwick, 'Creative, Technical, Entrepreneurial'.
 - 10 Unity Technologies, *Unity* (2005), MacOS and Windows.
 - 11 Epic Games, *Unreal* (1998), Windows and subsequently other platforms.
 - 12 Juan Linietsky and Ariel Manzur, *Godot* (2014), Linux, MacOS and Windows.
 - 13 Chris Klimas, *Twine* (2009), Windows, MacOS, Linux and subsequently other platforms; Joseph White, *PICO-8* (2014), Windows, MacOS and Linux.
 - 14 B.F. Robertson and D.F. Radcliffe, 'Impact of CAD Tools on Creative Problem Solving in Engineering Design', *Computer-Aided Design*, 41.3 (2009), 136–46.

Werning argues that tools play a wider role within the development ecology which helps situate game engines in relationship to other creative software tools.¹⁵ The term affordance was outlined by Gibson¹⁶ and adapted by Norman¹⁷ for the field of design. Norman suggests that affordances (or perceived affordances) specify the possible actions that a user may take within a piece of software. In reference to affordances then we can consider how a game engine may enable certain creative opportunities while also constraining the imaginary of the user. Nicoll and Keogh describe how game engines facilitate user creativity:

Crucially, like all cultural software, game engines offer the promise of self-sovereignty—they make us feel empowered to take control of our creative potentials through accessible drag-and-drop tools, dashboard interfaces, and customizable management techniques, all by concealing the true basis of their operability under the guise of ‘user-friendliness’ (Chun, 2011).¹⁸

In addition to the affordances provided by the software, the ability or experience of the user also serves to constrain the process via their awareness of the features and how to implement their designs. How the user navigates the game engine and moves from concept to implementation can be a complex and messy process.¹⁹ For less experienced users such as students, these complex engines can respond to input in unexpected ways leaving the game developer unsure of whether the problem lies in their implementation or an issue with the engine. Whitson describes

15 Stefan Werning, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021).

16 James J. Gibson, ‘The Theory of Affordances’, in *Perceiving, Acting, and Knowing: Toward an Ecological Psychology*, ed. by Robert Shaw and John Bransford (Hillsdale, NJ: Lawrence Erlbaum Associates, 1977), 67–82.

17 Donald A. Norman, ‘Affordance, Conventions, and Design’, *Interactions*, 6.3 (1999), pp. 38–43.

18 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), p. 10.

19 Larsen, ‘Juicing the Game Design Process’; Jennifer R. Whitson, ‘What Can We Learn From Studio Studies Ethnographies? A “Messy” Account of Game Development Materiality, Learning, and Expertise’, *Games and Culture*, 15.3 (2020), 266–88.

the uncertainty between what the user can do and the output in the engine as ‘voodoo software’.²⁰

Many of these issues can be seen as constraints that are placed upon game developers by their experience with game engines and the capabilities of the software itself. Game designer Fawzi Mesmar describes these constraints in his book, *Demystifying Creativity*, as also providing opportunities for developers. He highlights the fog in *Silent Hill 2*²¹ as an example of a technical constraint that formed a core aspect of the game’s identity and became much more than just a workaround.²² The interplay between technical constraints and creativity in this way can create new opportunities for game designers as they may attempt to leverage the features provided by game engines. Lê, Massé, and Paris suggest that game engines ‘may act as a compass, a constraint or a source of inspiration’ within the game development process.²³ Constraining the design space within game development engines may serve to provide more opportunities for creative exploration. In the *Geneplore* model of creativity, this type of product constraint is said to create boundaries for ideation to take place with a more clearly defined limit.²⁴ This suggests that the constraints provided by a game engine may be a core part of creative approaches in game development and not obstacles to it. The game engine then can be seen not only as a tool of game development but may have significant impacts on the types of games developers and students produce.

Keogh suggests that the practice of game development (or gamemaking) can be understood not as a purely technical implementation of game concepts but rather as a craft process.²⁵ This

20 Whitson, ‘Voodoo Software and Boundary Objects in Game Development’.

21 Konami, *Silent Hill 2* (2001), PlayStation 2 and subsequently other platforms.

22 Fawzi Mesmar, *Demystifying Creativity: On Originality in Game Development* (Boca Raton: CRC Press, 2024), p. 17.

23 Patrick L. Lê, David Massé, and Thomas Paris, ‘Technological Change at the Heart of the Creative Process’, *International Journal of Arts Management*, 15.2 (2013), 45–59.

24 Ronald A. Finke, Thomas B. Ward, and Steven M. Smith, *Creative Cognition: Theory, Research, and Applications* (Cambridge, Massachusetts: MIT Press, 1992)

25 Keogh, ‘Situating the Videogame Maker’s Agency through Craft’.

approach encourages us to consider how the creator works with the tools of game production and the wider expectations of the field. Situating the game developers' practice as craft allows us to further consider the impact tools may have on the process. The role of the software tools can be seen in some of the earliest accounts of game development. For example, in the following quote from Jordan Mechner's journals (dated 9 February 1987), the developer of *Prince of Persia*²⁶, highlights the role tools play in the craft of game development.

Today for the first time, I constructed a really large level and played around in it. It was the first time this game had ever given me the feeling of space. It was kind of thrilling. I think it's going to be a winner.²⁷

In this example, Mechner can be seen to use the tools of game development to better realise the potential of the game concept. By implementing a large level for *Prince of Persia* he is able to get a better sense of how the game will feel when complete. Schön and Bennett describe this as reflection on action, where the designer reflects on the design after the activity is complete.²⁸ The tools and code used by the developer can be seen as a form of material that the developer can then manipulate to achieve an outcome. Manovich describes how software tools such as *After Effects*²⁹ served as a 'key material foundation' involved in the transformation of moving image production which began in the 1990s.³⁰ Similarly, Nicoll and Keogh describe how the *Unity* game engine

26 Jordan Mechner, *Prince of Persia* (Broderbund, 1989), Apple II and subsequently other platforms.

27 Jordan Mechner, *The Making of Prince of Persia: Journals 1985–1993*, 2nd edn (San Francisco: Stripe Press, 2020).

28 Donald Schön and John Bennett, 'Reflective Conversation with Materials', in *Bringing Design to Software* (New York: ACM, 1996), 171–89.

29 David Herbstman and others, *After Effects* (Adobe Inc., 1993), MacOS and Windows.

30 Lev Manovich, *Software Takes Command*, International Texts in Critical Media Aesthetics, vol. 5 (New York: Bloomsbury, 2014), p. 246.

was central to a similar transformation that lowered the barrier of entry for a wider array of developers from the mid 2000s.³¹

Some of the earliest games were developed as collaborations and evolved by different developers. For example, *Spacewar!*³² from 1962 was initially developed by Steve Russell with Martin Graetz and Wayne Wiitanen at MIT and later hacked and changed by other developers.³³ It was not until the 1990s that game modding and game engines started to emerge and decrease the barrier to game creation for more student and hobbyist developers. Modding refers to players altering or changing game functionality and/or assets to modify the game.³⁴ As modding for games such as *Doom*³⁵ began to receive attention from players and developers in the mid-1990s, commercial game engines were also starting to take hold in the game industry.

Many game studios use proprietary game engines, while others choose to use commercial game engines that emerged in the 1990s as a way to simplify development.³⁶ Early engines were primarily commercially licensed tools and not available to a wider audience due to the licensing costs. This left modding as a creative avenue for those interested in game development and was often a route into the industry itself.³⁷ Similarly, modding tools found their way into the game design classroom as the first academic programmes in the area began to emerge.³⁸ These modding tools were often limited in terms of functionality and tended to focus on altering existing games instead of creating new ones. With the release of

31 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*.

32 Steve Russell, Martin Graetz, and Wayne Wiitanen, *Spacewar!*, 1962, Video Game.

33 J. Martin Graetz, 'The Origin of Spacewar', *Creative Computing*, 7.8 (1981), 56–67.

34 *Game Mods: Design, Theory and Criticism*, ed. by Erik Champion (Pittsburgh: ETC Press, 2012).

35 id Software, *Doom* (1993), MS-DOS and subsequently other platforms.

36 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*.

37 Deuze, Martin, and Allen, 'The Professional Identity of Gameworkers'.

38 Magy Seif El-Nasr and Brian K. Smith, 'Learning through Game Modding', *Computers in Entertainment*, 4.1 (2006), p. 7.

engines such as *Unity* and the *Unreal Development Kit*³⁹ in the 2000s, developers and universities had access to more fully featured game engines with less restrictive licensing terms. Today, most game development and game design programmes employ the use of game engines in their curriculum, however, the role of these key development tools in the craft of game development is not well understood.

The data presented in this chapter is drawn from two studies, an interview study with game design educators in Ireland and the UK and an observational study of student game design processes using the *Unity* game engine. The interviews and observational study took place in 2022, with the interviews taking place both in person and online while the student study took place in Technological University Dublin. All participants provided informed consent to be part of the research, and the project received ethical approval for the interview and observational studies (REC-18-147 and REIC-21-43). The interviews involved five lecturers in the UK and Ireland with between five to twenty-seven years of experience at the time of the interview. The interviews followed a semi-structured approach to allow the conversation to develop and insights to emerge naturally.⁴⁰ Each interview lasted between forty and fifty-five minutes and was transcribed manually to assist with data familiarisation. The observational study took place at Technological University Dublin in an introduction to game development class with students on the BA (Honours) in Game Design. Prior to data collection, the students were given the opportunity to opt-in to the study and thirty-two students across eight teams chose to participate in the research. The data gathered in this study was in the form of researcher field notes and development logs (DevLogs) produced by the students as part of the module coursework.

Throughout this study the author acted as a participant observer and had a dual role within the research as both a participant in

39 Epic Games, *Unreal Development Kit* (2009), Windows.

40 Eric Drever, *Using Semi-Structured Interviews in Small-Scale Research: A Teacher's Guide* (Edinburgh: Scottish Council for Research in Education, 1995).

the research and an observer of it.⁴¹ To aid in this, field notes were maintained throughout the project outside class time to reflect on the process and provide insights into the experience. For this chapter, the interview transcripts, fieldnotes and DevLogs were analysed using a thematic analysis approach to gain an understanding of the role of game engines in the student development process.⁴²

The student project took place over a six-week period with students who were nearing the end of their second semester and had covered the basic tools afforded by the Unity engine. Students worked in groups of three to four and had to create a game based on the theme 'The World Will End in Five Minutes'. Concept presentations took place in week 2 of the project, with the first playtest two weeks later and the final submission three weeks after that. Students were prompted to record weekly DevLogs to record their project development process.

The data analysis for this chapter followed the approach outlined by Braun and Clarke, drawing on the guidance provided by Maguire and Delahunt.⁴³ Initial codes were developed following data familiarisation, then themes were identified, reviewed and defined to provide a rich account of the game design classroom grounded in the perspectives of research participants. From analysing the data three themes emerged relating to how game engines both constrain and facilitate student creativity. The first theme, *Game Engines as a Source of Constraints* describes how the development tools enforce constraints on the development process, shaping the design directions that projects can take. The second theme, *The Push and Pull of Implementation* explores how producing work within a game engine both serves to move the game forward but also leads to new challenges. The final theme, *Navigating Complexity and Constraint*, discusses the ways in

41 Ann Bonner and Gerda Tolhurst, 'Insider-Outsider Perspectives of Participant Observation', *Nurse Researcher*, 9.4 (2002), p. 7.

42 Moira Maguire and Brid Delahunt, 'Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars', *All Ireland Journal of Higher Education*, 9.3 (2017), 3351–59.

43 Virginia Braun and Victoria Clarke, 'Using Thematic Analysis in Psychology', *Qualitative Research in Psychology*, 3.2 (2006), 77–101; Maguire and Delahunt, 'Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars'.

which student developers navigate the complexity and constraint inherent in game engines.

The analysis builds on existing literature situating *Unity* and game engines as cultural software and considers the impact within higher education. It also contributes to ongoing discussions regarding platformisation within the creative industries, highlighting how engines shape student learning experiences in higher education. By considering how game engines function as pedagogical tools both facilitating and constraining student learning it adds to existing discussions around platform governance, creative industries, and digital labour.

Game Engines as a Source of Constraints

As outlined above, game engines have become an increasingly important tool within the game industry and within game development education. All educators interviewed as part of this research highlighted the importance of implementation within an engine as a core skill for game developers. Engines also serve to constrain the work students are able to produce. One of the primary issues that the educators discussed was the challenge of students struggling to manage the scope of their games.

I think what typically happens is (that) what they present scope-wise is really big. I think students don't understand, even in their second or first year, how big and how long it will take to deliver a game like what they're presenting. (Lecturer 2)

The scope refers to the size or ambition of the game that the students are developing. In this case, the lecturer suggests students tend to believe that they can create games with a larger scope than may be achievable with their experience and the time available. *Lecturer 4* below suggests this is because students believe things will go to plan during development.

But they don't think about scope enough (...) and I think that's to do with the fact that again, and we see this in a lot of our students, there's no realistic understanding of how long things take. So, they

constantly think everything's gonna go smoothly, everything's gonna go perfect, 'I'm gonna go into the engine and everything's gonna work perfectly fine and I won't need to problem solve anything'. And I think allowing them to learn that is an important lesson. (Lecturer 4)

While the students may have the belief that things will go according to plan this may also suggest that the messy nature of game development may make it difficult to plan effectively for student developers.⁴⁴ The lecturer also suggests that it is through this experience of over-scoping that students may learn how to manage scope for future projects. This experience can also be seen in the student DevLogs.

As development went on we had quite a few ideas that were scrapped to keep the game cleaner and simpler. (Team 4)

Here *Team 4* have recognised that some of the ideas they developed had to be removed to ensure development went smoothly and to keep the game simple while not being overly ambitious. Another recurring topic in the educator interviews had to do with emulating genre norms and professional practices. Many educators discussed how they follow approaches that align with the larger game industry.

We try and keep it pretty similar to (the industry), like in terms of the structure of what they're doing is kind of mimicking maybe what would happen in real life. (Lecturer 2)

This alignment to industry structures is similar to approaches discussed earlier by Harvey.⁴⁵ The close alignment to industry norms aims to prepare students for the game industry, however as outlined by Keogh, the field of gamemaking can be seen as much broader than the large, commercial game industry which

44 Whitson, 'What Can We Learn From Studio Studies Ethnographies?'

45 Harvey, 'Becoming Gamesworkers'.

dominates media coverage.⁴⁶ This focus on mimicking industry practice may not only limit student potential to a small portion of game development routes post-graduation but it may also limit their creative development.

We ended up producing games and perhaps students who are very cookie cutter, derivative of what's already visible from a mainstream perspective, they don't really push the boundaries of what games can be. (Lecturer 3)

This suggests that the approach of aligning with industry standards may limit the student *imaginaries* to those they have experienced from the mainstream industry.⁴⁷ By trying to mimic industry practice and using industry-standard tools students may constrain their design space to one bounded by commercial interests and fail to develop a richer design repertoire. For students in this research, the primary constraints of game engines were felt as technical limitations either in terms of the engine or their perceived understanding of how the engine worked based on their experience.

Making it grid-based created a lot of issues that had to constantly be fixed. Many clipping issues and the player getting stuck on walls and not being able to progress were worrisome. (Team 2)

In the above quote, *Team 2* discusses the challenges they had with using the *Unity* engine to create a grid-based game (i.e. a game where the player moves to spaces on a grid as opposed to moving freely). This design choice created technical challenges for the team as they did not have experience with implementing this feature previously. The DevLog makes it clear that this challenge created a level of anxiety for the developers, later in the project another DevLog highlights how this feature continued to create challenges for the team.

46 Brendan Keogh, *The Videogame Industry Does Not Exist: Why We Should Think Beyond Commercial Game Production* (Cambridge, Massachusetts: MIT Press, 2023).

47 Ashton, 'Thinking with Games'.

The Second level is the forest and the approach is much different from the cave. (...) The trees were difficult to use on a tilemap, instead we used them as a normal image with a box collider. We had a lot of complications with this section as we have numerous iterations of the level and how much constraint we enforce on the player. (Team 2)

This shows how the technical challenges encountered with an early design decision have led to additional complexity throughout the development process. In this case, the technical workarounds do not lead to increased creative exploration but rather cause challenges that the students try to fix. While Mesmar suggests that technical limitations can lead to creative opportunity, it is also clear that they can lead to increased anxiety and a reduced vision for less experienced developers.⁴⁸ This highlights how students design for the constraints imposed on them through their knowledge of the engine as opposed to using the engine as a tool to realise their design vision. The above quote also highlights how self-imposed constraints during development can also lead to questions about constraining the player. The grid-based movement and technical workarounds led the student developers to develop a number of iterations and question the level of player freedom in their games. The issues encountered can also have other impacts on players.

Right now we are having a couple of issues with the game, the most notable one is that the itch.io version does not run on WebGL and at the moment we are trying to fix it. In the worst case scenario, we would decide to make it exclusively a downloadable version for Windows. (Team 8)

The above quote highlights the challenges students face with the engine functionality as it provides a way to export the game for playing in the web browser, however, they are having issues with this functionality. This suggests that the hidden nature of the functionality that is sometimes hidden through the 'user-friendliness' of the game engine can obscure problems and solu-

48 Mesmar, *Demystifying Creativity: On Originality in Game Development*.

tions for student developers.⁴⁹ Instead of using the engine as a tool of creative exploration, they are designing for the constraints it has imposed. While this section has considered the nature of the constraints imposed by game engines on student developers, the following theme will explore the role of implementation within game development education.

The Push and Pull of Implementation

The role of implementation in game development education came up regularly during the interviews with educators. Many discussed the importance of implementation as a skill for student game developers and as a way to learn what they were capable of producing. It was also often in implementation where the constraints of the game engine were most clearly felt.

They have to submit a prototype with the pre-production submission and if there are things that I think are significant, big technical implementation things that they have not included, for example, if they've never done pathfinding, and they haven't included pathfinding in their prototype, then I'll say 'You can't make the game that you've said you can make on here'. (Lecturer 1)

The above quote highlights the significance many educators place on implementation as a way to manage student progress. In this example, the students are required to demonstrate their technical competency in the engine before being able to move further into development or being encouraged to change their design. The implementation is not of value in isolation as the same lecturer outlined later in the interview.

A lot of the time it's about getting them to understand, it's not just can you implement it, but is this gonna take a lot of time to implement something that is purely you showing you can program a particular thing, which is then not actually design. (Lecturer 1)

49 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*.

This highlights the tension inherent in implementation where students may over-focus on implementation to the detriment of their design process. While the lecturer previously discussed the significance of implementation it also becomes important for student developers to identify what features are appropriate for their games. The challenge of technical implementation becomes a point of friction between the educator and the student. Implementing features within the game also serves to identify issues for students when players interact with it as demonstrated below.

Some people found that there wasn't enough gameplay. This bizarrely was something we overlooked. In summation of what was said, the game felt more like a simulation, as in going through the actions, rather than actively engaging with any sense of urgency despite the 5-minute timer. This shocked us. We had become (so) focused on the game world and narrative that the actual gameplay aspect was forgotten. (Team 3)

Implementing the game to the point of being a playable experience and playtesting can act to bring the developer's attention to areas they may have overlooked. This realisation for the student game developers only became apparent after implementation however, once they saw players interacting with the game, the issue was readily identifiable. The educators interviewed also discussed the fact that a focus on implementation can lead to students becoming more confident.

They're very good at actually then moving into implementation, you know. And that's just because they've spent so much time going over the same process again, and again, and again, that reinforced process is there, it's almost in the genes at that stage, you know? (Lecturer 5)

This educator identifies that final year students have internalised the development process and have become comfortable with moving to implementation. Some of the student developers who participated in the study reflected on how implementation acted as an approach for them to focus their design. The engines don't solely act to constrain their vision, implementing in-engine also allowed them to refine their concept.

Once we made the core mechanic (the constant movement), we realised that some of the features we were planning on adding like powerups would just be clutter. (Team 6)

This quote highlights the impact that implementation can have on the development process as it can bring clarity to a design by observing it in action. Implementation in game development education often follows an iterative approach, where something is implemented, feedback is received, and the game is modified to try to improve the player experience. One lecturer below discusses the role of iteration with their assessment process:

The way you get your marks is by iterating. And then by doing that, to chase the marks, where they go 'Oh, yeah, like, actually, we can see those changes we've made over the past two weeks have made so much difference' (Lecturer 1)

As the lecturer makes the iterative process a graded requirement for the project, they hope that it encourages students to iterate on their games. Thus encouraging students to observe the intrinsic value of the approach. The iterative approach is also a method that aims to mimic commercial development processes. *Lecturer 2* below describes how this iterative approach and feedback is used to set production goals for the student developers.

So every time they would present, we would give them feedback on the work, but then we would give them individualized goals per team, depending on the game that they're working on: 'So this is what we want you to show us next week' and kind of go from there. (Lecturer 2)

This mimics the role of producers within the game industry, whereby they organise the development team and maintain production timelines.⁵⁰ The focus on industry practices may also create challenging work environments for students. *Team 1* below

50 Jennifer R. Whitson, Bart Simon, and Felan Parker, 'The Missing Producer: Rethinking Indie Cultural Production in Terms of Entrepreneurship, Relational Labour, and Sustainability', *European Journal of Cultural Studies*, 24.2 (2021), 606–27.

discusses their experience with iterating through code for an interaction system.

The first few iterations of the interaction code were a disaster, with some not working at all and some causing countless other problems to pop up within the other code. It took a lot of effort and very little sleep in order to get a basic interaction mechanic working in time for the playtest but we did it! (Team 1)

This highlights some of the challenges that may present themselves as educators apply industry approaches within game development education. The above quote highlights student game developers in a *crunch* mode where they feel compelled to work on the game to the detriment of their well-being.⁵¹ The risk of emulating commercial approaches to game development within an educational context may encourage the behaviours that educators would prefer students avoid and as shown in this section the use of game engines plays a central role in this. Having discussed the role of engines as sources of constraints and the impact of implementation, the final theme will discuss how students and educators attempt to navigate around these constraints.

Navigating Creativity and Constraint

The final theme in this chapter explores ways that educators structure the learning environment and students engage with the constraints of game development education. During the educator interviews, most discussed the desire for students to focus on technical execution over originality in their work.

I'd rather they produce something small and polished even if it's not the most original thing. Because if they manage to finish it, because you're teaching them professionalism, part of that is to be able to finish something, to be able to publish something, to be able to kind of follow the pipelines all the way through. (Lecturer 4)

51 Weststar and Dubois, 'From Crunch to Grind'.

The above quote highlights this approach with the lecturer indicating a preference for students to create polished, complete games, as opposed to something more conceptually rich. This also runs the risk of reducing the student *imaginaries* and perhaps creating less creatively engaged developers.⁵² Later in the interview the same lecturer questioned this approach.

If we're focusing on allowing students to be creative and follow their own practice or identify their own practice within a framework, then we can't be too prescriptive with them, and then that obviously becomes a challenge as well. (Lecturer 4)

This suggests the lecturer is aware of the challenges of focusing on structured approaches and the limitations it may place on student creativity. While the educator below agreed with the sentiment of focusing on the process, they also saw the process as providing the opportunity for students to flourish.

With students, it's sometimes like trying to keep them to the basics as much as possible and then letting them kind of flourish, you know, during production. (Lecturer 2)

In this example, the lecturer encourages students to focus on the core skills of game development in order to make the production process more straightforward. This can be seen as a way of creating a structure for students to follow, while still developing their knowledge of the game engine. In the observational study, students also discussed keeping things simple to facilitate the development process.

For the most part the goal with both the code and the user interface was to not overcomplicate it and make it easy for me to expand on so that it could be done on time. (Team 4)

A number of educators discussed the use of constraints in their project briefs to support students in navigating the development

52 Ashton, 'Thinking with Games'.

process. *Lecturer 2* gave the following example from one of their modules:

In the first (semester), we make a first-person shooter- I guide them through unreal and making a first-person shooter project. So in the second semester, we say like, no first-person shooters, you know, like, we don't want to make the same game again, type of thing. So we try and put constraints on them. (*Lecturer 2*)

This highlights the structured approach to game development education. By first guiding students through creating a game within a common genre, the lecturer hopes students will be able to translate that knowledge into other games in the second semester. They also discussed this in relation to more advanced topics such as artificial intelligence (AI).

In the first year, I might have shown them how to make some rudimentary AI. But in the second year, we expect more, but I'm not going to be able to teach everybody like the different AI that they want to make in the game. So they have to research into that particular aspect of how to develop themselves. (*Lecturer 2*)

In the above example, the lecturer highlights how the structured approach can provide students with the basic tools of game development, however, more advanced and complex systems that might be bespoke to specific genres or systems are not easily taught in this way. Instead, the lecturer expects students to develop their own skill sets as developers and to seek out resources on more advanced topics. A number of students also discussed the impact of self-directed learning on their technical skills:

I felt that my coding ability greatly improved due to the hours I put into the item inventory system, the key-coded door (which unfortunately wasn't implemented but is accessible in the centre of the map), and having clean code (that is each in its separate class). (*Team 3*)

For this student developer, the process of developing the game and struggling with challenges has helped them grow in confidence with game engines and code. This wasn't the case for all

students with one DevLog highlighting the tension students may experience when looking at supplementary material:

I feel that it is lacking in something, however my current knowledge of unity scripting is not of a high enough standard to make any major improvements at this time and I also wanted to keep from using too many tutorials, as then it wouldn't feel like I've learned anything and I would feel like I didn't create enough by myself. (Team 5)

These extracts highlight the differences students might experience when tools such as game engines are given a central place in game development education. While some may be confident about developing their skills, others may be resistant to looking beyond the classroom. The game engine can create friction between educators and students as they try to navigate the inherent constraints of the software. A further tension that students may experience is the gap between what they want to do on a project and what they can do:

At first I wanted to design the exterior, but figured that it would most likely not be shown in-game (Team 7)

This DevLog succinctly highlights the challenge for game development educators between student creativity and the constraints of software tools. The student wanted to design the exterior of the level for their game; however, the constraints of the development process and the in-engine implementation led to them moving away from their design goal. Students also found the constraints they had set on themselves were not always limiting.

We had clear objectives and we weren't afraid to make difficult choices such as scrapping or changing parts of game from what we declared during our presentation to lecturer. (Team 2)

The above quote suggests students in the game development process may become less fixated on the self-imposed constraints of their vision as opposed to the reality of needing to meet academic assessment deadlines. While this may be seen as a potential issue to educators, it may at times be part of the learning experience:

Keep it simple first and build on it... it doesn't always work because students often want to go off and go for the end product before the start. (Lecturer 5)

Lecturer 5 identifies students focusing on the final product instead of following a process, however the larger student vision of the project is constrained by the academic calendar. The constraints of the university environment may help to bring students' vision closer to something that is achievable and enhance their learning experience. Considering how these constraints both facilitate creativity while simultaneously providing a valuable learning experience may allow educators to consider whether the process or product is the goal of the assignment.

Conclusion

Game engines are integral to many game development programmes and are a tool through which much game development education takes place. The research presented in this chapter provides insight into the complex interplay between technical implementation and creative expression within game engines in higher education. It draws on qualitative data from a small sample size, however, it may encourage other educators to reflect on their use of game engines in the classroom through a more critical perspective. Game engines can have a significant impact on student learning and present challenges alongside the opportunities they provide. While engines provide opportunities for students to design through their knowledge and experience of the functionality offered, they often lead to students designing for the constraints of the engine and their own knowledge.

Game engines within the context of higher education not only serve as pedagogical tools for concrete learning outcomes but also as socio-technical infrastructures with the power to reproduce creative literacies and professional imaginaries within game development programmes. By making these explicit, the author hopes that educators can consider the role of engine-based teaching in a more critical and reflective manner beyond the binaries of technology as being solely empowering or limiting. In addi-

tion to this, the central role of game implementation runs the risk of perpetuating negative industry practices and warrants further reflection from educators employing this approach.

Bibliography

- Ashton, Daniel, 'Thinking with Games: Exploring Digital Gaming Imaginaries and Values in Higher Education', *Journal of Media Practice*, 10.1 (2009), 57–68, https://doi.org/10.1386/jmpr.10.1.57_1 [accessed 1 March 2025]
- Bonner, Ann, and Gerda Tolhurst, 'Insider-Outsider Perspectives of Participant Observation', *Nurse Researcher*, 9.4 (2002), 7–19, <https://doi.org/10.7748/nr2002.07.9.4.7.c6184> [accessed 1 March 2025]
- Braun, Virginia, and Victoria Clarke, 'Using Thematic Analysis in Psychology', *Qualitative Research in Psychology*, 3.2 (2006), 77–101, <https://doi.org/10.1191/1478088706qp0630a> [accessed 1 March 2025]
- Champion, Erik, ed., *Game Mods: Design, Theory and Criticism* (Pittsburgh: ETC Press, 2012)
- Deuze, Mark, Chase Bowen Martin, and Christian Allen, 'The Professional Identity of Gameworkers', *Convergence: The International Journal of Research into New Media Technologies*, 13.4 (2007), 335–53, <https://doi.org/10.1177/1354856507081947> [accessed 1 March 2025]
- Drever, Eric, *Using Semi-Structured Interviews in Small-Scale Research: A Teacher's Guide* (Edinburgh: Scottish Council for Research in Education, 1995)
- El-Nasr, Magy Seif, and Brian K. Smith, 'Learning through Game Modding', *Computers in Entertainment*, 4.1 (2006), 1–19, <https://doi.org/10.1145/1111293.1111301> [accessed 1 March 2025]
- Finke, Ronald A., Thomas B. Ward, and Steven M. Smith, *Creative Cognition: Theory, Research, and Applications* (Cambridge, Massachusetts: MIT Press, 1992)
- Gibson, James J., 'The Theory of Affordances', in *Perceiving, Acting, and Knowing: Toward an Ecological Psychology*, ed. by Robert Shaw and John Bransford (Hillsdale, NJ: Lawrence Erlbaum Associates, 1977), pp. 67–82
- Godin, Danny, Guillaume Roux-Girard, and Sébastien Savard, 'Game Development Praxiography: A Methodological Approach to Setup a Knowledge Brokering Pipeline Between Higher Education Institutions and the Game Development Industry', *The Computer Games Journal*, 9.1 (2020), 15–27, <https://doi.org/10.1007/s40869-020-00092-7> [accessed 1 March 2025]

- Graetz, J. Martin, 'The Origin of Spacewar', *Creative Computing*, 7.8 (1981), 56–67
- Harvey, Alison, 'Becoming Gamesworkers: Diversity, Higher Education, and the Future of the Game Industry', *Television & New Media*, 20.8 (2019), 756–66, <https://doi.org/10.1177/1527476419851080> [accessed 1 March 2025]
- , 'Passion, Pipelines, and Precarity: Working Lives in Games from the Perspective of Higher Education', *AoIR Selected Papers of Internet Research* (2021), <https://doi.org/10.5210/spir.v2021i0.11934> [accessed 1 March 2025]
- Keogh, Brendan, 'Situating the Videogame Maker's Agency through Craft', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 374–88, <https://doi.org/10.1177/13548565211056123> [accessed 1 March 2025]
- , *The Videogame Industry Does Not Exist: Why We Should Think Beyond Commercial Game Production* (Cambridge, Massachusetts: MIT Press, 2023), <https://mitpress.mit.edu/9780262545402/the-videogame-industry-does-not-exist/> [accessed 22 May 2023]
- Keogh, Brendan, and Taylor Hardwick, 'Creative, Technical, Entrepreneurial: Formative Tensions in Game Development Higher Education', *Games and Culture*, 19.6 (2024), 804–26, <https://doi.org/10.1177/15554120231176874> [accessed 30 May 2023]
- Larsen, Lasse Juel, 'Juicing the Game Design Process: Towards a Content Centric Framework for Understanding and Teaching Game Design in Higher Education', *Educational Media International*, 55.3 (2018), 231–54, <https://doi.org/10.1080/09523987.2018.1512445> [accessed 1 March 2025]
- Lê, Patrick L., David Massé, and Thomas Paris, 'Technological Change at the Heart of the Creative Process', *International Journal of Arts Management*, 15.2 (2013), 45–59, <https://researchportal.ip-paris.fr/en/publications/technological-change-at-the-heart-of-the-creative-process-insight/> [accessed 1 March 2025]
- Maguire, Moira, and Brid Delahunt, 'Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars', *All Ireland Journal of Higher Education*, 9.3 (2017), 3351–59, <https://ojs.aishe.org/index.php/aishe-j/article/view/335> [accessed 1 March 2025]
- Manovich, Lev, *Software Takes Command*, International Texts in Critical Media Aesthetics, vol. 5 (New York: Bloomsbury, 2014)
- Mechner, Jordan, *The Making of Prince of Persia: Journals 1985–1993*, 2nd edn (San Francisco: Stripe Press, 2020)
- Mesmar, Fawzi, *Demystifying Creativity: On Originality in Game Development* (Boca Raton: CRC Press, 2024)
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), <https://doi.org/10.1007/978-3-030-25012-6> [accessed 1 March 2025]

- Norman, Donald A., 'Affordance, Conventions, and Design', *Interactions*, 6.3 (1999), 38–43, <https://doi.org/10.1145/301153.301168> [accessed 1 March 2025]
- Robertson, B.F., and D.F. Radcliffe, 'Impact of CAD Tools on Creative Problem Solving in Engineering Design', *Computer-Aided Design*, 41.3 (2009), 136–46, <https://doi.org/10.1016/j.cad.2008.06.007> [accessed 1 March 2025]
- Schön, Donald, and John Bennett, 'Reflective Conversation with Materials', in *Bringing Design to Software*, ed. by Terry Winograd (New York: ACM, 1996), 171–89, <https://doi.org/10.1145/229868.230044> [accessed 1 March 2025]
- Tunnel, Raimond-Hendrik, and Ulrich Norbistrath, 'A Survey of Estonian Video Game Industry Needs', *Journal of Education and Learning*, 11.5 (2022), 183–92, <https://doi.org/10.5539/jel.v11n5p183> [accessed 1 March 2025]
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- Weststar, Johanna, and Louis-Étienne Dubois, 'From Crunch to Grind: Adopting Servitization in Project-Based Creative Work', *Work, Employment and Society*, 37.4 (2023), 972–90, <https://doi.org/10.1177/09500170211061228> [accessed 1 March 2025]
- Whitson, Jennifer R., 'Voodoo Software and Boundary Objects in Game Development: How Developers Collaborate and Conflict with Game Engines and Art Tools', *New Media & Society*, 20.7 (2018), 2315–32, <https://doi.org/10.1177/1461444817715020> [accessed 1 March 2025]
- , 'What Can We Learn From Studio Studies Ethnographies? A "Messy" Account of Game Development Materiality, Learning, and Expertise', *Games and Culture*, 15.3 (2020), 266–88, <https://doi.org/10.1177/1555412018783320> [accessed 1 March 2025]
- Whitson, Jennifer R., Bart Simon, and Felan Parker, 'The Missing Producer: Rethinking Indie Cultural Production in Terms of Entrepreneurship, Relational Labour, and Sustainability', *European Journal of Cultural Studies*, 24.2 (2021), 606–27, <https://doi.org/10.1177/1367549418810082> [accessed 1 March 2025]
- Zagal, José P., *Ludoliteracy: Defining, Understanding, and Supporting Games Education* (Pittsburgh: ETC Press, 2010)

Software and tools

- Epic Games, *Unreal* (1998), Windows
- , *Unreal Development Kit* (2009), Windows

Herbstman, David, and others, *After Effects* (Adobe Inc., 1993), MacOS and Windows
Klimas, Chris, *Twine* (2009), Windows, MacOS, Linux
Linietsky, Juan, and Ariel Manzur, *Godot* (2014), Linux, MacOS and Windows
Unity Technologies, *Unity* (2005), MacOS, Windows
White, Joseph, *PICO-8* (2014), Windows, MacOS and Linux

Ludography

Broderbund, *Prince of Persia* (1989), Apple II
id Software, *Doom* (1993), MS-DOS
Konami, *Silent Hill 2* (2001), PlayStation 2
Russell, Steve, Martin Graetz, and Wayne Wiitanen, *Spacewar!* (1962), PDP-1

KEVIN WONG

ANTIQUITY FOR SALE: GAME ENGINES, ASSET STORES, AND THE PLATFORMISATION OF THE CLASSICAL IMAGINATION

Heroes, quests, gods, arenas, empire, war: those well-acquainted with videogames will likely recognise just how deeply those themes are integrated into the medium's aesthetic, narrative, and gameplay structures. These ideas, alongside the overarching desire to play, experience, and create something 'epic' (seemingly an unofficial mantra for the industry), can be attributed in part to the influence of ancient Greek and Roman myth, epic, and history. Games that explicitly adapt the classical world and its mythology — including well-known titles like *Assassin's Creed Odyssey*, *Hades*, and *God of War*¹ — continue to attain widespread acclaim and commercial success. Besides these more direct examples, classical antiquity is constantly adapted, in tandem with other cultures and histories, into transmutable source material for more generic fantasy worldbuilding (for instance, throughout the long-running *Final Fantasy* series).² Encountering antiquity as it is reflected in its visual and narrative in-game representations, however, brings us face-to-face only with the *end* products of a long and often opaque process of creation. In this paper, I venture a glimpse behind the curtain, to examine the sociotechnical processes by which these visions of antiquity are integrated into the commercial realities and creative possibilities of modern game development.

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- 1 Ubisoft, *Assassin's Creed Odyssey* (2018), PS4, Windows, Xbox One, Switch, and Stadia; Supergiant Games, *Hades* (2020), macOS, Switch, Windows, PS4, PS5, Xbox One, and Series X/S; Santa Monica Studio, *God of War* (series) (2005–present), various platforms.
 - 2 Square Enix, *Final Fantasy* (series) (1987–present), various platforms.

Rather than picture the path of historical adaptation as a one-way street leading from past to present, I invite us to imagine these lines of cultural influence as marked by a deep reciprocity: just as antiquity provides the material that inspires the making of many modern videogames, the sophisticated technology of modern game development in turn offers antiquity the tools it needs to enact its own cultural and digital afterlife. This reorientation towards the technical bases of historical adaptation raises new and probing questions: how exactly do the technological processes underlying game development software work to harness myth and history for the creation of new playable worlds? And how do those technologies select, transform, and ideologically encode the playable versions of the past that they create? These questions serve as my north star for this foray into game engines and their asset stores, bizarre spaces where recreated fragments of antiquity are sold on online marketplaces in service of creating playable worlds that are, at once, both old and new.

I begin by turning our attention to some of the most important tools employed by videogame developers: game engines, game assets, and asset stores. A game engine is a software development platform that provides a code framework for facilitating the collaboration of game designers, programmers, artists, and writers.³ A game asset, on the other hand, refers to any digital object that

3 Although used for the primary purpose of creating videogames, growing recognition of their flexible capabilities has begun to see game engines deployed for other purposes; see Eric Freedman, 'Software', in *The Craft of Criticism: Critical Media Studies in Practice*, ed. by Michael Kackman and Mary Celeste Kearney (New York: Routledge, 2018), pp. 318–30 (pp. 327–28); Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), p. 10; Jonathan Weinel, 'The Senses Beyond: New Directions in Game Engine Experiences', in *The Arts and Computational Culture: Real and Virtual Worlds*, ed. by Tula Giannini and Jonathan P. Bowen (Cham, Switzerland: Springer, 2024), pp. 499–520. For examples of game engines being used for 3D archaeological rendering, see Luca Cipriani, Silvia Bertacchi, and Gianna Bertacchi, 'An Optimised Workflow for the Interactive Experience with Cultural Heritage through Reality-Based 3D Models: Case Study in Archaeological and Urban Complexes', *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XLII-2/W11 (2019), 427–34; and for heritage recreation, see Abhishek Kumar, *VR Integrated Heritage Recreation: Using Blender and Unreal Engine 4* (Berkeley, California: Apress, 2020).

might be conceivably used as part of a videogame, be it a character model, a 3D landscape, an animation sequence, a set of textures, a physics system, or a musical score. These assets are imported into game engines which function as unifying and centralising platforms for the game development process. Lastly, asset stores are online marketplaces where digital artists and designers can upload and sell game assets that are already optimised for convenient integration into their associated game engine.

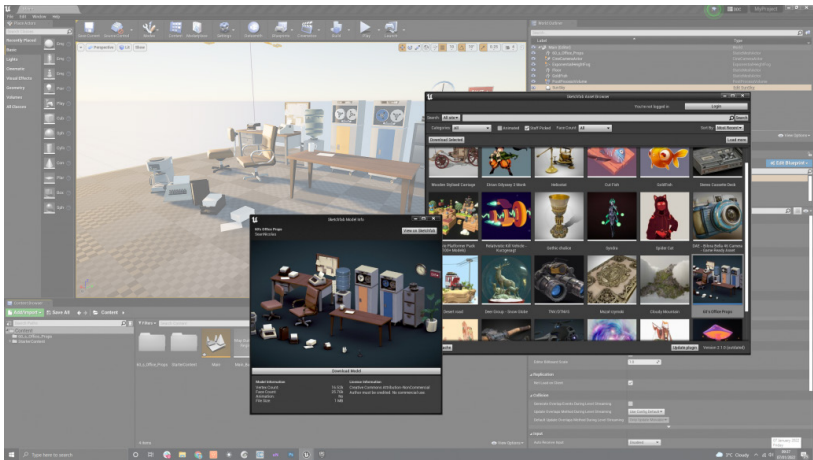


Fig. 1. A screenshot depicting Unreal Engine, with an open browser connecting directly to its asset store⁴

Viewing these asset stores not just as extensions of their game engines but platformised infrastructures in their own right, this paper examines the structural influence of asset stores on the

4 Screenshot source: 'We've Updated Our Unreal Engine Plugin', Sketchfab, 15 December 2021 <https://sketchfab.com/blogs/community/weve-updated-our-unreal-engine-plugin/> [accessed 12 December 2024]. On 22 October 2024, the Unreal Engine Marketplace and Sketchfab Store were merged and rebranded as Fab. Since I primarily examine the asset store's influence in the era of game development leading up to this change, this paper will keep to its original name, Unreal Engine Marketplace. For news of the merger, see 'Fab, Epic's New Unified Content Marketplace, Launches Today!', Sketchfab, 22 October 2024 <https://www.unrealengine.com/en-US/blog/fab-epics-new-unified-content-marketplace-launches-today> [accessed 12 December 2024].

imagination, reception, and incorporation of classical material in game development. Here, I argue that dominant asset stores like the Unity Asset Store and the Unreal Engine Marketplace do much more than passively facilitate the sale of classically-inspired game assets. Rather, they actively mediate the flow of historical material and traffic in cultural signals of demand, availability, and imaginative possibility.

This line of inquiry finds its intellectual roots in an interdisciplinary union between two fields that have rarely been brought into conversation: platform studies and classical reception. Ian Bogost and Nick Montfort first brought the study of material constraint, creativity, and culture under the banner of 'platform studies,' which they introduced as an analytical framework that 'explores how understanding a computer platform is vital to a critique of the particular works, genres, or categories of creative production built on top of it'.⁵ Classical reception studies, as its name suggests, broadly involves the examination of how various aspects of ancient Greece and Rome have been received, engaged with, and transformed beyond antiquity.⁶ A study of game engines manages to establish some common ground between the two disparate fields. The non-human orientation inherent to platform studies, premised as it is on appreciating hardware and software as cultural actors, has recently found interest in the much older discipline of Classics with the uptake of new materialism. This theoretical re-orientation towards objects and materiality has, as of late, established a productive foothold in the humanities and has begun to leave its mark on classical scholarship as well.⁷

5 Nick Montfort and Ian Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, Massachusetts: MIT Press, 2009); Ian Bogost, *Alien Phenomenology, Or, What It's Like to be a Thing* (Minneapolis: University of Minnesota Press, 2012), p. 100.

6 Lorna Hardwick, *Reception Studies* (Oxford: Oxford University Press, 2006) offers a strong introduction to classical reception and its central concerns. Although she stresses that reception is not a uniquely modern phenomenon and took place within antiquity as well (p. 4), I have opted for a more general definition since ancient receptions are not directly relevant to the topic at hand: namely, the highly contemporary receptions occurring in modern game engines and asset stores.

7 Diana Coole and Samantha Frost, eds, *New Materialisms: Ontology, Agency, and Politics* (Durham, North Carolina: Duke University Press,

Game engines, operating at the nexus of culture and technology, lend themselves readily to interdisciplinary analysis. Eric Freedman offers us one articulate framing:

By studying the engine as infrastructure, we can see code at a particular moment when it has coalesced and attached to a singular narrative impulse, even as we understand that the engine as communication is always transactional, carrying operations, relaying interactions, and connecting and transforming inputs and outputs.⁸

Within his shrewd analysis of ancient reception and ludic violence, David Serrano-Lozano has made a welcome inroad into this intersection of platform studies and classical reception, theorising that antiquity was adapted to meet a demand for easily recognisable visual interfaces during the preceding period of game development (the 1960s to early 2000s).⁹ In this era, developers had to confront the practical challenges of acclimatising a world not yet saturated with interactive media. As Serrano-Lozano suggests, it was ‘the constant need for a fluent interactive language with players’ that saw developers moulding violence-centred depictions of antiquity in order to meet design imperatives of familiarity and intuitiveness.¹⁰ Turning our focus now to game engines — the primary tool of twenty-first century game development — this paper picks up where existing scholarship has left off with the question of antiquity’s entanglements with technological constraint and commercialisation.

Working at these interdisciplinary crossroads, I imagined for myself an equally eclectic blend of audiences as I was writing this chapter. For starters, this paper speaks directly to scholars work-

2010). For a survey of this ‘material turn’ specifically within classical scholarship, see Lilah Grace Canevaro, ‘Materiality and Classics: (Re)turning to the Material’, *Journal of Hellenic Studies*, 139 (2019), 222–32.

8 Eric Freedman, *The Persistence of Code in Game Engine Culture* (New York: Routledge, 2020), pp. 11–12.

9 David Serrano-Lozano, ‘*Si vis ludum para bellum*: Violence and War as the Predominant Language of Antiquity in Video Games’, in *Ancient Violence in the Modern Imagination: The Fear and the Fury*, ed. by Irene Berti, Maria Castello, and Carla Scilabra (London and New York: Bloomsbury, 2020), pp. 151–60 (p. 152).

10 Serrano-Lozano, ‘Violence and War’, p. 157.

ing on game production as well as practitioners curious about how platforms might shape their creative processes around historical adaptation. Those coming from platform studies, STS, and media history might hopefully have their interests piqued by this exploration into the subtle yet far-reaching effects that platformised cultural software can have on the adaptation of a specific historical culture for game development. Finally, for those primarily invested in antiquity and its afterlife — whether as classicists, historians, archaeologists, curators, digital humanists, or their ilk — this chapter offers a narrative of classical reception charted across several intertwining sociotechnical developments and the ever-shifting place of ancient Greece and Rome within our contemporary visions of fantasy, immersion, and entertainment.

'Antiquity on Aisle Four!': The Platformisation of the Past in the Asset Store

In theory, any studio (or individual) with sufficient expertise, time, resources, and incentive can build their own proprietary game engine for in-house use.¹¹ While a number of (generally large and well-funded) studios have done so,¹² the game development landscape has, since the mid-2000s, undergone significant 'platformisation', a complex social, economic, and technical phenomenon which, briefly stated, involves the convergence of production and/or consumption practices across an industry onto a small number of global 'platform behemoths'.¹³ Today, a large

11 Nicoll and Keogh, *Circuits of Cultural Software*, p. 11.

12 For example, Electronic Arts (EA) uses their proprietary game engine, Frostbite, to make the *Battlefield* series (2002–present), while Ubisoft uses theirs, Anvil, to make the *Assassin's Creed* series (2007–present).

13 Platformisation has seen significant interest in scholarship and has been situated in the study of commercial game engines, especially Unity: see Maxwell Foxman, 'United We Stand: Platforms, Tools and Innovation with the Unity Game Engine', *Social Media + Society*, 5.4 (2019), 1–10 (p. 2); David Nieborg and Thomas Poell, 'The Platformisation of Cultural Production: Theorizing the Contingent Cultural Commodity', *New Media & Society*, 20.11 (2018), 4275–92; Nicoll and Keogh, *Circuits of Cultural Software*, p. 11; Aleena Chia and others, 'Platformisation in Game Development', *Internet Policy Review*, 9.4 (2020); Chris J. Young, 'Unity Production: Capturing

proportion of games are produced using one of two commercially available game engines: (1) Unity, developed by Unity Technologies, and (2) Unreal Engine, developed by Epic Games. In 2022, Unity Technologies CEO John Riccitiello announced during the company's annual keynote presentation that 'Unity accounted for 50% of all games across mobile, PC, and console, including a whopping 72% of the top 1,000 mobile games.'¹⁴ Likewise, during Unreal Engine's keynote, State of Unreal 2022, Epic Games CEO Tim Sweeney boasted that '48% of announced next-generation console titles are powered by Unreal', driving home the engine's hyper-realistic and graphically intensive capabilities.¹⁵

Dominant platforms like Unity and Unreal Engine entrench themselves over time by means of numerous, intertwining path dependencies, such as greater interoperability with other game engines. For instance, Havok — a proprietary game engine known for its advanced physics system, used by Nintendo in the making of the *Zelda* games¹⁶ — specifically advertises its compatible integration with other game engines, singling out Unity and Unreal Engine. Interoperability lends invaluable flexibility to the production process: many studios prototype early versions of their game using Unity or Unreal Engine before switching over to a proprietary engine, while others might decide to switch over to Unity or Unreal Engine mid-development.¹⁷

Additionally, game design courses in schools have become increasingly tied to specific engines like Unity, entrenching these platforms through prevailing currents of software literacy and familiarity.¹⁸ Writing about Unity, Nicoll and Keogh conclude

the Everyday Game Maker Market', in *Game Production Studies*, ed. by Olli Sotamaa and Jan Svelch (Amsterdam: Amsterdam University Press, 2021), pp. 141–158.

14 Unity, 'Unite 2022 Keynote | Unity', YouTube, 1 November 2022.

15 Unreal Engine, 'Unreal Engine 5 Release | The State of Unreal 2022 Keynote Presentation', YouTube, 5 April 2022.

16 Nintendo, *The Legend of Zelda* (series) (1986–2023), various platforms.

17 Havok, 'About Havok', n.d.

18 Nicoll and Keogh, *Circuits of Cultural Software*, p. 89: 'Increasingly, Unity either explicitly or implicitly becomes the default learning environment for student videogame developers, and schools become a crucial juncture where Unity's dominance is reinforced and perpetuated...' See also Foxman, 'United We Stand', p. 2.

from extensive interviews that, 'Quite simply, developers often use Unity because they already know how to use Unity, and developers already know how to use Unity because Unity has successfully ensconced itself within local communities as the default option.'¹⁹

Given the commercial dominance of Unity and Unreal Engine within the game development landscape, these game engine platforms function as important infrastructures that not only mediate but *shape* cultural production.²⁰ Recent scholarship on game engines has scrutinised the unrestrained freedom and creativity promised by Unity, referring to how its tools, UI, and technical capabilities have led to the creation of numerous games with a distinct and formulaic 'Unity' feel. The classification 'Unity game' has even taken on a derogatory connotation within game developer communities, implying that the game comes across as mass-produced, depersonalised, and indistinguishable from others. One major 'tell' is when a game comprises heavily of prefabricated assets, and therefore lacks the bespoke elements that convey a studio's originality.²¹

While existing scholarship has thus engaged with the creative constraints imposed by the game engines themselves, comparatively less attention has been paid to the asset stores that have been released following the widespread commercial uptake of these game engines.²² Unity launched the Unity Asset Store in November 2010, while Epic Games launched the Unreal Engine

19 Nicoll and Keogh, *Circuits of Cultural Software*, p. 89.

20 Petter Törnberg, 'How Platforms Govern: Social Regulation in Digital Capitalism', *Big Data & Society*, 10.1 (2023), 1–13 (p. 2).

21 Nicoll and Keogh, *Circuits of Cultural Software*, p. 65. See also Brendan Keogh, 'Situating the Videogame Maker's Agency through Craft', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 374–88 (p. 382); Foxman, 'United We Stand', p. 2.

22 D'An Knowles Ball, 'Artists as Assets: Labor and Capital in the Unity Asset Store', in *Video Game Art Reader: Volume 4*, ed. by Tiffany Funk (Amherst, Massachusetts: Amherst College Press, 2022), pp. 19–30 offers one direct study of the asset store, arguing that the platform exploits artists through its misleading constructions of their artistic labour. Foxman, 'United We Stand', p. 5 notes the importance of the Asset Store in entrenching Unity's game engine, but does not go into detail by viewing the asset store as a platform in itself: 'At each stage of this workflow, Unity locks-in existing platforms at a functional level. It achieves this through intraoperability: its Asset Store and other platforms affect each stage of the production

Marketplace in September 2014. Customers of these asset stores include developers of all sorts (large AAA studios, indie developers, hobbyists, and students) who purchase assets from asset artists to effectively outsource time-consuming and labour-intensive asset creation work, thereby expediting the development process. Asset stores generate profit by withholding from artists a share of each transaction (the Unity Asset Store takes a cut of 30% and the Unreal Engine Marketplace keeps 12%), while simultaneously marketing to developers the convenience and collaborative potential that comes with using their associated game engine.²³

Among the many assets for sale on the Unity Asset Store and the Unreal Engine are those inspired by Ancient Greece and Rome. Given the prominence of historical and fantasy elements in videogames, this is a popular and wide-ranging category comprised of various character models (e.g. heroes, gods, gladiators, legionnaires, the occasional senator), temples, villas, monuments, weapons, ships, marble statues, and even entire cityscapes. Just like any online marketplace (e.g. Amazon), these asset stores utilise a robust search-and-recommendation system, which allows users to locate assets they might need for their game in an efficient and targeted manner. When a user performs a directed search function for 'Roman', the resulting grid might look something like this (Fig. 2).

Whether the search term is 'Greek' or 'Roman', both asset stores each produce hundreds of search results, offering a visually suggestive frame of reference for the kinds of objects, images, and themes that belong to videogames that engage classical material in some way or another. Each search result is framed by a (usually) representative thumbnail image, along with the seller's name, asset title, buyer rating, price, and an option to add directly to cart. Clicking on a specific asset takes the user to a much more detailed asset page (Fig. 3).

pipeline. Consequently, Unity reifies and further entrenches current platforms and facilitates their use to its benefit.'

23 Unity, 'Start Publishing on the Asset Store', Unity, n.d.; Unreal Engine, 'Marketplace Guidelines', n.d.. Epic Games initially launched the Unreal Engine Marketplace with a 30% cut, matching the Unity Asset Store's, but lowered the amount to 12% in July 2018 following the massive success of *Fortnite* (2017), their massively popular flagship title, which they use to demonstrate the capabilities of Unreal Engine.

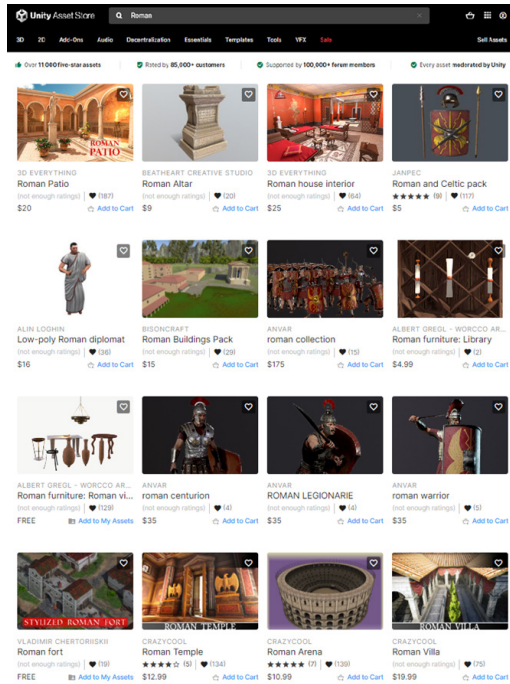


Fig. 2. An example of a search results grid for Roman-inspired assets on the Unity Asset Store²⁴

Individual asset pages include additional images that showcase each aspect of the asset, unique pieces, different angles, close-ups on intricate carvings, or highlights of special features. Some creators also include videos that offer a guided tour of their 3D environment or showcase an animation sequence. On top of these visual representations, asset creators include a written overview and descriptions ranging from the qualitative (e.g. ‘AAA quality’, ‘unique’, ‘high attention to detail’) to the deeply technical (e.g. file size, supported platforms, texture and mesh specifications, details relating to collision and physics). Within the context of an online business-to-business (B2B) marketplace, each element of

²⁴ Screenshot source: Found through a search performed for ‘Roman’ on the Unity Asset Store <https://assetstore.unity.com/> (accessed 23 April 2023).

the asset store fulfils an obvious commercial function of presenting detailed product information to potential customers.

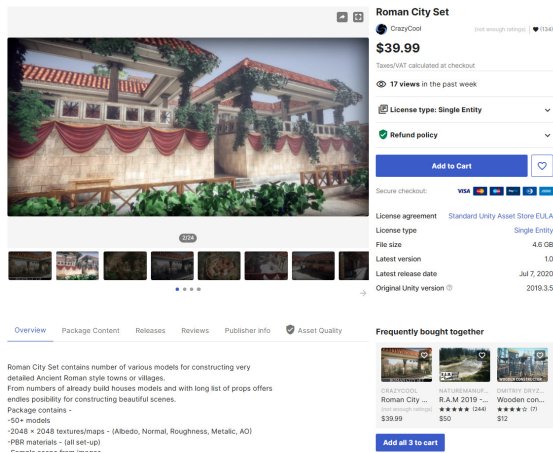


Fig. 3. An example of an individual asset page on the Unity Asset Store²⁵

The predominance of technical language here belies the fact that asset stores like the Unity Asset Store and the Unreal Engine Marketplace do not simply *facilitate* the sale of classical assets in a purely neutral, mechanical sense. Their hegemonic positionality imbues these platforms with suggestive force, transforming them into externalised infrastructures for the classical imagination that shape the place of Greco-Roman material in game development. They outline, non-exhaustively: (1) the particular elements of a game where historical material might be incorporated (e.g. character design, environments, equipment); (2) the art style, level of detail, and mode of realism that should structure their representation; and, perhaps most noticeably, (3) *which* aspects of the classical past (for instance, Rome's imperial military as opposed to Greek rustic cult practices) warrant selective adaptation for videogames. Cultural signals like these subtly inform the creative imagination of actors throughout the game industry, developers, artists, hobbyists, students, and other asset creators. More significantly, these

25 CrazyCool, 'Roman City Set', Unity Asset Store, 7 July 2020.

signals attain the backing of material and commercial forces once they begin to influence practical considerations like asset availability, supply, pricing, expertise, familiarity, and consumer demand. By mediating the flow of historical material simultaneously across its artistic and commercial axes, asset stores establish themselves as influential sites of cultural production where ancient history and modern game development collide.

As always, it should be qualified that cultural software like game engines and asset stores are never *completely* determinative of culture. Affordance has now been widely adopted as the standard terminology for acknowledging the structuring force of technology without entirely undermining the agency of human actors. As Jenny Davis concisely frames it, ‘affordances mediate between a technology’s features and its outcomes. Technologies don’t *make* people do things but instead, push, pull, enable, and constrain’.²⁶ Since asset stores emerge from a continuously evolving interplay between various human and non-human agents, one productive avenue for studying their sociotechnical dynamics might be to conceive of them, as Davis suggests, as a complex series of choices:

Technologies are designed, implemented, and used through webs of choices. Some of these choices are explicit and reflect a clear intention for the technology to affect human action in some specific way. Other choices are implicit and may not ever enter the conscious minds of designers, distributors, or end users. Each choice — explicit or implicit — reflects and affects value orientations, sociostructural arrangements, and social dynamics.²⁷

26 Jenny Davis, *How Artifacts Afford: The Power and Politics of Everyday Things* (Cambridge, Massachusetts: MIT Press, 2020), p. 6. Some recent studies, like James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024), p. 7, build upon this paradigm of affordance but express critical scepticism towards technological determinist analyses that attribute creativity disproportionately to game engines and other forms of capital. Acknowledging some value in this scepticism, I respond by recognising countercurrents to the engine-led model of game development in my section on ‘Worlds Missing, Worlds Recommended’.

27 Davis, *How Artifacts Afford*, p. 14.

Answering this call for greater attention to choice, the following section argues that a game of interpretation takes place through the medium of the asset store — a game in which the stakes may be nothing less than the classical imagination itself: how it is received, understood, and perpetuated within the landscape of videogame production.

Searching for the Classical

The very notion of ‘the classical’ emerges from a long history of mediated encounters with the past: a past that is always relative, of course, to whoever is asking. Such a past has tended to be idealised, in patently circular terms, for its very pastness. We are referring, naturally, to a specific brand of pastness — a *classical* pastness — that has tended to be viewed as especially worthy of idealisation. We even have a name for this strain of idealisation. Namely, *classicism*, the precise mechanics of which require us to think a bit more abstractly:

The classical is never directly apprehended: it always comes indirectly and secondhand, which is to say that it is the transference not merely of a perception, but of an illusion, or fantasy, about the past. Only, the fantasy is always courtesy of another’s fantasy, triangulated around some imaginary object (...)²⁸

Visuality and co-construction are crucial to the project of classicism, as captured by James Porter in this proposition. After all, it is at the intersection of our subjective gazes and lines of sight that we collectively generate the imaginary objects which we go on to label as classical.²⁹ Although he primarily had concrete objects, archaeological material, and literary works in mind, I find that this attentiveness to our shared, classicising imaginaries can offer us a salient frame for deciphering even the technologically-mediated determinations that take place on asset store platforms.³⁰ In this

28 James Porter, ‘What is “Classical” about Classical Antiquity? Eight Propositions’, *Arion*, 13.1 (2005), 27–61 (p. 54).

29 Porter, ‘Eight Propositions’, p. 38, p. 54.

30 Porter, ‘Eight Propositions’, p. 38.

day and age, nowhere does this co-production of classical objects and images occur more fervently than on the internet, scattered across innumerable websites, internet archives, digital libraries, image databases, and more. These socially determined identifications, coalesced now into helpful metadata, are what enables us, with our computers and technologies, to locate the classical within the internet's endless sea of data. They allow us to *search*.

Given the everyday nature of search and our reliance on search engines like Google, however, we may tend to take for granted the behind-the-scenes epistemic work that underlies the sleek, simple, and minimalist search boxes that we have grown accustomed to. Jutta Haider and Olof Sundin's *Invisible Search and Online Search Engines* casts a spotlight on the essential non-neutrality of search engines and the misguided perception of search engines as 'objective' relayers of information. In fact, the authors preclude that possibility entirely: 'There is no possible way to provide a *neutral* or *objective* search engine. The question has to be how are they biased and how visible are the various biases (in the plural)?'³¹ An asset store — another form of information infrastructure — relies heavily on search. To understand how historical material is shaped by these software platforms, we must begin by figuring out exactly what processes are taking place behind this search box (Fig. 4), and precisely what parameters are used whenever someone conducts a search for anything relating to antiquity.

If one were to enter 'Greek' into the search box of the Unreal Engine Marketplace, the vast majority of search results will align with a popular imagination of Greece as it circulates in the videogame landscape: plenty of statues, warriors, temples, gods, heroes, mythical creatures, and so on. Game developers hoping to incorporate Greek assets into their game might peruse an asset store's offerings in search of relevant material, perhaps guided by a set of practical questions: will this asset fit the vision for my game? Where might I make use of this? And is the time and effort saved by purchasing this worth the cost? Curious about the hidden analytical work that underlies an asset store's search operations, however, I find myself intrigued by a different set of

31 Jutta Haider and Olof Sundin, *Invisible Search and Online Search Engines: The Ubiquity of Search in Everyday Life* (Routledge, 2019), p. 39.

questions: when I search for ‘Greek’, which assets show up, and in what order? What shows up that shouldn’t have? And what doesn’t that *should*? And perhaps most importantly, who or what is it that decides?

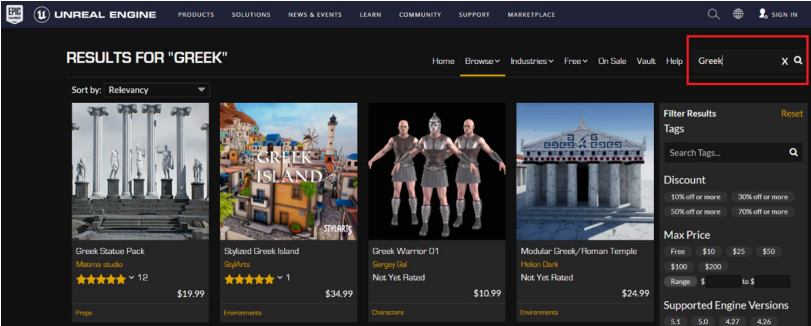


Fig. 4. The search box on the Unreal Engine Marketplace (highlighted in red)³²

Both the Unity Asset Store and the Unreal Engine Marketplace deploy algorithmic search-and-recommendation systems, which they base on forms of asset classification defined by the asset stores themselves, along with creator-defined asset titles, tags, and keywords. The Unreal Engine Marketplace limits its asset classification system to broad categories like ‘Characters’, ‘Props’, ‘Environments’, ‘Textures’, and ‘Animations’, while the Unity Asset Store offers, in addition to these, a second layer of categorization via subcategories. For instance, subcategories for environmental assets include ‘Dungeons’, ‘Fantasy’, ‘Historic’, ‘Industrial’, and ‘Sci-Fi’. Since Unity’s subcategories make only partial headway in sifting out classical material amidst the many other represented histories and cultures, creators are invited to provide a number of searchable buzzwords. The Unity Asset Store uses the term ‘related keywords’, while the Unreal Engine Marketplace uses the term ‘tags’:

³² Screenshot source: Found through a search performed for ‘Greek’ on the Unreal Engine Marketplace (now Fab) <https://www.fab.com/> [accessed 12 April 2023].

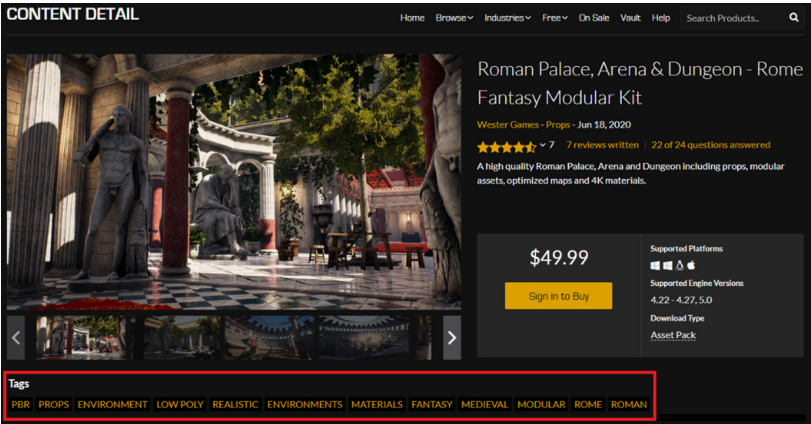


Fig. 5. ‘Tags’ (highlighted in red) on the Unreal Engine Marketplace³³

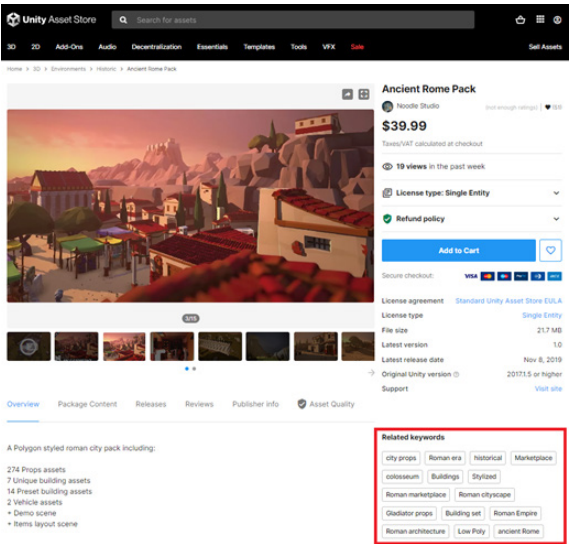


Fig. 6. ‘Related Keywords’ (highlighted in red) on the Unity Asset Store³⁴

33 Wester Games, ‘Roman Palace, Arena & Dungeon — Rome Fantasy Modular Kit’, Unreal Engine Marketplace, 18 June 2020.
34 Noodle Studio, ‘Ancient Rome Pack’, Unity Asset Store, 8 November 2019.

Unity provides a publicly available User Manual on its official website, including a specific section on ‘Adding Keywords to Assets’. There, the Manual emphasises the importance of keywords in shaping website metadata and thereby influencing the searchability of their products, couching this to creators in straightforward commercial terms: ‘They are very beneficial for your assets, as they will make them easier for potential customers to locate them within the store when using the search bar.’³⁵ We also learn, however, that Unity reserves for *itself* the final say. Under Step 8 — the keyword submission stage — the Manual instructs: ‘Please add a submission comment (...) for our Asset Store Specialists describing why you chose your keywords. This will be vital information for them to use to make a decision and expedite your update. Our Asset Store Specialists will vet keywords to ensure that they are relevant to your asset.’³⁶ In exercising ultimate control over the search parameters, the relevant Unity employees, the ‘Asset Store Specialists’, become co-authors (alongside the asset creators themselves) of the technical, cultural, and historical identifiers of assets sold on the platform.

Knowing which human actors are involved takes us only part of the way in understanding how Greco-Roman antiquity has come to be recognised, defined, then re-articulated on asset stores. We still need to examine how exactly these keywords participate in the platform’s determination of what counts or does not count as classical. Classicists themselves also have trouble untangling such thorny questions about classification.³⁷ In his aptly titled ‘What is “Classical” about Classical Antiquity? Eight Propositions’, Porter re-states this age-old dilemma with some humour: ‘So strong are the assumptions about what the classical and classicism are, we tend to forget that objects do not surface from the ground or emerge from ancient libraries wearing a sign with the label *classical* written across their face.’³⁸

35 Unity Technologies, ‘Adding Keywords to Assets’, Unity User Manual, 29 March 2017.

36 *Ibid.*, Step 8.

37 Porter, ‘Eight Propositions’, p. 28: ‘Passionate defenses of the Classical were once in vogue, but consensus was never reached and is never likely to be reached.’

38 *Ibid.*, p. 30.

I suppose if we think about it, it is somewhat odd that software like asset stores demand that digital representations of physical objects be accompanied by a comprehensive set of twenty or so identificatory keywords, especially when the objects themselves do not always offer easy markers of their origins or historical status.

Paradoxically enough, this digital mandate for constructedness is not far off from how these idealising designations of 'the classical' emerge as a matter of social practice. That is, from a vague, indefinite, but most importantly, *shared* sense that a certain object belongs to a now inaccessible, broadly Greco-Roman past. Here, taking a cue from Bourdieu's concept of *habitus* (a kind of cultural inculcation), we could view classicism as 'a set of dispositions that organise social behaviour (...) [which, in turn] directs us to the inarticulate knowledge of the practitioners of a given social field (or "game")'.³⁹ Running with this theoretical frame of an intersocial, cultural 'game', I propose that there is a game of interpretation being played between various actors with the asset store as their arena, a game for which the Unity User Manual serves as a kind of informal rulebook. While the bulk of its instruction is primarily administrative in nature or framed around the obvious commercial logic of maximising searchability and customer traffic on an online marketplace, there is some surprisingly profound advice offered in Step 6 of its 'Adding Keywords to Assets' section: 'Before you, a publisher, add keywords for your asset, *think about what kind of search terms you expect developers to use* in order to find your asset. *Think about how users search*.'⁴⁰

Regardless of whether asset sellers choose to heed this advice, this platform-sanctioned reflection on both searchability and cognition reveals how the asset store articulates its own sociotechnical infrastructure, where its various users are made to engage in an exercise of image- and word-association as they pertain to the classical. This game of interpretation begins with developers, who generate the demand for assets, and perform directed searches on asset stores to find relevant material for the projects they are

39 *Ibid.*, p. 41 citing Pierre Bourdieu, *The Logic of Practice*, ed. by Richard Nice (Stanford University Press, 1990), p. 73.

40 Unity Technologies, 'Adding Keywords to Assets', Step 6.

working on. Asset creators are confronted with the task of thinking one step ahead, to imagine how game developers engage with their game-making process and to anticipate the kinds of classically-inspired assets they should create in order to support them in the process. Meanwhile, the thought processes of both asset creators and game developers are inevitably framed by some degree of speculation, prediction, and market research as to the sort of classical material that gamers themselves — the end consumer of *both* their products — might expect or wish to see in the games they play. Complicating matters further, all participants are jointly tapped into a network of transmedia discourses about the classical within a global cultural landscape, which in turn shape the trends, discourses, and predictions of cultural interest in the game industry. Within the arena of the asset store, the stage is therefore set for a complex game of interpretation, with each networked actor contributing to the platform's eventual construction of 'the classical'.⁴¹

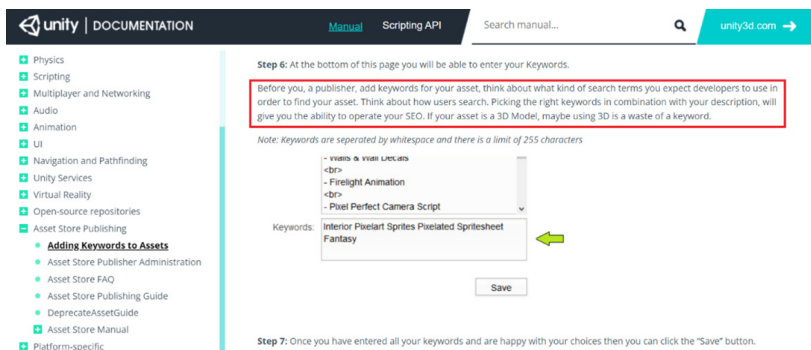


Fig. 7. Extract from the Unity User Manual guidance on keyword selection

Nor is searchability the only thing at stake (as the Manual seems to suggest). In fact, the stakes of this game might be the classical imagination itself; how it is received, understood, and then per-

41 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005) sets out a comprehensive introduction to actor-network theory, which has laid the important foundations for constructionist thought around the relationship between technology and society. Latour's theory undoubtedly informs my analysis and invocation of 'networked actor(s)' here.

petuated within the landscape of videogame production. This is because these intertwining interpretations shape the very infrastructures of cultural production by *first* influencing searchability. Since visibility on the asset store effectively signals the existence of a market, it in turn influences more practical considerations, such as perceived demand for such assets and related games, then availability, pricing, and expertise.⁴² Backed by material and commercial force, these cultural signals grow in strength and begin to exert a structuring force on creative ideation itself as it pertains to the imagined uses and relevance of the past within the present. This gets at the crux of how cultural software like asset stores are inadvertently situated as ontologically generative sites for ‘the classical’: they ‘speak’ antiquity into its contemporary, socially-constructed existence on the web. In contrast to the continued afterlife of the classical within academic and museum settings, where the material precedent of text, evidence, or source is brought to the foreground, the algorithms used by cultural software platforms like asset stores, *strictly speaking*, require no ‘real’ material basis to construct the classical’s searchable existence. They already have all they need: code, keywords, and the human actors who produce them.

Worlds Missing, Worlds Recommended

The internet has promised us comprehensive knowledge at our very fingertips, spoiling us with its unparalleled ease, efficiency, and accessibility. Media scholars contend regularly with perceptions (mistaken or otherwise) of the internet as the ultimate font and repository of human knowledge.⁴³ Accordingly, the implica-

42 Ball, ‘Artists as Assets’, p. 26 has examined the fraught dynamics of pricing and price competition within the asset store, observing that Unity itself, by putting up some of its *own* assets for sale and for free, unfairly competes with the artists that sell on its platform. My following section focuses instead on the buyers of these assets, examining the influence of these practical considerations on their decision-making process.

43 A series of experiments by Adrian F. Ward, ‘People Mistake the Internet’s Knowledge for Their Own’, *Proceedings of the National Academy of Sciences*, 118.43 (2021) offers evidence that regular reliance on internet searches has strongly blurred users’ perceptions of the boundaries between the knowledge they possess internally and the knowledge that they can externally access

tion of searchability has become an existential one: to be found on the internet is to exist. Conversely, when something *cannot* be found on the internet — when it leaves no digital footprint — its existence becomes remarkably difficult to prove. Building upon the discussion of searchability in the previous section, I now turn to the aspects of the classical that cannot easily be found in asset stores. These missing worlds, however, are less the result of a *mechanical* glitch than of a socially-enacted representational bias.

Scholars working at the intersection of Classics and videogames have extensively observed how popular game franchises set in classical antiquity overwhelmingly fixate on stories that revolve around ‘men of action’.⁴⁴ In this sense, games seem to follow in the tradition of ancient Greek epic, in its self-avowed commemoration of *klea andron* (the famed deeds of *men*).⁴⁵ Videogames have taken a mostly literal approach to this invitation, thrusting players into the sandals of deicidal Greek heroes and Roman gladiators, as well as into increasingly elaborate simulators for historical warfare, imperial expansion, and civilisation building.⁴⁶ Kevin Schut’s comprehensive analysis of historical videogames foregrounds their tendency to reinscribe masculin-

through the internet. Special volumes like Chang Choi, Francesco Piccialli, and Jason Jung, ‘Internet of Knowledge,’ *Future Generation Computer Systems*, 102 (2020) have productively taken ontological approaches to understanding the internet’s function as knowledge repository.

- 44 Dunstan Lowe, ‘Playing with Antiquity: Videogame Reception of the Classical’, in *Classics for All: Reworking Antiquity in Mass Culture*, ed. by Dunstan Lowe and Kim Shahabudin (Newcastle upon Tyne: Cambridge Scholars Publishing, 2009), pp. 64–90; Ross Clare, *Ancient Greece and Rome in Videogames: Representation, Play, Transmedia* (London and New York: Bloomsbury, 2021); Jane Draycott and Kate Cook, *Women in Classical Video Games* (London and New York: Bloomsbury, 2022); Jane Draycott, *Women in Historical and Archaeological Video Games* (Berlin: De Gruyter, 2022).
- 45 A programmatic phrase invoked in meta-performative references to epic and songcraft within Homer’s *Iliad* and *Odyssey* (*Il.* 9.189; 9.524; *Od.* 8.73). See Homer, *Odyssey, Volume I: Books 1–12*, trans. by Augustus T. Murray, ed. by George E. Dimock, Loeb Classical Library 104 (Cambridge, Massachusetts: Harvard University Press, 1919); Homer, *Iliad, Volume I: Books 1–12*, trans. by Augustus T. Murray, ed. by William F. Wyatt, Loeb Classical Library 170 (Cambridge, Massachusetts: Harvard University Press, 1924).
- 46 I gesture broadly here to the popular, long-running franchises like *God of War* (Santa Monica Studio, 2005–present), *Total War* (Creative Assembly, 2000–present), and *Civilization* (Sid Meier, Firaxis Games, 1991–present).

ized models of history centred on ‘politics, economics, and war’ in ways that ‘writ(e) marginal social groups out of our cultural historical consciousness’.⁴⁷ This influence operates bi-directionally: in the shoring up of a historical consciousness within playable media along familiar axes of social valuation, and in the curtailing of alternative possibilities for ludic adaptation.

A recent wave of scholarship has made significant inroads into uncovering some of the mechanics underlying the deeply gendered representations of antiquity in games. In their introduction to *Women in Classical Video Games* (2022), editors Jane Draycott and Kate Cook suggest that the paradigm established by earlier historical games continues to leave its lasting imprint on gaming culture, having inculcated in long-term players a misleading sense of knowledge about what ‘historical authenticity’ looks like. This has fostered, in certain vocal sects, strongly-held expectations for future titles in the historical game genre to conform to the masculinizing frames they find familiar.⁴⁸ Hannah-Marie Chidwick’s chapter examines the aggressive policing of these boundaries in *Total War: Rome II* through negative reviews and other socio-commercial pressures that players are able to impose upon developers. Citing one such review, Chidwick writes:

Those wedded to the brand of the ancient warrior as white, cis-gender male, heterosexual — and who pursue that prototype as a desirable icon of the ancient Mediterranean — perceive the inclusion of women and multiple ethnicities in positions of authority as: ‘the constant “streamlining/dumbing down” of *Total War* iteration after iteration in a desperate attempt to make the franchise appeal to wider casual audience at the cost of the needs and desires of the franchise’s core fans, that want a more complex, historical, and deeper game (like older *Total War*(s)).’⁴⁹

On Roman gladiator-inspired videogames, an extensive discussion follows below.

47 Kevin Schut, ‘Strategic Simulations and Our Past: The Bias of Computer Games in the Presentation of History’, *Games and Culture*, 2.3 (2007), 213–35 (220–21).

48 Draycott and Cook, *Women in Classical Video Games*, p. 2.

49 Hannah-Marie Chidwick, ‘Women and Violence in Ancient Mediterranean Video Games’, in *Women in Classical Video Games*, ed. by Draycott and Cook, pp. 147–71 (p. 153).

Reviews like these are by no means uncommon, echoed throughout all genres of videogames to reflect growing discontent with the industry's attempts to move beyond its long-standing 'core' demographic. Lay perceptions of historicity and ludic representations of the past are now co-produced within an ideologically sustained loop of legitimation. Claire Manning takes both the academy and the game industry to task for some of these developments, citing a host of interconnected inequities, from the game industry's long-attested sexism that leads it to simultaneously underrepresent and oversexualise women in games, to the biased assumptions held by 19th and 20th century archaeologists that give rise to misclassifications of female warrior burials as male.⁵⁰ Writing from an archaeologist's perspective, Manning casts a productive suspicion on the material transmission contexts behind our fragmented knowledge of antiquity, and the fact that it has filtered down into the popular imagination via a long and equally tendentious history of cultural preservation. The forms of historical knowledge production that have taken place in our academic and curatorial institutions have hardly been immune from the same masculine bias we find in videogames. As the following hypothetical case study aims to show, these unequal discourses surrounding cultural preservation have now shifted over into our digital libraries, software repositories, and online marketplaces.

A Trip to the Asset Store: In Search of the Gladiator and the Goddess

So that we might experience the material affordances of asset stores when it comes to the use of ancient material in more concrete terms, let us pretend we were developers set on making a videogame based on classical antiquity. Keeping in consideration the discussion of gendered representations of the past in the previous section, suppose that there are two possible projects tabled for discussion: the first being a gladiator game, and the second being a mythological, narrative-centric game based on the god-

⁵⁰ Claire Manning, 'Expectations vs. Reality: Perceived Accuracy when Women are in Historical Video Games', in *Women in Historical and Archaeological Video Games*, ed. by Draycott, pp. 57–73 (p. 71).

dess Demeter. Imagining the practical realities of a small budget, tight deadline, and limited manpower for original asset creation, we turn to asset stores to scout out the availability of relevant pre-made assets to help us decide between the two projects.

As a starting point, if we were to search for ‘Gladiator’ on either of these asset stores, we would be greeted with a sizeable number of hits, the Unity Asset Store offers 115 search results, while the Unreal Engine Marketplace offers 50 (Fig. 8).

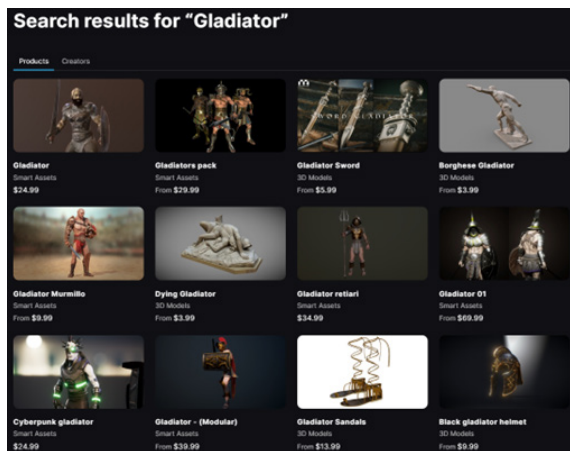


Fig. 8. A grid of search results for gladiator-inspired assets on the Unreal Engine Marketplace⁵¹

The wide selection of gladiator-related assets mostly comprises highly-detailed and fully-animated character models, found in a variety of art styles, from vivid, hyper-realistic models intended for more graphically-intensive PC or console games, to blocky, colourful, and stylised models designed with mobile games in mind. Taking the ‘Gladiator A’ asset as an example (Fig. 9), these asset pages are complete with photos from all angles, customisation options, video showcases of all the possible animations, and even a 360 degree showcase of the asset with a camera that the user can adjust at will for detailed inspection.

51 Screenshot source: found through a search performed for ‘Greek’ on the Unreal Engine Marketplace (now Fab) (accessed 18 November 2024).

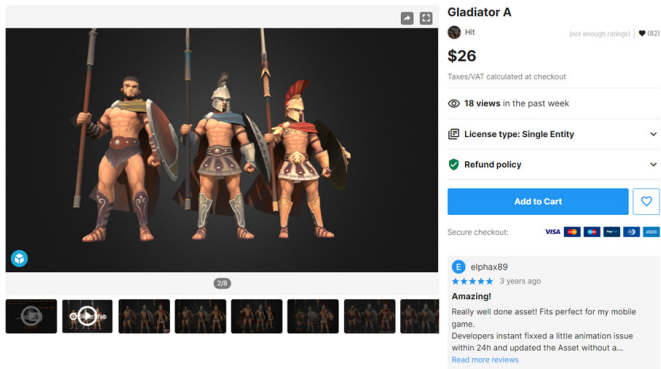


Fig. 9. An individual asset page for a set of gladiator-inspired character models on the Unity Asset Store⁵²



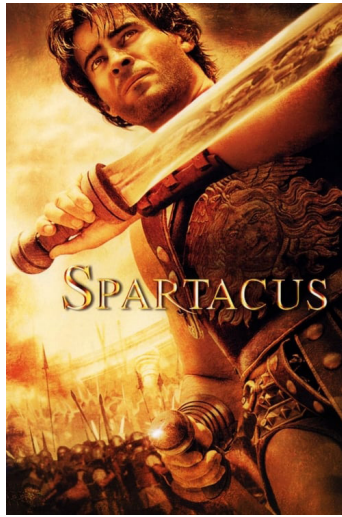
Fig. 10. An individual asset page for a gladiator arena environment on the Unreal Engine Marketplace⁵³

Accompanying these character models are also numerous environmental assets such as the Colosseum and other gladiator arenas (Fig. 10). Crafted with ease and flexibility in mind, these environments are packaged as modular environments that can be slotted seamlessly into any broader landscape that a game developer might have in mind. With the character models and environments so readily available, it is clear that a quick journey to these asset stores can supply most of the artistic building blocks for making a gladiator game. The wide offering of high-quality gladiator-inspired assets on asset stores can almost certainly be

⁵² Hit, 'Gladiator A', Unity Asset Store, 25 December 2022.

⁵³ Erhan Yilmaz, 'Gladiator Arena', Unreal Engine Marketplace, 18 September 2024.

traced to the influence of transmedia cultural flows, with sword-and-sandal films like *Gladiator* (2000), *Troy* (2004), the *Spartacus* mini-series (2004), *300* (2007), and the *Spartacus* television series (2010–2013) pervading the cultural imagination around the precise moment when commercial game engines were undergoing platformisation and their asset stores were starting to emerge (the Unity Asset Store in 2010, and the Unreal Engine Marketplace in 2014).⁵⁴



54 *Gladiator*, dir. by Ridley Scott (USA, 2000); *Troy*, dir. by Wolfgang Petersen (2004); *Spartacus*, dir. by Robert Dornhelm (2004); *300*, dir. by Zack Snyder (USA, 2007); *Spartacus* created by Steven S. DeKnight (Starz, 2010–2013). Lowe, 'Playing with Antiquity', pp. 72–73 has similarly attributed the boom of gladiator videogames to *Gladiator*: 'Scott's epic film *Gladiator* (2000) had no licensed computer game, but can instead be credited with casting up an entire wave of classically themed games, which began to break in 2005. One sign of its influence on games — what has been called the 'Gladiator effect' — is the sudden popularity of the late 2nd century CE.' Recently, the filmic sequel *Gladiator II*, dir. by Ridley Scott (2024) and the television show *Those About to Die* dir. by Roland Emmerich and Marco Kreuzpaintner (Peacock, 2024) have brought a fresh wave of interest in gladiators, suggesting that this trend of gladiatorial videogame adaptations may be far from over.



Figs. 11 and 12. Movie posters for the *Spartacus* mini-series (2004) (left) and *300* (2007) (right) showcase the visual presence of gladiatorial and adjacent sword-and-sandal media. Note, for instance, visual resonances between the warriors in *300* to the 'Gladiator A' assets (Fig. 9).

The televisual gladiatorial craze finds a natural fit with the dominant combat-driven model of game design. This alignment lends easy appeal and usability to gladiator-related game assets, which are perceived as products more likely to be in demand if put up for sale. On their own, asset stores are certainly not determinative of creative production, or capable of generating cultural signals out of thin air. Yet, by directing and diffusing cultural flows from existing videogames and other popular transmedia depictions in literature, film, television, comics, graphic novels, and animation, they propagate prevailing cultural imaginaries and foster creative path dependencies at a material level by incentivising the creation of certain types of high-quality assets and making them readily available for wide commercial use on an online marketplace.

Now imagine that we, being the enterprising game developers that we are, wish to inject a touch of variety and flair into our game. Instead of having gladiators simply face off against one another, we could include a formidable enemy for our gladiators to face in combat within the arena. Better yet if it's an iconic, mythological creature like the Minotaur. If one were to perform a search for 'Minotaur', they would find an impressive 94 hits on the Unity Asset Store, and 89 on the Unreal Engine Marketplace.

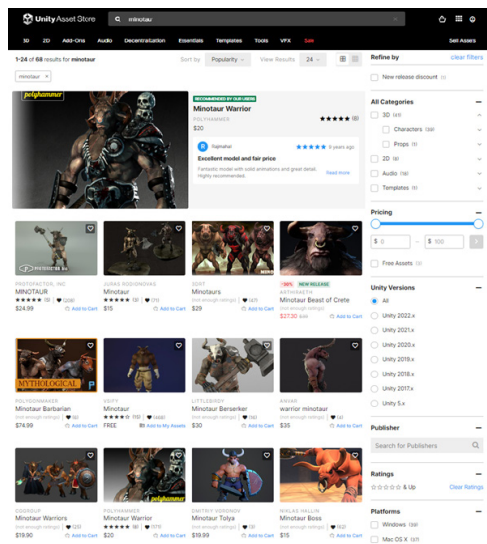


Fig.13. A grid of search results for ‘Minotaur’ in the Unity Asset Store⁵⁵

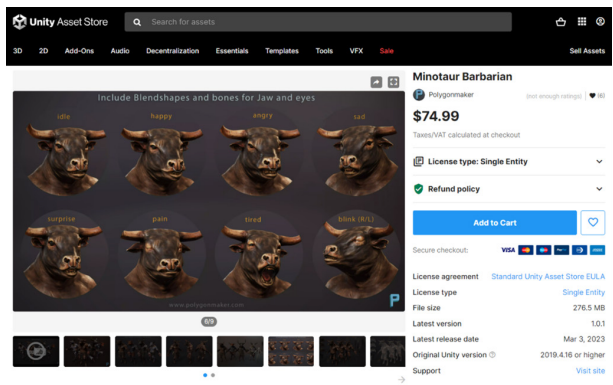


Fig. 14. An individual asset page for ‘Minotaur Barbarian’, with a showcase of detailed facial animations⁵⁶

55 Screenshot from a search performed for ‘Minotaur’ on the Unity Asset Store (accessed 18 November 2024).

56 Polygonmaker, ‘Minotaur Barbarian’, Unity Asset Store, 3 March 2023.

Once more, the user would be greeted with a selection of highly-detailed and animated models, with the full range of possible price points (Fig. 14): from a simple model being offered for free, to a couple of good options priced at 15 USD, to a whopping 74.99 USD for an elaborate ‘Minotaur Barbarian’ package that comes with detailed animations for attacking, dying, movement, idling around, and even facial expressions like yawning (Fig. 14). The offerings of antiquity-inspired assets made with combat-based games in mind are not simply *available* on these asset stores, but they enjoy the privilege of detail, variety, quality, and reasonable pricing facilitated by commercial competition within an online marketplace.

Should we turn now to our other project and perform a search for ‘Demeter’ on both of these asset stores, a much less satisfactory selection emerges. When I first began this project in April 2023, my search results on both asset stores came up entirely (Figs. 15 and 16).

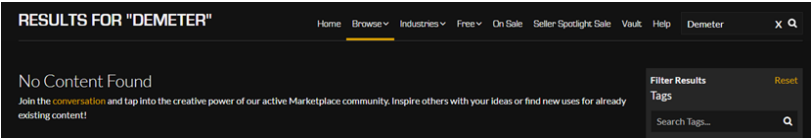


Fig. 15. No search results are found for ‘Demeter’ on the Unreal Engine Marketplace

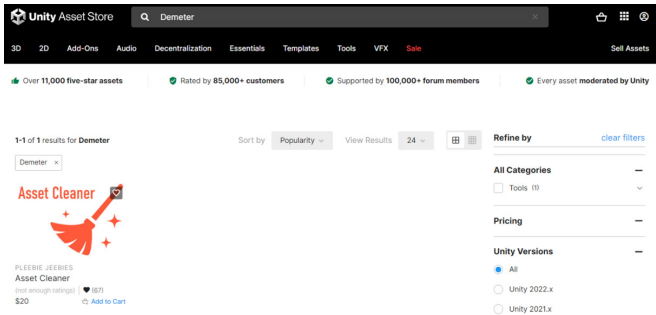


Fig. 16. A single unrelated search result is found for ‘Demeter’ on the Unity Asset Store⁵⁷

57 Results from searches performed for ‘Demeter’ on the Unreal Engine Marketplace and Unity Asset Store (accessed 23 April 2023).

The Unreal Engine Marketplace offered not a single hit, while the Unity Asset Store presented a single unrelated search result, directing the user to an 'Asset Cleaner' tool. While this could have come in handy perhaps, it was not quite what we were looking for. Carrying out the same search slightly over a year later, near the end of 2024, a small selection of options have now appeared (Figs 17. and 18).

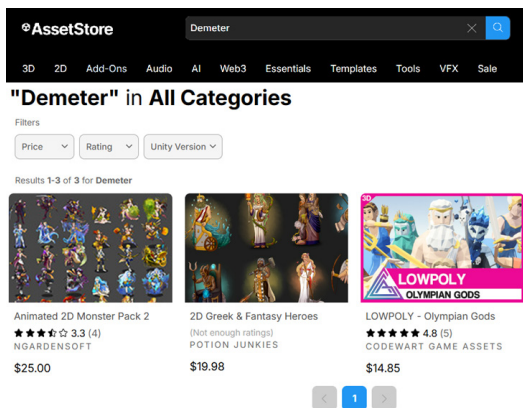


Fig. 17. Three new options on the Unity Asset Store; Demeter can be found in collections of Greek characters⁵⁸

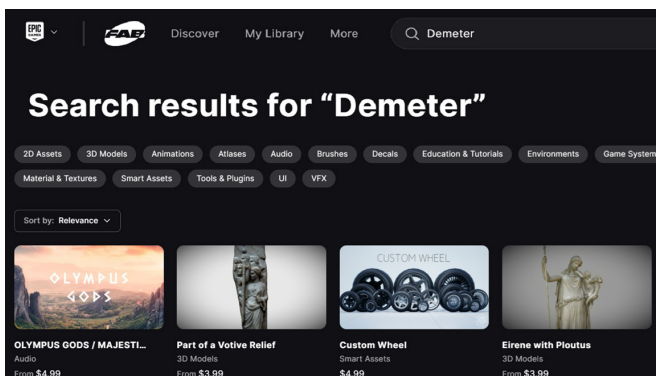


Fig. 18. Four new options on the Unreal Engine Marketplace, with varying degrees of relevance⁵⁹

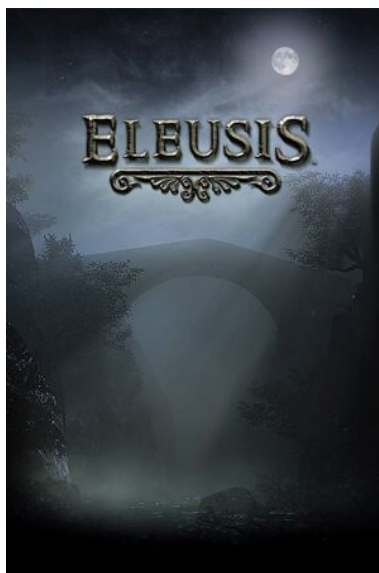
- 58 Results from a search performed for 'Demeter' on the Unity Asset Store [accessed 12 December 2024].
- 59 Results from a search performed for 'Demeter' on the Unreal Engine Marketplace (now Fab) [accessed 12 December 2024].

On the Unity Asset Store, we now find Demeter-related assets available as part of three larger collections of Greek mythological characters. The Unreal Engine Marketplace now presents us with four search hits, offering a relevant collection of soundtracks themed according to each Olympian God, possibly pertinent 3D renderings of archaeological finds, and one unrelated search result. Although these developments seem to signal a gradual movement towards the incorporation of a wider range of historical material, there remains a world of difference between this and the cornucopia of assets afforded to gladiators and minotaurs. We might be able to cobble together a few relevant character assets for this project and add in a nifty soundtrack accompaniment, but such a game world would remain woefully incomplete.

To qualify the technologically deterministic implications of this search, it must be stressed that none of this suggests that representations of Demeter have not been found in games. She appears, for instance, as one of the player's Olympian benefactors in the immensely popular, award-winning videogame *Hades*.⁶⁰ The game offers a careful and unique characterisation of a regal, frosty goddess who, departing from her more iconic associations with the harvest, lends the player-controlled Zagreus her powers of ice and winter. This creative representation of Demeter aligns itself with her depiction in the throes of the *Homeric Hymn to Demeter*, prolonging the winter as she grieves for the traumatic loss of her daughter, Persephone. The game tells and resolves this story as the player encounters Demeter repeatedly over the course of many playthroughs. Likewise, *Eleusis* (2013), a first-person horror-adventure game, offers a playable exploration of the rustic ritual practices that surround Demeter, known as the Eleusinian Mysteries. *Eleusis* has been analysed by Ross Clare as a 'psychologically unsettling' work that draws the player into an ecofeminist interpretation of the Mysteries which recasts those ritual practices as a frame for exploring the possibility and threat of environmental reclamation.⁶¹ Given that both these games manage sophisticated and researched engagements with the elusive goddess, it is clear that asset stores alone do not tell the full story.

60 Supergiant Games, *Hades*, 2020.

61 Clare, *Ancient Greece and Rome in Videogames*, pp. 127, 134.



Figs. 19 and 20. Demeter in Supergiant Games' *Hades* (2020) (left); cover art of Nocturnal Works' *Eleusis* (2013) (right)⁶²

Although this paper is concerned primarily with game development software — an aggregation of *non*-human actors for a joint purpose — and how it shapes the representation of classical mate-

62 Supergiant Games, *Hades* (2020), various platforms; Nocturnal Works, *Eleusis* (2013), Windows.

rial, it is essential that we acknowledge how human actors like game developers can challenge those technological affordances by exploring underrepresented aspects of the classical world. In fact, bringing to life lesser-known aspects of Greek myth is something that the narrative director of Supergiant Games has stressed as a key objective of the studio in the making of *Hades*.⁶³ Recent work on game engines, such as James Malazita's *Enacting Platforms: Feminist Technoscience and the Unreal Engine*, has advised timely caution that, even as we continue to take seriously the undeniable influence of platforms and technology used in creative production, not to tilt too far towards the opposing axis of an unexamined 'fetishization or concretization of the technical apparatus'.⁶⁴ Accordingly, it must be said that counter-currents to prevailing patterns of creative production might not be captured simply through an analysis of asset stores, B2B (business-to-business) marketplaces where sellers are inherently incentivised to market products that cater towards wider and more general use. These counter-currents emerge as blind spots in the data, taking the form of original assets never intended to reach an asset store. Such assets are crafted by studios for in-house use and may even be deployed solely within a studio's own proprietary game engine.⁶⁵

The majority of studios, however, may not necessarily have sufficient capital, expertise, or simply an incentive to resist the prevailing currents of historical representation. This is only likely to be accentuated by the industry's recent shift towards indie game development. Smaller studios, working without the luxury of large teams of 3D artists, have to be extra judicious when allocating resources to original asset creation. Purchasing and modifying pre-made assets is often the most practical and efficient solution. Influenced by these material considerations, developers are exposed to the technological affordances of commercial game

63 Ryan Easby, 'Interview With Supergiant Game's Creative Director Greg Kasavin', *The Outerhaven*, 9 September 2021.

64 Malazita, *Enacting Platforms*, p. 8.

65 For example, Ubisoft used Anvil, their proprietary game engine, in the making of *Assassin's Creed Odyssey*, a massive undertaking that was able to rely heavily on carefully-recreated, rather than pre-made, classical material.

engines and their asset stores, which manifest clear preferences for some types of ancient assets over others. The sizeable presence of Roman gladiatorial material compared to Demeter's near-absence represents only one instance of this skewed representation of antiquity on these platforms. The circumscribed nature of these offerings nudges developers towards selectively receiving certain aspects of antiquity while overlooking others, in ways that inevitably shape the classical imagination.

The entanglement of game development software within these currents of historical representation has cumulative implications, especially once practical considerations are factored in. Given the hefty (and growing) production costs of game development, commercial viability is often decisive in determining whether the green light will be given to even begin production. On asset stores we find a wide variety of detailed, animated, and elaborately showcased gladiator-related assets, at price points driven down by stiff competition. As things are, it would be far simpler, easier, cheaper, and quicker to procure all the assets needed for a game where gladiators fight minotaurs in an arena than to obtain a single asset depicting Demeter. Case in point: *Circus Maximus*' (2002) delightful cover features a minotaur-gladiator swinging his axe from the backseat of a chariot (Fig. 21). It is little coincidence that the past two decades have borne witness to an extensive selection of gladiator-inspired videogames (Fig. 21).

This trend of gladiatorial videogames is, as classicists like Dunstan Lowe would note, 'ironic' given their scarce and often unflattering depictions in antiquity.⁶⁶ These playable gladiators muster much of their contemporary relevance and legitimacy from what Lowe refers to as the long-standing 'link between Classics and patriarchy' and their alignment with 'the celebration of masculine stereotypes in games'.⁶⁷ The prevalence of this gladiatorial imaginary across the industry's largest game engine asset stores is evidence that the masculinizing associations accrued by antiquity inform not only the output of game development, but their material and technical bases of creative production. Examining

66 Lowe, 'Playing with Antiquity', p. 80 (citing Barton, *Sorrows of the Ancient Romans*, pp. 11–81).

67 *Ibid.*, pp. 79–80.

the wider implications of game engine platformisation, Maxwell Foxman remarks how ‘the multitude of creative possibilities are increasingly locked-in, which affects all stages of game development and manifests in countless ways’.⁶⁸ The forces that simultaneously maintain and constrain the classical imagination are not exempt from this diffusion. They are present at the level of technical software, at brainstorming sessions in the writers’ room, and all the way down to the marketing and consumption of these games in ways that cycle endlessly into one another.



Fig. 21. A selection of cover art from gladiator videogames produced in the last two decades⁶⁹

68 Foxman, ‘United We Stand’, p. 5.

69 Kodiak Interactive, *Circus Maximus* (2002), PS2 and Xbox; Acclaim Studios Manchester, *Gladiator: Sword of Vengeance* (2003), Windows, PS2, Xbox; LucasArts, *Gladius* (2003), PS2, Xbox, and GameCube; Ertain and Koei, *Colosseum: Road to Freedom* (2005), PS2; GOSHOW, *Gladiator Begins* (2011), PSP; Crytek, *Ryse: Son of Rome* (2013), Windows and Xbox One; Steel Monkeys, *I, Gladiator* (2015), Windows, Mac, iOS; Creative Storm Entertainment, *Age of Gladiators* (2016), Windows; VirtualAge,

Since these discourses around production spill over directly into the ideological battleground that mass entertainment and hobby spaces like gaming have become, these materialised preferences can have far-reaching implications that extend beyond academic squabbles over historical representation. An article by Stephanie Jennings offers an incisive look into the industry's unexamined obsession with the 'monomyth'⁷⁰, a term coined by Joseph Campbell in reference to the hero's journey, which he posits as a 'universal' narrative structure. Although Campbell's monomyth finds no shortage of detractors within the academy, Jennings observes how it has been successfully internalised into mainstream game design philosophy and entrenched as the default.⁷¹ Framing the game industry's monomythic obsession as a 'secularized religiosity'⁷² — with loyal adherents in players and developers alike — Jennings turns the spotlight onto the tenacious convictions that sustain the preferences we now find encoded within its creative, technical, and commercial infrastructure:

There is an undeniable conventionalism at work across world-saviour videogames. Together, their profitability and assurances of previous success; players' enthusiasm for them; and the preponderance of white masculinity across imagined target audiences, participation in gaming culture, videogame development and design education all spiral into a self-reinforcing coil of repetitive and uninterrupted design practices (...) [T]he hero's journey is now 'just level design', the natural and universal and sacrosanct way to create videogames.⁷³

Gladius (VR game) (2016), *Meta Quest*, 2, 3, 3S, and Pro; Creative Storm Entertainment, *Age of Gladiators II: Rome* (2018), Windows, Brain Seal Limited, *Story of a Gladiator* (2019), Switch, PS4, Windows, Xbox One, Mac, Android, iOS; Jordy Lakiere, *We Who Are About To Die* (2022), Windows.

70 Joseph Campbell, *The Hero with a Thousand Faces*, 2nd edn (Princeton, NJ: Princeton University Press, 1968).

71 Stephanie C. Jennings, 'Only You Can Save the World (of Videogames): Authoritarian Agencies in the Heroism of Videogame Design, Play, and Culture', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 320–44.

72 Jennings, 'Only You Can Save the World', p. 332.

73 Jennings, 'Only You Can Save the World', pp. 331–32, citing Janine Fron and others, 'The Hegemony of Play', *Proceedings, DiGRA: Situated Play*,

Enforcement of these paradigms can range anywhere from implicit support to outbursts of aggression,⁷⁴ and as scholars like Chidwick have shown, games centred around history are profoundly implicated in this reactionary opposition to change.⁷⁵ The legitimating function that the past takes on within these masculinized imaginaries turns historical games into some of gaming's most urgent zones of ideological contention, especially in the eyes of reactionaries that wince at even the slightest suggestion that alternative formulations — of gaming; of history; of the world — are being actively contemplated in ways that threaten to reshape the medium's cultural centre. These anxieties around historical revisionism can be easily restated in accordance with the age-old alarmist rhetoric that if history itself can be rewritten, nothing else is sacred.

The direct link between game production and gaming culture therefore bears implications for considering how the forms of technical affordances explored in this paper simultaneously operate as more ideological modes of constraint. Platformised software — asset stores included — actively attempt to keep users within pre-established epistemic frames, re-affirming familiar choices rather than challenging our innate preferences, inclinations, and presumptions. One of the most explicit ways by which they accomplish this is through recommendations, which attempt to link users seamlessly from one thing to the next according to pre-defined parameters of relevance (the asset being viewed, the user's search history, as well as keywords, tags, titles, and ratings). Studying the algorithms and metrics used in recommender systems by music and television streaming platforms, Nick Seaver summons the apt metaphor of 'entrapment' to explain this core and seemingly inescapable feature of our hyper-mediated land-

Tokyo, Japan, September 24–27, 2007, pp. 1–10 and Bei Yang, 'Imagineers at Play', Keynote speech at Meaningful Play 2018 Conference, Michigan State University, East Lansing, USA.

74 For instance, GamerGate, a harassment campaign against women in the gaming industry that began in 2014, along with fresh waves of harassment in 2024 against diversity and inclusion consultancies like Sweet Baby Inc. that specialise in videogames.

75 Chidwick, 'Women and Violence'.

scape.⁷⁶ His analysis foregrounds how recommender systems are designed to capture and build worlds for users, exposing them as ‘epistemic frame(s) designed to entice and hold particular kinds of envisioned agents, according to culturally specific cosmological preconceptions.’⁷⁷ The highly visual interfaces of the Unity Asset Store and the Unreal Engine Marketplace — even more so than music streaming platforms like Spotify — facilitates the interpretation of these asset stores through this cosmological lens:

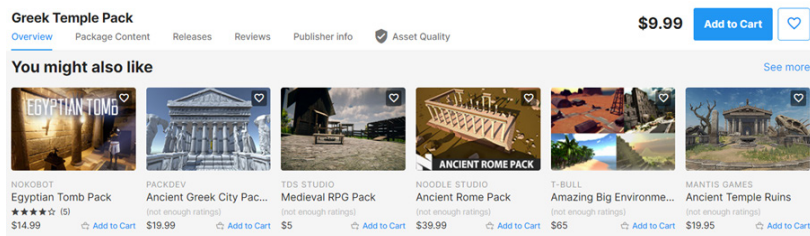


Fig. 22. A selection of recommended assets on the Unity Asset Store

Both asset stores bombard users with a visual array of additional options, suggestively laid out beneath headers such as ‘You might also like’, ‘Frequently bought together’, ‘Related content’, and ‘More from (Seller)’. These recommendations banish the messiness and complexity of the past, allowing history to instead cascade neatly into these predesignated pathways of creation. As users find these temples, tombs, and heroes placed side-by-side — each with the ‘Add to Cart’ option a convenient single-button click away — they are invited to envision a world already midway through the process of building itself. *This* is the potent rhetoric wielded by platforms; a persuasion that works on the imagination. It relies upon the same circular search logics that drive these recommendations as well as the imbalanced offerings of historical assets. It is hard to deny that platform technologies make creative work infinitely more convenient, but they simultaneously threaten to hijack the cognitive and creative labour of search and synthesis. One must wonder about the possibilities we miss out

76 Nick Seaver, ‘Captivating Algorithms: Recommender Systems as Traps’, *Journal of Material Culture*, 24.4 (2019), 421–36.

77 Seaver, ‘Captivating Algorithms’, p. 432.

on when the very tools we rely on are predisposed to consign our games to tread and retread upon the same played out uses of history. Perhaps it is time we ditch the convenient, fully-stocked shelves to instead go searching for the histories left forgotten in the backroom.

Conclusion

My objective in this chapter has not been to impose any expectations of historicity onto game developers, let alone to gate-keep how classical antiquity is used in games. If anything, the inspiration for this project began as a thought experiment in de-centering the classicist, the academy, and curatorial institutions. Rather, I hoped to bring attention to the immense influence being exerted on the historical consciousness by games and new media. These are realms governed not by academics, but creative professionals, software technologies, and the whims of the free market. This examination of how historical material is received, processed, packaged, distributed, and sold by asset stores has hopefully served as an informative window, not just into game development, but more broadly into the technologies of cultural production and preservation through which the objects of academic study circulate in the popular imagination. Accordingly, game engines like Unity and Unreal Engine (and their asset stores) deserve our attention. Tenacious as platforms tend to be, they are on a trajectory to persist through generation after generation of game developers as the industry's canvas of choice, quietly shaping the future of videogames and, with it, classical antiquity's playable afterlife.

Bibliography

- Ball, D'An Knowles, 'Artists as Assets: Labor and Capital in the Unity Asset Store', in *Video Game Art Reader: Volume 4*, ed. by Tiffany Funk (Amherst, Massachusetts: Amherst College Press, 2022), pp. 19–30
- Barton, Carlin, *The Sorrows of the Ancient Romans: The Gladiator and the Monster* (Princeton, New Jersey: Princeton University Press, 1993)

- Bogost, Ian, *Alien Phenomenology, Or, What It's Like to be a Thing* (Minneapolis, Minnesota: University of Minnesota Press, 2012)
- Bourdieu, Pierre, *The Logic of Practice*, trans. by Richard Nice (Stanford, California: Stanford University Press, 1990)
- Campbell, Joseph, *The Hero with a Thousand Faces*, 2nd edn (Princeton, New Jersey: Princeton University Press, 1968)
- Canevaro, Lilah Grace, 'Materiality and Classics: (Re)Turning to the Material', *Journal of Hellenic Studies*, 139 (2019), 222–32, <https://doi.org/10.1017/S0075426919000089> [accessed 12 December 2024]
- Chia, Aleena, Brendan Keogh, Dale Leorke, and Benjamin Nicoll, 'Platformisation in Game Development', *Internet Policy Review*, 9.4 (2020), <https://doi.org/10.14763/2020.4.1515> [accessed 12 December 2024]
- Chidwick, Hannah-Marie, 'Women and Violence in Ancient Mediterranean Video Games', in *Women in Classical Video Games*, ed. by Jane Draycott and Kate Cook (London: Bloomsbury, 2022), pp. 147–71
- Choi, Chang, Francesco Piccialli, and Jason J. Jung, 'Internet of Knowledge', *Future Generation Computer Systems*, 102 (2020), 948–49, <https://doi.org/10.1016/j.future.2019.07.058> [accessed 12 December 2024]
- Cipriani, Luca, Silvia Bertacchi, and Gianna Bertacchi, 'An Optimised Workflow for the Interactive Experience with Cultural Heritage through Reality-Based 3D Models: Case Study in Archaeological and Urban Complexes', *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XLII-2/W11 (2019), 427–34, <https://doi.org/10.5194/isprs-archives-XLII-2-W11-427-2019> [accessed 12 December 2024]
- Clare, Ross, *Ancient Greece and Rome in Videogames: Representation, Play, Transmedia* (London: Bloomsbury, 2021), <https://doi.org/10.5040/9781350157224> [accessed 12 December 2024]
- Coole, Diana, and Samantha Frost, eds, *New Materialisms: Ontology, Agency, and Politics* (Durham, North Carolina: Duke University Press, 2010), <https://doi.org/10.1215/9780822392996> [accessed 12 December 2024]
- Davis, Jenny L., *How Artifacts Afford: The Power and Politics of Everyday Things* (Cambridge, Massachusetts: MIT Press, 2020)
- Draycott, Jane, and Kate Cook, eds, *Women in Classical Video Games* (London: Bloomsbury, 2022)
- Easby, Ryan, 'Interview With Supergiant Game's Creative Director Greg Kasavin', *The Outerhaven*, 9 September 2021, <https://www.theouterhaven.net/2021/09/in-discussion-supergiant-games-greg-kasavin/> [accessed 12 December 2024]
- Foxman, Maxwell, 'United We Stand: Platforms, Tools and Innovation with the Unity Game Engine', *Social Media + Society*, 5.4 (2019), 1–10, <https://doi.org/10.1177/2056305119880177> [accessed 12 December 2024]
- Freedman, Eric, *The Persistence of Code in Game Engine Culture* (New York: Routledge, 2020), <https://doi.org/10.4324/9780429434242>

- , 'Software', in *The Craft of Criticism: Critical Media Studies in Practice*, ed. by Michael Kackman and Mary Celeste Kearney (New York: Routledge, 2018), pp. 318–30, <https://doi.org/10.4324/9781315879970-27> [accessed 12 December 2024]
- Fron, Janine, and others, 'The Hegemony of Play', *Proceedings, DiGRA: Situated Play*, Tokyo, Japan, September 24–27, 2007, pp. 1–10
- Haider, Jutta, and Olof Sundin, *Invisible Search and Online Search Engines: The Ubiquity of Search in Everyday Life* (London and New York: Routledge, 2019), <https://doi.org/10.4324/9780429448546>
- Hardwick, Lorna, *Reception Studies* (Oxford: Oxford University Press, 2006)
- Homer, *Iliad*, Volume I: Books 1–12, trans. by Augustus T. Murray, ed. by William F. Wyatt, Loeb Classical Library 170 (Cambridge, Massachusetts: Harvard University Press, 1924)
- , *Odyssey*, Volume I: Books 1–12, trans. by Augustus T. Murray, ed. by George E. Dimock, Loeb Classical Library 104 (Cambridge, Massachusetts: Harvard University Press, 1919)
- Jennings, Stephanie C., 'Only You Can Save the World (of Videogames): Authoritarian Agencies in the Heroism of Videogame Design, Play, and Culture', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 320–44, <https://doi.org/10.1177/13548565221079157> [accessed 12 December 2024]
- Keogh, Brendan, 'Situating the Videogame Maker's Agency through Craft', *Convergence: The International Journal of Research into New Media Technologies*, 28.2 (2022), 374–88, <https://doi.org/10.1177/13548565211056123> [accessed 12 December 2024]
- Kumar, Abhishek, *VR Integrated Heritage Recreation: Using Blender and Unreal Engine 4* (Berkeley, California: Apress, 2020)
- Latour, Bruno, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005)
- Lowe, Dunstan, 'Playing with Antiquity: Videogame Reception of the Classical', in *Classics for All: Reworking Antiquity in Mass Culture*, ed. by Dunstan Lowe and Kim Shahabudin (Newcastle upon Tyne: Cambridge Scholars Publishing, 2009), pp. 64–90
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Manning, Claire, 'Expectations vs. Reality: Perceived Accuracy when Women are in Historical Video Games', in *Women in Historical and Archaeological Video Games*, ed. by Jane Draycott (Berlin: De Gruyter, 2022), pp. 57–73
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019), https://doi.org/10.1007/978-3-030-25012-6_1

- Nieborg, David, and Thomas Poell, 'The Platformization of Cultural Production: Theorizing the Contingent Cultural Commodity', *New Media & Society*, 20.11 (2018), 4275–92 [accessed 12 December 2024]
- Porter, James, 'What is "Classical" about Classical Antiquity? Eight Propositions', *Arion*, 13.1 (2005), 27–61
- Schut, Kevin, 'Strategic Simulations and Our Past: The Bias of Computer Games in the Presentation of History', *Games and Culture*, 2.3 (2007), 213–35, <https://doi.org/10.1177/1555412007306202> [accessed 12 December 2024]
- Seaver, Nick, 'Captivating Algorithms: Recommender Systems as Traps', *Journal of Material Culture*, 24.4 (2019), 421–36, <https://doi.org/10.1177/1359183518820366> [accessed 12 December 2024]
- Serrano-Lozano, David, 'Si vis ludum para bellum: Violence and War as the Predominant Language of Antiquity in Video Games', in *Ancient Violence in the Modern Imagination: The Fear and the Fury*, ed. by Irene Berti, Maria Castello, and Carla Scilabra (London and New York: Bloomsbury, 2020), pp. 151–60
- Törnberg, Petter, 'How Platforms Govern: Social Regulation in Digital Capitalism', *Big Data & Society*, 10.1 (2023), 1–13, <https://doi.org/10.1177/20539517231153808> [accessed 12 December 2024]
- Ward, Adrian F., 'People Mistake the Internet's Knowledge for Their Own', *Proceedings of the National Academy of Sciences*, 118.43 (2021), <https://doi.org/10.1073/pnas.2105061118>
- Weinel, Jonathan, 'The Senses Beyond: New Directions in Game Engine Experiences', in ed. by Tula Giannini, Jonathan P. Bowen, *The Arts and Computational Culture: Real and Virtual Worlds* (Cham, Switzerland: Springer Nature Switzerland, 2024), pp. 499–520
- Yang, Bei, 'Imagineers at Play', keynote address, Meaningful Play 2018 Conference, Michigan State University, East Lansing, 13 October 2018, <https://meaningfulplay.msu.edu/2018/program> [accessed 12 December 2024]
- Young, Chris J., 'Unity Production: Capturing the Everyday Game Maker Market', in *Game Production Studies*, ed. by Olli Sotamaa and Jan Svelch (Amsterdam: Amsterdam University Press, 2021), pp. 141–58

Websites and videos

- CrazyCool, 'Roman City Set', Unity Asset Store, 7 July 2020 <https://assetstore.unity.com/packages/3d/environments/historic/roman-city-set-168930> [accessed 12 December 2024]
- Havok, 'About Havok', Havok, <https://www.havok.com/about-havok> [accessed 12 December 2024]

- Hit, 'Gladiator A', Unity Asset Store, 25 December 2022 <https://assetstore.unity.com/packages/3d/characters/gladiator-a-136117?srltid=AfmBOooRMjT6xMCcMUooBc78hgP6yDwxnRcOfDFYie6nCZqlbUmrImCu> [accessed 12 April 2023]
- Noodle Studio, 'Ancient Rome Pack', Unity Asset Store, 8 November 2019 https://assetstore.unity.com/packages/3d/environments/historic/ancient-rome-pack-156176?srltid=AfmBOorHrTEAdjQuFA9H_8VoM8wnGMkMcEQ5-FqePr6mSzAgYkT7dVa2 [accessed 12 April 2023]
- Polygonmaker, 'Minotaur Barbarian', Unity Asset Store, 3 March 2023 <https://assetstore.unity.com/packages/3d/characters/humanoids/fantasy/minotaur-barbarian-222570> [accessed 12 April 2023]
- Unity, 'Unite 2022 Keynote | Unity', YouTube, 1 November 2022, <https://www.youtube.com/watch?v=wdmiPPjcBSA> [accessed 12 December 2024]
- Unity, 'Start Publishing on the Asset Store', Unity, n.d. <https://assetstore.unity.com/publishing/publish-and-sell-assets> [accessed 12 December 2024]
- Unity Technologies, 'Adding Keywords to Assets', Unity User Manual, 29 March 2017 <https://docs.unity3d.com/550/Documentation/Manual/AssetStoreMassLabeler.html> [accessed 12 April 2023]
- Unreal Engine, 'Unreal Engine 5 Release | The State of Unreal 2022 Keynote Presentation', YouTube, 5 April 2022, https://www.youtube.com/watch?v=7ZLibi6s_ew [accessed 12 December 2024]
- Unreal Engine, 'Marketplace Guidelines', n.d. <https://www.unrealengine.com/en-US/marketplace-guidelines> [accessed 12 December 2024].
- Wester Games, 'Roman Palace, Arena & Dungeon — Rome Fantasy Modular Kit', Unreal Engine Marketplace, 18 June 2020 <https://www.fab.com/listings/c73d016f-0776-4707-9b2c-a5e101b5966e> [accessed 12 April 2023].
- Yilmaz, Erhan 'Gladiator Arena', Unreal Engine Marketplace, 18 September 2024 <https://www.fab.com/listings/56a4fb69-e464-4409-bcb9-f64089bdc4f7> [accessed 12 December 2024]

Ludography

- Acclaim Studios Manchester, *Gladiator: Sword of Vengeance* (Acclaim Entertainment, 2003), PlayStation 2; Windows PC; Xbox
- Brain Seal Limited, *Story of a Gladiator* (Brain Seal Limited, 2019), Android; iOS; macOS; Nintendo Switch; PlayStation 4; Windows PC; Xbox One
- Creative Assembly, *Total War* (series) (Creative Assembly, 2000–present), various platforms

- Creative Storm Entertainment, *Age of Gladiators* (Creative Storm Entertainment, 2016), Windows PC
- , *Age of Gladiators II: Rome* (Creative Storm Entertainment, 2018), Windows PC
- Crytek, *Ryse: Son of Rome* (Crytek, 2013), Windows PC; Xbox One
- Electronic Arts, *Battlefield* (series) (Electronic Arts, 2002–present), various platforms
- Epic Games, *Fortnite* (Epic Games, 2017), Android; iOS/iPadOS; Nintendo Switch; PlayStation 4; PlayStation 5; Windows PC; Xbox One; Xbox Series X/S
- Ertain and Koei, *Colosseum: Road to Freedom* (Koei, 2005), PlayStation 2
- GOSHOW, *Gladiator Begins* (GOSHOW, 2011), PlayStation Portable
- Guerrilla Games, *Horizon Zero Dawn* (Guerrilla Games, 2017), PlayStation 4; Windows PC
- Jordy Lakiere, *We Who Are About to Die* (Jordy Lakiere, 2022), Windows PC
- Kodiak Interactive, *Circus Maximus* (Kodiak Interactive, 2002), PlayStation 2; Xbox
- LucasArts, *Gladius* (LucasArts, 2003), GameCube; PlayStation 2; Xbox
- Nintendo, *The Legend of Zelda* (series) (Nintendo, 1986–2023), various platforms
- Nocturnal Works, *Eleusis* (Nocturnal Works, 2013), Windows PC
- Santa Monica Studio, *God of War* (series) (Santa Monica Studio, 2005–present), various platforms
- Sid Meier and Firaxis Games, *Civilization* (series) (Firaxis Games, 1991–present), various platforms
- Square Enix, *Final Fantasy* (series) (Square Enix, 1987–present), various platforms
- Steel Monkeys, *I, Gladiator* (Steel Monkeys, 2015), Windows PC; macOS; iOS
- Supergiant Games, *Hades* (Supergiant Games, 2020), macOS; Nintendo Switch; PlayStation 4; PlayStation 5; Windows PC; Xbox One; Xbox Series X/S
- Ubisoft, *Assassin's Creed* (series) (Ubisoft, 2007–present), various platforms
- , *Assassin's Creed Odyssey* (Ubisoft, 2018), PlayStation 4; Windows PC; Xbox One; Nintendo Switch; Stadia
- VirtualAge, *Gladius* (VirtualAge, 2016), Meta Quest 2; Meta Quest 3; Meta Quest 3S; Meta Quest Pro

Film and televisual works

DeKnight, Steven S., creator, *Spartacus* (Starz, 2010–13).

Dornhelm, Robert, dir., *Spartacus* (USA Network, 2004).

Emmerich, Roland, and Marco Kreuzpaintner, dirs., *Those About to Die* (Peacock, 2024).

Petersen, Wolfgang, dir., *Troy* (Warner Bros. Pictures, 2004).

Scott, Ridley, dir., *Gladiator* (Universal Pictures, 2000).

—, dir., *Gladiator II* (Universal Pictures, 2024).

Snyder, Zack, dir., *300* (Warner Bros. Pictures, 2007)

CHRIS KERICH

‘RETURN PLAYER.ISPOTIONACTIVE
(EFFECTS.HERO_OF_THE_VILLAGE);’:
INDIGENEITY AND CODE IN *MINECRAFT*

The ugly spectre of colonialism haunts the world of video games. Dedicated labs at universities,¹ issues of journals² and books³ have all been dedicated to highlighting the influence of colonial thought on contemporary games. One game that has seen more examination than most is 2011’s *Minecraft*, which began as a small indie project and is now a flagship game and franchise for Microsoft. In this era of postcolonial game scholarship *Minecraft* has been criticised for creating a space of *terra nullius*⁴, advancing a neoliberal worldview of empire,⁵ and deploying procedural generation to create environments that exist only to be extracted from,⁶ and rightly so. What we haven’t yet seen in this field of scholarship, and that I intend to address, is an engagement with the underlying code of *Minecraft* itself. Using Minecraft Forge

1 Mikael Jakobsson, ‘Games & Colonialism’, MIT Game Lab.

2 Souvik Mukherjee and Emil Lundedal Hammar, eds, ‘Special Collection: Postcolonial Perspectives in Game Studies’, Open Library of Humanities, 4.2 (2018).

3 See, for example, Souvik Mukherjee, *Videogames and Postcolonialism: Empire Plays Back* (Cham, Switzerland: Palgrave Macmillan, 2017).

4 Ligia (Licho) López López, Lars de Wildt, and Nikki Moodie, “I Don’t Think You’re Going to Have Any Aborigines in Your World”: Minecrafting Terra Nullius’, *British Journal of Sociology of Education*, 40.8 (2019), 1037–54.

5 Daniel Dooghan, ‘Digital Conquerors: *Minecraft* and the Apologetics of Neoliberalism’, *Games and Culture*, 14.1 (2019), 67–86.

6 Max Kreminski and Noah Wardrip-Fruin, ‘Gardening Games: An Alternative Philosophy of PCG in Games’, presented at FDG (Malmö, Sweden, 2018). PCG stands for Procedural Content Generation.

and the Mod Coder Pack,⁷ two community-run modding projects, *Minecraft*'s code can be decompiled and deobfuscated. In doing so, we can gain greater insight into the colonial implications of *Minecraft*'s procedural systems. These varying systems govern everything from world generation to the 'desires' and 'categorisations' of the AI characters within it. It's one thing to speak to what worlds *Minecraft* often produces, as much scholarship does, but what worlds are made possible by the code in the first place?

To answer this question, I'll engage with the academic areas of postcolonial theory and Indigenous⁸ studies. These are well-established disciplines that are gaining significant traction in game studies. I have already mentioned Souvik Mukherjee's 2017 *Videogames and Postcolonialism: Empire Plays Back*⁹, which is a foundational text in the study of games and colonial empire. Soraya Murray's *On Video Games*¹⁰ is also one of the first books to engage with colonial space in games. Indigenous studies in games primarily has taken form in game creation work being done in pursuit of decolonial goals. For example, Elizabeth LaPensée has worked to facilitate what she calls 'sovereign' games created by and for Indigenous people.¹¹ In explicitly naming this postcolonial/decolonial foundation, I hope to expand the possibilities of postcolonial and Indigenous game studies into game engine critique.

A major impediment to doing game engine analysis is that outside of the few publicly available engines such as Godot, Unity,

7 Minecraft Forge documentation is available here: <https://mcforge.readthedocs.io/en/1.16.x/> [accessed 14 November 2024] and the temporary Mod Coder Pack website is here: <http://www.modcoderpack.com/website/releases> [accessed 14 November 2024].

8 I have attempted to use a capitalised version of 'Indigenous' when referring to Indigenous people in the real world, as are studied in the Nairn *et al.* study, for example, and a non-capitalised version when referring to the fictional indigenous groups in the world of *Minecraft*.

9 Mukherjee, *Videogames and Postcolonialism*.

10 Soraya Murray, *On Video Games: The Visual Politics of Race, Gender and Space*, International Library of Visual Culture, 27 (London: I.B. Tauris, 2018).

11 Elizabeth A. LaPensée, Outi Laiti, and Maize Longboat, 'Towards Sovereign Games', *Games and Culture*, 17.3 (2022), 328–43.

or Unreal Engine, game engines are largely proprietary and inaccessible to researchers. However, there are some key exceptions to this. A notable example of this type of research is Claudia Lo's analysis of the encoded gender biases of the game *Rimworld*.¹² Her article makes a clear connection between the programmatic elements that exist in the game's code and the procedural ones which become activated when the game engine is executed. Beyond game engine analysis, Paul Hertz and Shawné Michelain's account of the DDoS tool FloodNet demonstrates the same technique — decompilation deployed to reveal hidden features of code objects — to similarly powerful effect.¹³ This is the primary technique I will be using in my analysis.

Technical Note

Before getting into more analytic objectives, I first want to explain some of the technical framework which has made this chapter possible and which affects my conclusions. *Minecraft*, as distributed commercially, is both compiled and obfuscated. *Minecraft* is written in Java, a compiled language, which in essence means the version that runs on your computer is different from the human-readable version that the programmers originally wrote. It has been 'compiled' into a machine-readable format for use by the computer. Programs known as Java decompilers take this compiled version and return it to a human-readable form. This was necessary for this project in order for me to read the code. The actual process of decompilation varies in difficulty and complexity between different programming languages. In every case, decompilers look for what are essentially 'hints' to the structure and content of compiled code and through different methods slowly reconstruct as close to the original source as possible. Luckily, Java decompilation is considered to be one of the easier kinds of decompilation and at the time of writing Java decompil-

12 Claudia Lo, 'How *RimWorld*'s Code Defines Strict Gender Roles', *Rock, Paper, Shotgun*, 2 November 2016.

13 Paul Hertz and Shawné Michelain Hollaway, 'FloodNet: Deliberate Error as Protest and Performance', CCS Working Group 2020.

ers have a very high success rate in reproducing the exact source code from compiled code. However, this doesn't account for obfuscation.

Minecraft, like many professionally released pieces of software, is also obfuscated, which means that after decompiling the code the original names of different code objects like 'populateTradeData()' or 'SoundEvent' are changed to things like 'func_233641_cN_()' or 'p_1241915_1_', meaningless strings of characters. This is done to prevent the easy duplication or editing of the code after decompilation. The reasons for this can vary, but most often it is done to preserve intellectual property, prevent code stealing, and otherwise maintain code control. Modders who want to edit the game or add new features can't easily work with obfuscated code. It was only with the release of the Mod Coder Pack, or MCP, in 2010 that truly allowed *Minecraft* modding to begin in earnest.¹⁴ The MCP is a collection of mappings from the gibberish names of the obfuscated code to human-readable names, which allows code to be 'deobfuscated' by changing the former to the latter. Because deobfuscation is being done by modders and not Mojang, the developer, this means that the deobfuscated names are not necessarily the original ones used in writing the code, but instead are just interpretations/best guesses. As of late, to aid modders, Mojang has been releasing official deobfuscation mappings, but even these are incomplete.¹⁵ This means that in my version of the decompiled *Minecraft* source code, specific pieces of code either do not have names or have names that do not necessarily match developer intent. For this chapter I have specifically avoided any kind of analysis that relies on precise wording of code objects since they are not guaranteed to be the original text. The code you will find in this paper is from the deobfuscated 1.16.4 version of *Minecraft* Java Edition that I generated using the

¹⁴ While there is no definitive history of *Minecraft* modding available, many accounts point to the release of the MCP in mid-2010 as the true beginning of the practice. A community-run MCP release history is available here: https://minecraft.fandom.com/wiki/Programs_and_editors/Mod_Coder_Pack#History [accessed 14 November 2024]

¹⁵ Mojang's official announcement of their deobfuscation maps is available here: <https://www.minecraft.net/en-us/article/minecraft-snapshot-19w36a> [accessed 14 November 2024]

MCP mappings. While there are several versions of *Minecraft* that exist across phones and other video game platforms¹⁶, only the Java edition currently has support for decompilation and deobfuscation.

Analytic Goals

One way to describe 2011's *Minecraft* is as a sandbox game, where you or a group of your friends can harvest resources, fight monsters, and build structures. However, games scholar Daniel Dooghan describes it as a neoliberal utopia where, 'skillful play results in the development of in-game technological prowess that necessitates both continuous resource extraction and the perspective necessary to see the game world unfold as uniformly available to players'.¹⁷ This engine of resource consumption, acquisition, and spatial dominance requires a world that enables it. My main focus in examining *Minecraft*'s game engine source code was to examine how this world is constructed. As *Minecraft* is a fairly complex game with many interlocking systems, a full game engine analysis in a paper of this size is impossible. Instead, I decided to specifically focus on one area which I thought would be especially fruitful: the generation and governance of indigenous characters.

One of the primary ways *Minecraft* constructs its vision of a world to be settled by the player is through the figure of the Villager, a humanoid group of characters who already live in villages prior to the arrival of the player. First introduced in the November 2011 '1.0' release of *Minecraft* as simple creatures (with the same behaviour AI as pigs) they have since been expanded on to add new systems such as trading, professions, and various interactions with the other flora and fauna of the *Minecraft* world. In addition, since 2011 new groups of indigenous peoples, Illagers and Piglins, have been added as well, each with their own traits and behaviours. In their 2017 survey of Indigenous representa-

¹⁶ The current slate of *Minecraft* versions include Java edition, Bedrock edition (on most video game consoles), New Nintendo 3DS edition, *Minecraft* Earth, and Raspberry Pi edition. There also exist several now-defunct legacy console versions which are no longer updated.

¹⁷ Dooghan, 'Digital Conquerors', p. 69.

tion across American, Australian, Canadian, and New Zealand mass media, researchers Nairn, McCreanor, and Moewaka Barnes identify three broad ‘discursive resources’ which mass media tend to rely on when representing Indigenous people. These are ‘Violent–Violence’, ‘Primitive–Emotional’, and ‘Savage–Noble and Ignoble’.¹⁸ While video games were not included as part of this study, their insights are just as applicable to games as they are to print, television, and film. Across *Minecraft*’s array of indigenous groups, we can find examples of each of these ‘resources’ being deployed in the game and in the game’s code.

Violent–Violence

Many creatures in *Minecraft* seek to harm the player: from skeletons to zombies, there is no shortage of creatures which are a danger to the player. In fact, the Villager is a notable exception to this as they are peaceful, non-hostile creatures. However, in 2012 with the addition of the Witch character,¹⁹ in 2018 with the addition of the Illagers,²⁰ and in 2020 with the addition of Piglins,²¹ hostile creatures which live in the world (in huts, villages or other structures) now exist in the world of *Minecraft*.

18 Raymond Nairn, Tim McCreanor, and Angela Moewaka Barnes, *Mass Media Representations of Indigenous Peoples* (Auckland, New Zealand: Shore and Whariki Research Centre, 2017).

19 Mojang, ‘Minecraft: Pretty Scary Update’, Mojang.com, 27 October 2012.

20 Mojang Studios, ‘Village & Pillage Out Today on Java’, Minecraft.net, 23 April 2019. While the update officially released in 2019, Illagers had been available in the weekly snapshots since late 2018.

21 Piglins were first introduced in weekly Java Edition snapshot 20w06a, released on 5 February 2020. Their official release as part of the ‘Nether Update’ occurred on 23 June 2020 with Java Edition 1.16. The code analysed in this chapter is from the subsequent 1.16.4 patch; Mojang Studios, ‘Nether Update Out Today on Java’, Minecraft.net, 23 June 2020.

```

protected void registerGoals() {
    super.registerGoals();
    this.goalSelector.addGoal(0, new SwimGoal(this));
    this.goalSelector.addGoal(2, new
AbstractRaiderEntity.FindTargetGoal(this, 10.0F));
    this.goalSelector.addGoal(3, new RangedCrossbowAttackGoal<>(this,
1.0D, 8.0F));
    this.goalSelector.addGoal(8, new RandomWalkingGoal(this, 0.6D));
    this.goalSelector.addGoal(9, new LookAtGoal(this,
PlayerEntity.class, 15.0F, 1.0F));
    this.goalSelector.addGoal(10, new LookAtGoal(this,
MobEntity.class, 15.0F));
    this.targetSelector.addGoal(1, (new HurtByTargetGoal(this,
AbstractRaiderEntity.class)).setCallsForHelp());
    this.targetSelector.addGoal(2, new
NearestAttackableTargetGoal<>(this, PlayerEntity.class, true));
    this.targetSelector.addGoal(3, new
NearestAttackableTargetGoal<>(this, AbstractVillagerEntity.class,
false));
    this.targetSelector.addGoal(3, new
NearestAttackableTargetGoal<>(this, IronGolemEntity.class, true));
}

```

Code 1: Code snippet from net.minecraft.entity.monster.PillagerEntity.java

The above code block shows the assignment of goals and targets for the Pillager, a type of Illager, in *Minecraft*. Goals are the main way the creature AI determines what actions a character will take, and targets designate what the entity will attack. The numbers that preface each goal and target (0, 2, 3, 8, 9, 10, 1, 2, 3, 3) represent the priority each goal or target has — the lower the number, the higher priority. With this information, we can start to parse this code block as a map of the potential active expressions of the Pillager in the game. Its highest priority is to swim, if it is in water, and its three lowest priority goals are to look at a ‘mob’ (a generic term which encompasses a range of creatures in *Minecraft*), to look at the player, or to aimlessly wander: actions which all represent what we can consider ‘idle’ behaviour. In terms of high priority goals, next after swimming to avoid drowning is seeking a target to attack, and the next priority after that is to attack that target.



Fig. 1. A group of Pillagers in a jungle. Screenshot from Mojang Studios, *Minecraft*, 2011, video game.

In terms of targets, the highest priority is to attack whatever creature has hurt it (and also call for help, reflecting a social character to the Pillagers), followed by the nearest player, and then the nearest Villager or Iron Golem (metal automatons which defend Villagers). Pillagers are thus programmatically violent, almost without the capacity for any non-violent behaviour at all (only swimming and 'looking'). As they hunt and kill Villagers and their protectors, they are a symbolic embodiment of the 'predatory animality that is to be feared and mistrusted'²² that Nairn *et al.*, associate with the 'violent-violence' media representation of indigeneity. In addition, the raids that Pillagers and other Illagers perform on villages demonstrate how they are coded to be 'irrationally or mindlessly violent'²³ — another quality identified by Nairn *et al.* also associated with a 'violent-violence' media representation. The one apparent exception — the celebratory behaviour Illagers perform after destroying a village — proves the rule: coded as the terminal phase of a raid rather than as an autonomous cultural act, it remains inseparable from the logic of violence. Beyond this,

22 Nairn, McCreanor, and Barnes, *Mass Media Representations of Indigenous Peoples*, p. 38.

23 *Ibid.*

they have no way of capitalising on or utilising the village, they just leave. Despite their name, they never programmatically ‘pill-age’ anything. We can also see this simply from the code snippet of their goal registration: aside from their goals of combat, and its choreographed aftermath they do not actually ‘do’ anything. Much like all the other monsters in the world of *Minecraft*, they are depicted as hunting and killing, but never as living.

This runs counter to the fact that, like Villagers and the villages they live in, across the world of *Minecraft* there exist several kinds of structures, mansions and towers, where Illagers supposedly live. These structures are constructed using a jigsaw-like procedural construction system, the same system that constructs villages, but without the affordances for life that appear in villages (adequate number of beds, locations for domestic labour, fields for food, etc.). Even the beds or other facilities that do exist in these structures are proven to be hollow by the code snippet above — by programmatic definition, they can never be used by the Pillagers. This reveals a fundamental emptiness at the heart of this kind of representation: the Illagers are depicted as having a culture of building structures and living in them, but they are programmatically governed by the same irrational violence as a zombie or spider.

Primitive-Emotional

Of the humanoid indigenous creatures added to *Minecraft*, the pig/human hybrid ‘Piglins’ are the most recent, having been added in February 2020. They reside in the Nether, the hellish counterpart to the lush overworld of *Minecraft* accessible only through constructible portals. One of their defining characteristics is a love for gold, which is evident in the code snippet below.

```

protected static void pickUpItem(Piglin piglin, ItemEntity itemEntity) {
    ItemStack itemStack;
    PiglinAi.stopWalking(piglin);
    if (itemEntity.getItem().getItem() == Items.GOLD_NUGGET) {
        piglin.take(itemEntity, itemEntity.getItem().getCount());
        itemStack = itemEntity.getItem();
        itemEntity.remove();
    } else {
        piglin.take(itemEntity, 1);
        itemStack =
PiglinAi.removeOneItemFromItemEntity(itemEntity);
    }
    Item item = itemStack.getItem();
    if (PiglinAi.isLovedItem(item)) {

PiglinAi.getBrain().eraseMemory(MemoryModuleType.TIME_TRYING_TO_REACH_ADMIRE_
ITEM);
        PiglinAi.holdInOffhand(piglin, itemStack);
        PiglinAi.admireGoldItem(piglin);
        return;
    }
    if (PiglinAi.isFood(item) && !PiglinAi.hasEatenRecently(piglin)) {
        PiglinAi.eat(piglin);
        return;
    }
    boolean bl = piglin.equipItemIfPossible(itemStack);
    if (bl) {
        return;
    }
    PiglinAi.putInInventory(piglin, itemStack);
}

```

Code 2: Code snippet from net.minecraft.entity.monster.piglin.PiglinAi.java

This code snippet shows the code that governs what happens when a Piglin picks up an item in the world, and is one of many places in *Minecraft's* code where the Piglin's hardcoded preference for gold is apparent. In this section of code, it specifically shows up in two places. The first is in the 'if' statement that reads `if (itemEntity.getItem().getItem() == Items.GOLD_NUGGET)`. If the item that the Piglin encounters is a gold nugget, instead of taking just one item from the stack on the ground, they will greedily pick up all of it. If the Piglin encounters any other type of object, they only pick up one from the stack. Similarly, in the section that reads `if (PiglinAi.isLovedItem(item))`, if the item is loved by the Piglin (meaning, that it's a gold item of some kind), they will wield it in their offhand and admire it. These behaviours are part of a larger set that all revolve around gold, such as Piglins attacking players who are not wearing gold armour, trading valuable items for dropped gold, and attacking players who are seen mining gold.

In the report published by Nairn *et al.*, they describe Indigenous peoples being regularly positioned on a scale of ‘primitive–advanced’ and ‘irrational(emotional)–rational’²⁴ which often serve as legitimations of colonial takeover: that they are a primitive/irrational people who need a more ‘civilised’ nation to step in and govern. In other words, this is the idea that Indigenous cultures are ‘backward and inadequate’, and requires a superior, advanced culture to replace it. The Piglins, especially in their totemic, worshipful relationship to gold compared to the item crafting system’s implied utilitarian, functional one are an example of this kind of cultural positioning in miniature.



Fig. 2. A Piglin (and a Hoglin) in the Nether. Screenshot from Mojang Studios, *Minecraft*, 2011, video game.

Gold, in *Minecraft*, is neither the most common nor the rarest element. It’s used in many crafting recipes, but notably produces weaker armour and tools than many other elements like iron or diamond. In fact, often, gold equipment is weaker than its wooden equipment counterpart (a reference to the softness of the metal in the real world). While it’s possible for the player to use gold to create golden equipment, it’s more likely used by players for other kinds of crafting, such as the creation of gold apples, clocks,

24 *Ibid.*, p. 40.

powered rails, and other items. Piglins, on the other hand, value gold equipment over all others and as noted in the code, will stop to admire it before equipping it. Because of its mechanical weakness but apparent significance to the Piglins, there's a reinforcement of an 'emotional' as opposed to 'rational' attachment to the resource. Because Piglins do not use gold 'correctly', the seizure of their gold by the player is justified through the delegitimisation of the Piglins' attachment to it. This echoes a sentiment in the report by Nairn *et al.*, where colonial powers find that 'ownership by indigenous peoples locks land away from needed development and resource exploitation'.²⁵

In the Nether where Piglins live, gold can be found as a fairly common resource. Yet, Piglins cannot mine it (or choose not to), nor do they have any culture or structures situated around these deposits. It is only when gold moves through the figure of the player, or the coloniser, that this 'emotional-rational' divide become activated and these various coded behavioural mechanisms around gold are triggered. This fact is perhaps the ultimate reinforcement that these traits only exist in relation to the player, and only exist to reaffirm the player's superiority to Piglins as an indigenous people.

Savage–Noble and Ignoble

The most obvious form of indigenous life in the world of *Minecraft* comes through the Villager, a type of people who live in small towns in the various biomes of a *Minecraft* world. They are peaceful towards the player, and will trade goods with them in exchange for emeralds, a mineable resource.

25 *Ibid.*, p. 41.


```
private static final ImmutableList<MemoryModuleType<?>> MEMORY_TYPES =
    ImmutableList.of(MemoryModuleType.HOME, MemoryModuleType.JOB_SITE,
        MemoryModuleType.POTENTIAL_JOB_SITE, MemoryModuleType.MEETING_POINT,
        MemoryModuleType.MOBS, MemoryModuleType.VISIBLE_MOBS,
        MemoryModuleType.VISIBLE_VILLAGER_BABIES, MemoryModuleType.NEAREST_PLAYERS,
        MemoryModuleType.NEAREST_VISIBLE_PLAYER,
        MemoryModuleType.NEAREST_VISIBLE_TARGETABLE_PLAYER,
        MemoryModuleType.NEAREST_WANTED_ITEM, MemoryModuleType.WALK_TARGET,
        MemoryModuleType.LOOK_TARGET, MemoryModuleType.INTERACTION_TARGET,
        MemoryModuleType.BREED_TARGET, MemoryModuleType.PATH,
        MemoryModuleType.OPENED_DOORS, MemoryModuleType.NEAREST_BED,
        MemoryModuleType.HURT_BY, MemoryModuleType.HURT_BY_ENTITY,
        MemoryModuleType.NEAREST_HOSTILE, MemoryModuleType.SECONDARY_JOB_SITE,
        MemoryModuleType.HIDING_PLACE, MemoryModuleType.HEARD_BELL_TIME,
        MemoryModuleType.CANT_REACH_WALK_TARGET SINCE, MemoryModuleType.LAST_SLEPT,
        MemoryModuleType.LAST_WOKEN, MemoryModuleType.LAST_WORKED_AT_POI,
        MemoryModuleType.GOLEM_DETECTED_RECENTLY);
```

Code 3: Code snippet from net.minecraft.entity.merchant.villager.
VillagerEntity.java

The above code snippet is the list of ‘memories’ that the Villager’s AI has access to. These memory modules are updated when the Villager needs to store some information, for example, where their home is. Though it is only a single line of code, this list contains details that give a fairly robust picture of the way Villagers exist in the *Minecraft* world. We can for instance see what entities in the world they can remember, such as `MemoryModuleType.VISIBLE_MOBS` (monsters, animals, and other Villagers), `MemoryModuleType.NEAREST_PLAYERS` (player characters), and `MemoryModuleType.VISIBLE_VILLAGER_BABIES` (Villager babies, which aren’t counted as mobs). Some categorisations in this list are fairly common in games, for example considering a player character to be in a separate category from other non-player characters, but others reflect some real taxonomic simplification, for instance ‘remembering’ fellow Villagers in the same category as chickens or zombies.²⁶

²⁶ Two further entries in this memory list merit attention. First, `GOLEM_DETECTED_RECENTLY` reveals that Villagers maintain a specific memory module tracking the recent presence of an Iron Golem — the very entity that fights on their behalf. This is a direct programmatic inscription of their dependence on external protection, corroborating at the code level what is visible in gameplay behaviour. Second, the list distinguishes between `NEAREST_PLAYERS` and `NEAREST_VISIBLE_TARGETABLE_PLAYER`, meaning that the player is registered in the Villager’s memory in two distinct registers simultaneously: one social (the player as a pres-

This special category for players is particularly indicative of the role of the Villager in *Minecraft*, whose society exists solely for the benefit of the player. While the Villagers do have professions (see below), they never ‘do’ anything — the profession simply dictates what types of items will be available for trade (and also where they stand during the day), the village itself never benefits from any labour. Only the player can add to the village, destroy it, or otherwise modify it.

```
public static final VillagerProfession NONE = register("none",
PointOfInterestType.UNEMPLOYED, (SoundEvent)null);
    public static final VillagerProfession ARMORER = register("armorer",
PointOfInterestType.ARMORER, SoundEvents.ENTITY_VILLAGER_WORK_ARMORER);
    public static final VillagerProfession BUTCHER = register("butcher",
PointOfInterestType.BUTCHER, SoundEvents.ENTITY_VILLAGER_WORK_BUTCHER);
    public static final VillagerProfession CARTOGRAPHER = register("cartographer"
PointOfInterestType.CARTOGRAPHER, SoundEvents.ENTITY_VILLAGER_WORK_CARTOGRAPHER)
    public static final VillagerProfession CLERIC = register("cleric",
PointOfInterestType.CLERIC, SoundEvents.ENTITY_VILLAGER_WORK_CLERIC);
    public static final VillagerProfession FARMER = register("farmer",
PointOfInterestType.FARMER, ImmutableSet.of(Items.WHEAT, Items.WHEAT_SEEDS,
Items.BEETROOT_SEEDS, Items.BONE_MEAL), ImmutableSet.of(Blocks.FARMLAND),
SoundEvents.ENTITY_VILLAGER_WORK_FARMER);
    public static final VillagerProfession FISHERMAN = register("fisherman",
PointOfInterestType.FISHERMAN, SoundEvents.ENTITY_VILLAGER_WORK_FISHERMAN);
    public static final VillagerProfession FLETCHER = register("fletcher",
PointOfInterestType.FLETCHER, SoundEvents.ENTITY_VILLAGER_WORK_FLETCHER);
    public static final VillagerProfession LEATHERWORKER =
register("leatherworker", PointOfInterestType.LEATHERWORKER,
SoundEvents.ENTITY_VILLAGER_WORK_LEATHERWORKER);
    public static final VillagerProfession LIBRARIAN = register("librarian",
PointOfInterestType.LIBRARIAN, SoundEvents.ENTITY_VILLAGER_WORK_LIBRARIAN);
    public static final VillagerProfession MASON = register("mason",
PointOfInterestType.MASON, SoundEvents.ENTITY_VILLAGER_WORK_MASON);
    public static final VillagerProfession NITWIT = register("nitwit",
PointOfInterestType.NITWIT, (SoundEvent)null);
    public static final VillagerProfession SHEPHERD = register("shepherd", |
PointOfInterestType.SHEPHERD, SoundEvents.ENTITY_VILLAGER_WORK_SHEPHERD);
    public static final VillagerProfession TOOLSMITH = register("toolsmith",
PointOfInterestType.TOOLSMITH, SoundEvents.ENTITY_VILLAGER_WORK_TOOLSMITH);
    public static final VillagerProfession WEAPONSMITH = register("weaponsmith",
PointOfInterestType.WEAPONSMITH, SoundEvents.ENTITY_VILLAGER_WORK_WEAPONSMITH);
```

Code 4: Code snippet from net.minecraft.entity.merchant.villager.
VillagerProfession.java

ence to be aware of) and one evaluative (the player as a potential threat to be assessed). This dual coding complicates any straightforward reading of the Villager as unconditionally ‘friendly’ — even the Noble Savage, it seems, is programmed for a degree of wariness toward the coloniser, however suppressed that wariness is by the weight of the other memory modules governing trade, work, and gift-giving.

As opposed to the Piglins or Illagers, which fit more of the role of the ‘Ignoble Savage’ with a ‘brute animality and a presumed instinctive urge to fight and kill’.²⁷ Villagers fit the role of the ‘Noble Savage’, as they are ‘friendly, helpful and fought alongside us against other indigenes’.²⁸ While Villagers do not fight, they are both raided by Illagers and also attacked on sight by Piglins, placing Villagers on the same ‘side’ as the player. This helplessness of the Villagers is reinforced by the fact that they are protected by huge metal automatons called ‘Iron Golems’, which fight on their behalf as they cower in their homes. If the player chooses to help Villagers during a raid by fighting the Illagers, they are granted the ‘HERO_OF_THE_VILLAGE’ status for 40 minutes which causes Villagers to give gifts to the player. Much like how the ‘primitive’-ness of the Piglins justifies the player’s rational superiority over them, this friendly helplessness of the Villagers justifies the player’s colonial right to rule over them. The player is even rewarded for stepping into a colonial protector role by using martial power on behalf of the helpless Villagers.



Fig. 3. A Villager cowering in a building during a raid. Screenshot from Mojang Studios, *Minecraft*, 2011, video game.

²⁷ *Ibid.*, p. 44.

²⁸ *Ibid.*

A detailed read of the above code sample appears distinct from the rest. This is, of course, the nitwit: `public static final VillagerProfession NITWIT = register("nitwit", PointOfInterestType.NITWIT, (SoundEvent)null);` As opposed to normal Villagers, which can take and change professions depending on the facilities available in the village, Nitwits cannot change their profession. In fact, they are born Nitwits. They sleep in later than other Villagers, and during the day, while other Villagers stand around in their 'Point of Interest' work sites, Nitwits idly wander the village. Unlike other Villagers, which can all trade with the player, if trade is attempted with a Nitwit they will simply shake their head. One additional trope of Indigenous representation that Nairn *et al.* identify in their report alongside the major ones of 'Violent-Violence', 'Primitive-Emotional', and 'Savage-Noble and Ignoble', is that of laziness and incompetence.²⁹ The nitwit as a 'profession' fits this trope but also reinforces the Villager as a nonthreatening, 'simple', friendly, helpful figure. In addition, it underlines the fact that the Villager is a resource to be extracted from. The Nitwit is an aberration because they cannot be traded with, which conversely emphasises the fact that normative Villagers are economic engines for the player to use. Villagers are truly the 'Noble Savage': the smiling, helpful indigenous group that has resources to give, but simultaneously is helpless and at the mercy of the dangers of the world, needing protection from the player.

Conclusion

The history of games is full of examples of the normalisation of settler perspectives such as these, whether it be the colonialist spatiality in *Empire: Total War*³⁰ to the operation of colonialist logics in *Clash of Clans*.³¹ The examples in this chapter are only a few of the many examples to be found in *Minecraft*'s code. Addi-

29 Nairn, McCreanor and Moewaka Barnes, *Mass Media Representations*, p. 44.

30 Mukherjee, *Videogames and Postcolonialism*, p. 37.

31 Jacob Euteneuer, 'Settler Colonialism in the Digital Age: Clash of Clans, Territoriality, and the Erasure of the Native', *Open Library of Humanities*, 4.1 (2018), 14.

tional ways that the colonial manifests in *Minecraft* include the way that resources are distributed in world generation such that the player always has an infinite amount to consume, the way that villages are constructed arbitrarily and without inherent culture,³² and the way that empty, unexplored terrain itself is generated. All of these have lingering or explicit traces of colonialist, settler ideas of *terra nullius*, an empty world free to be extracted and exploited.³³ While the code elements of these games might initially seem to be disconnected from these higher-level discussions of coloniality, in fact especially in games such as *Minecraft* that are procedurally generated and executed, the code elements are directly constitutive of the represented world. In doing this, they hold insight that can be used in conjunction with observed behaviour to develop deep understandings about the operation of all kinds of power in games, including the way settler colonial ideals shape the structure and form of modern video games.

The source code of most games is much harder to access and read than *Minecraft's*, so it is a privilege to be able to do this kind of analysis with it. I'm indebted to the hardworking modding community that has done so much work to make it accessible. Still, this should not be the current state of affairs when it comes to analysing game code. How many more games and game engines have ideological choices that are obfuscated behind hidden code? I hope this chapter shows that there is room for great insight when source code is accessible and readable. This methodology is essential for game studies to escape from binary forms of 'code versus image' analysis problematised by Malkowski and Russworm³⁴ and to develop unified ways of viewing games as

32 During the process of writing this chapter, the 2024 'Tricky Trials' update was released, which adds archaeological discoveries to the game in the form of ruins and pottery shards, which point to the existence of some prior culture or indigenous group. Thus far, none of the existing indigenous groups in *Minecraft* have any kind of connection to these ruins or objects, making this new addition more reflective of high adventure tomb-delving and artefact-looting than anything else.

33 For more on this in relation to *Minecraft*, see the author's art piece titled *Three Impossible Worlds* <https://www.ckrich.com/#/tiw/>.

34 Jennifer Malkowski and TreaAndrea M. Russworm, eds, *Gaming Representation: Race, Gender, and Sexuality in Video Games* (Bloomington: Indiana University Press, 2017), p. 3.

both representational and coded objects simultaneously. There is a pressing need for game studies to continue to pursue game engine code analysis as a way of expanding our understanding of how games operate and convey values in both mechanics and representation.

However, because *Minecraft* is a game that is still being updated at the time of writing,³⁵ many of the insights contained in this chapter are therefore provisional. It's possible that at the time that this chapter is being read, the code may have been updated and many of these code snippets will no longer be up to date. Perhaps the Illagers will develop a reason for their raids, perhaps the Piglins will build palaces of gold, and perhaps the Villagers will learn independence from the player character. I think it is more likely, however, that these things will never change, and the indigenous inhabitants of *Minecraft* will forever 'not speak, not 'progress', and primarily exist to be exploited, domesticated, ignored, or destroyed'.³⁶

Developer intent can never be fully reverse-engineered from code alone. However, I believe *Minecraft's* representation of indigenous characters will remain unchanging because *Minecraft* remains, systemically, a game of extraction and expansion. It needs the player to be superior to its indigenous inhabitants in order to legitimise that player's free rein to mine, build, and fight. Therefore, the game will always need to delegitimise indigenous people, most likely using the kinds of common resources identified by Nairn *et al.* to depict Indigenous life. The code is the force of creation and regulation onto which all this is inscribed, and off of which it can be read again.

Bibliography

Dooghan, Daniel, 'Digital Conquerors: *Minecraft* and the Apologetics of Neoliberalism', *Games and Culture*, 14.1 (2019), 67–86, <https://doi.org/10.1177/1555412016655678>

³⁵ The most recent "Tricky Trials" update was released on June 14 2024.

³⁶ López López, de Wildt, and Moodie, "I Don't Think You're Going to Have", p. 1042.

- Euteneuer, Jacob, 'Settler Colonialism in the Digital Age: Clash of Clans, Territoriality, and the Erasure of the Native', *Open Library of Humanities*, 4.1 (2018), art. 14, <https://doi.org/10.16995/olh.212>
- Hammar, Emil Lundedal, and Souvik Mukherjee, eds, 'Special Collection: Postcolonial Perspectives in Game Studies', *Open Library of Humanities*, 4.2 (2018), <https://olh.openlibhums.org/collections/436/> [accessed 14 November 2024]
- Hertz, Paul, and Shawné Michelain Holloway, 'FloodNet: Deliberate Error as Protest and Performance', *CCS Working Group 2020*, <http://wg20.criticalcodestudies.com/index.php?p=/discussion/96/floodnet-deliberate-error-as-protest-and-performance> [accessed 16 March 2022]
- Jakobsson, Mikael, 'Games & Colonialism', *MIT Game Lab*, n.d., <http://gamelab.mit.edu/research/games-and-colonialism/> [accessed 14 November 2024]
- Kreminski, Max, and Noah Wardrip-Fruin, 'Gardening Games: An Alternative Philosophy of PCG in Games' (paper presented at the Foundations of Digital Games, Malmö, Sweden, 2018), <https://dl.acm.org/doi/10.1145/3337722.3341861> [accessed 16 March 2022]
- LaPensée, Elizabeth A., Outi Laiti, and Maize Longboat, 'Towards Sovereign Games', *Games and Culture*, 17.3 (2022), 328–43, <https://doi.org/10.1177/15554120211029195>
- Lo, Claudia, 'How RimWorld's Code Defines Strict Gender Roles', *Rock, Paper, Shotgun*, 2 November 2016, <https://www.rockpapershotgun.com/rimworld-code-analysis> [accessed 17 March 2022]
- López López, Ligia (Licho), Lars de Wildt, and Nikki Moodie, "'I Don't Think You're Going to Have Any Aborigines in Your World": Minecrafting Terra Nullius', *British Journal of Sociology of Education*, 40.8 (2019), 1037–54, <https://doi.org/10.1080/01425692.2019.1640596>
- Malkowski, Jennifer, and TreaAndrea M. Russworm, eds, *Gaming Representation: Race, Gender, and Sexuality in Video Games* (Bloomington, Indiana: Indiana University Press, 2017)
- Mojang Studios, 'Minecraft: Pretty Scary Update', Mojang.com, 27 October 2012, <https://web.archive.org/web/20121027000319/http://mojang.com/2012/10/minecraft-pretty-scary-update> [accessed 14 November 2024]
- , 'Nether Update Out Today on Java', Minecraft.net, 23 June 2020, <https://www.minecraft.net/en-us/article/nether-update-java> [accessed 14 November 2024]
- , 'Village & Pillage Out Today on Java', Minecraft.net, 23 April 2019, <https://www.minecraft.net/en-us/article/village---pillage-out-java> [accessed 14 November 2024]
- Mukherjee, Souvik, *Videogames and Postcolonialism: Empire Plays Back* (Cham, Switzerland: Palgrave Macmillan, 2017)

- Murray, Soraya, *On Video Games: The Visual Politics of Race, Gender and Space* (London and New York: I.B. Tauris, 2018)
- Nairn, Raymond, Tim McCreanor, and Angela Moewaka Barnes, *Mass Media Representations of Indigenous Peoples* (Auckland, New Zealand: Shore and Whariki Research Centre, College of Health, Massey University, 2017)

Ludography

- Creative Assembly, *Empire: Total War* (Sega, 2009), Windows; macOS
- Ludeon Studios, *RimWorld* (Ludeon Studios, 2018), Windows; macOS; Linux
- Mojang Studios, *Minecraft: Java Edition* (Mojang Studios, 2011), Windows PC; macOS; Linux
- , *Minecraft: Bedrock Edition* (Mojang Studios, 2017), multiple platforms
- , *Minecraft: Pi Edition* (Mojang Studios, 2012), Raspberry Pi
- , *Minecraft: New Nintendo 3DS Edition* (Mojang Studios, 2018), New Nintendo 3DS
- , *Minecraft Earth* (Mojang Studios, 2019), iOS; Android
- Supercell, *Clash of Clans* (Supercell, 2012), iOS; Android

SANDRA YOUKHANA

*THE NEW ASTROLABES:
RESETTING 'DEFAULT IRAQ'
THROUGH EXPERIMENTAL
VIDEOGAME APPROACHES*

I am in Babylon. Others have been here too: hard hats thrown to the ground, stacks of bricks moved and used and knocked into. The site is in ruins, but there are attempts at reparation, visible through stark material changes to the walls and crenelations. A sign reads in Arabic: *Notify us of any injuries immediately*. A parachute is strewn over a monolithic archway, indicating that somebody landed there, maybe it was me. I mount onto the footings of an eroded column to obtain a better vantage point — the highest spot in the map. Taking in the scenery, I die, and then I die again. This time a headshot, confirmed by my killcam. Respawning, I spot my former self, a ragdoll slumped over a pile of debris. My bodies pile up as the enemy smartens, and time is reduced to seconds before my view is blood-spattered to the point of obscurity. The human spirit that once animated my avatar is torn from the digital realm and cast back out into real life.¹

This Babylon belongs to *Call of Duty: Black Ops 6* (2024), which deposits me back into 1991, during the Gulf War. This is a multiplayer map which has been poorly received by players due to its design - in a PC Gamer review, Morgan Park expresses his Babylon hate, calling it a 'damn mess' and stating, 'these arches suck.'² This Babylon is seemingly not fit for purpose as a virtual battleground

1 *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), p. 8.

2 Morgan Park, 'What is the Worst *Call of Duty: Black Ops 6* Map and Why Is It Babylon?', *PC Gamer*, 5 November 2024.

due to the porosity of its crumbled ruins, which once stood as vast structures erected to connect the ground to the sky. This Babylon has been forced into accommodating inherently chaotic and dangerous behaviours by the game engine, even though it doesn't really want to: a spatial form of ludonarrative dissonance³ where the architecture and the objective misalign. In campaign mode, I am a smart missile guiding an airstrike towards a blazing wreckage that I had called in seconds ago. Ten minutes later, I am a chopper gunner circling a mountain top, attempting a killstreak accompanied by a heavy metal soundtrack. Shifting between ground and sky, I personify 'full-spectrum dominance'⁴, a term for the powerful military interplay of ground and air forces, which, in the game engine, I can achieve as a single person with a simple camera switch.

I return to Babylon again, this time as Barbie. In the level start screen, I'm informed that it is very wet, but I should enjoy the river rafting. I platform across lily pads and stepping stones, on the back of a turtle and down a river using a raft, arriving at the entrance of a vibrant palace. The architecture is dynamic and surreal, presenting itself through environmental puzzles that exploit the flatness of the engine it was made on. After defeating a spitting plant, I enter a mysterious chamber to find a stone plinth, illuminated by a single beam of light. Here I uncover a statue of a golden lamassu, which I take home with me to display at a local museum, following in Lara Croft's footsteps. Within *Barbie: Explorer* (2001) Babylon is depicted as part of a global journey through a series of exoticised, adventure-oriented locations — the African jungle, Tibet, Egypt and Iraq, where my objective is to loot a series of precious artefacts. This Babylon is lush rather than arid, yet it does little to break away from the generic tropes of 'ancient mystery' placed upon it by Western-centric narratives. As Barry Atkins observes, 'Foreign space is full of traps and snares, and the threat that it represents is only defused through violence and (often) through the application

3 Clint Hocking, 'Ludonarrative dissonance in *Bioshock*: the problem of what the game is about', in *Well Played 1.0: Video Games, Value and Meaning*, ed. by Drew Davidson (Pittsburgh, Pennsylvania: ETC Press, 2009), pp. 114–17.

4 Nick Dyer-Witheford and Greg de Peuter, *Games of Empire: Global Capitalism and Video Games* (Minneapolis: University of Minnesota Press, 2009), p. 111.

of superior technology,⁵ and this can be seen through the architectural trickery of Babylon. As Barbie, with no weapons to hand, I rely on supernatural running and jumping abilities to obtain the prize, emphasising my dominance over the environment.

Through the lens of Western game developers, Iraq's depiction in videogames over the past 35 years has been profoundly shaped by its political positioning in relation to the rest of the world: as an enemy, a battleground, and an exploitative resource. The fidelity of such depictions has been enabled by advances in game engine technology, with game engines themselves imposing specific game structures onto Iraq that perpetuate these images of the country as a landscape of conflict. This chapter explores how those engines do more than render environments: they encode behaviours, perspectives, and logics that reinforce particular modes of representation, contributing to the persistence of a 'default Iraq'. Alyssa Mercante argues that these ongoing narratives translate into the desensitisation and brutalisation of brown bodies,⁶ as they are repeatedly represented within familiar scripts of violence and disposability. These games, developed primarily by Western studios for Western audiences, reinforce racialised expectations, where brown characters are routinely cast as enemies, collateral damage, or background figures. This normalises their suffering and erasure within the flow of gameplay. Because players are rarely encouraged to empathise with these figures, their representation becomes abstracted into gameplay mechanics, with little space for alternative subjectivities to emerge. Reviewing *Call Of Duty: Black Ops 6* (2024), the latest instalment of the *Call of Duty* series and newest game rerunning Iraq as a virtual playground, Brendan Caldwell reminds us that the narrative of this series and its genre has not changed: 'to kill is cool, but only if you do it for the United States Of America'.⁷

5 Barry Atkins, *More than a Game: The Computer Game as Fictional Form* (Manchester: Manchester University Press, 2003), p. 59.

6 Alyssa Mercante, 'We Have To Talk (Again) About How War Games Depict The Middle East', *Kotaku*, 7 December 2023.

7 Brendan Caldwell, 'Call of Duty: Black Ops 6 campaign review: a military shooter that comes disguised as other, better games', *Rock Paper Shotgun*, 5 November 2024.

As an Iraqi-born female growing up in the UK, glimpses of my country of birth during my childhood in the 1990s and early 2000s were communicated to me through the lens of Western media. Television broadcasts showed night skies illuminated by attacks, followed by the aftermath, a country shrouded in smoke, dust, and debris. These scenes were swiftly reincarnated through subsequent videogame titles, contradicting the Iraq I could access through family photo albums and the one I eventually returned to as a teenager in the early 2000s. Through this I discovered how my own culture was masked behind all the versions of Iraq that played out on screen (Fig. 1). Visiting all parts of *actual* Iraq has long been advised against by government foreign travel advice, yet as a virtual destination, it is marketed, visited and returned to by millions of people.

This ongoing archive brings together videogames that take samples of Iraq and present it back to us through varying degrees of fidelity and fantasy, in different time periods. There are 86 Iraqs, 56 guns, 38 ruins, a centaur, and a football pitch. Ordered chronologically according to the time period each game is set in, we can see new games depicting ancient scenes, old games projecting distant futures, and many that rushed to package a recent past or ongoing situation. In many of these Iraqs, it is trendy to fight infinite wars as an American hero and drop tons of bombs from aircrafts in the sky. The majority of games subject Iraq to a warzone, and approximately half of these games are played from first-person shooter (FPS) perspective, emphasising this as a dominant agency. Matthew Thomas Payne argues that this is down to a correspondence between the mainstream news and the game industry's evolving storytelling techniques from the Gulf Wars of the 1990s to the 2000s. These included video feeds pulled from attack vehicles and rocket-mounted cameras that recorded the final moments of their 'smart' weapons' flights,⁸ and subsequently, reporters accompanying soldiers on the battlefield and disseminating streams of live, 'on the ground' footage. This connects them to the evolution of game technologies at the time - most significantly, flight and tank simulators rooted in the Gulf War, and subsequently the Iraq War, especially through the rise of tactical shooters. Jean Baudril-

8 Matthew Thomas Payne, *Playing War: Military Video Games After 9/11* (New York: New York University Press, 2016), pp. 54–56.

lard proclaims, ‘We are all hostages of media intoxication [...] We are already all strategic hostages in situ; our site is the screen on which we are virtually bombed day by day, even while serving as exchange value.’⁹ The ubiquity of these images reinforced by game engines leads to ‘an endless loop of media replay’¹⁰ with ludic war culture evolving to play out these battles over again.

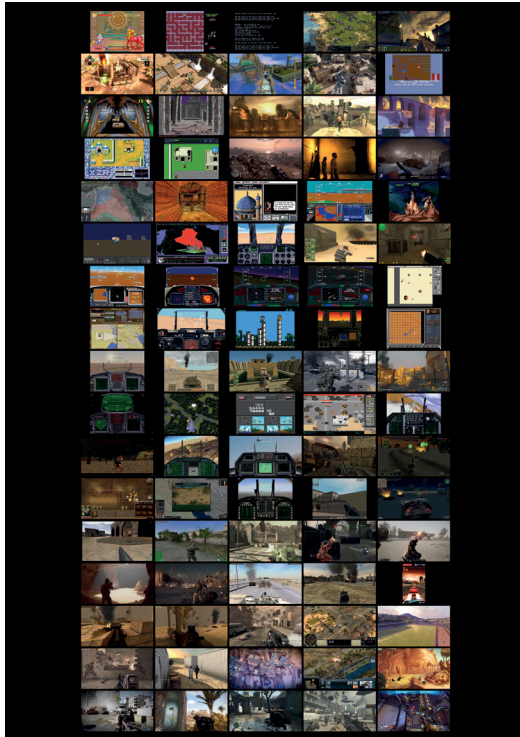


Fig. 1. Sandra Youkhana, *Iraq: Reloaded*, ongoing digital archive/composite of videogame screenshots depicting Iraq across different historical and speculative time periods, arranged chronologically according to each game's setting. The image brings together 86 representations of Iraq drawn from commercial videogames, foregrounding the recurrence of war, ruin, weaponry, and militarised first-person perspectives in the construction of a 'default Iraq'.

9 Jean Baudrillard, *The Gulf War Did Not Take Place*, trans. by Paul Patton (Bloomington: Indiana University Press, 1995), p. 25.

10 Payne, *Playing War*, p. 53.

Supernatural events also occur: an alien onslaught in Baghdad (*Anomaly: Warzone, Earth*, 2011) and a vampire takeover of an Akkadian temple in the Zagros mountains (*The Dark Pictures Anthology: House of Ashes*, 2021). The latter is an example of how games play with Alexander Galloway's notions of realisticness and realism¹¹ — through its (realistic) graphics and (unrealistic) narrative, *House of Ashes* demonstrates how 'gaming is a purely expressionistic medium with no grounding in realism no matter how high the polygon counts or dots per inch'.¹² The enemies are symbolic, they become another way of legitimising the long-term cultural preoccupations of broader US relationships with the outside world.¹³ Through these allegories, Iraq (already in ruins) is primed to accept this fate as a sacrificial backdrop for play.

Enabled by game engines, Iraq has also been programmed to become an 'ever-changing battlefield [...] with infinite playability'.¹⁴ In *Squad* (2020) this is facilitated by the decisions of a Commander, who shapes a new battlefield each time that determines the team's approach. *Six Days in Fallujah* (2023) does so through the spatial environment itself, priding itself on a game system called 'Procedural Architecture' which re-shapes the entire battlefield each time the game is played, assembling entire build-

11 Alexander Galloway distinguishes between 'realisticness' and 'realism' in video games. 'Realisticness' refers to visual fidelity and representational accuracy, that is the polygon counts, textures, and graphical detail that make a game *look* realistic. In contrast, 'realism' relates to the game's action and its congruence with the player's social reality. As Galloway argues, 'realisticness and realism are most certainly not the same thing. If they were the same, realism in gaming would simply be a mathematical process of counting the polygons and tracing the correspondences. Realisticness is a yardstick held up to representation'. See Alexander R. Galloway, 'Social Realism in Gaming', *Game Studies*, 4 (1) (2004); and Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006), pp. 70–94.

12 Galloway, *Gaming*, p. 73.

13 Ryan Lizardi, 'Repelling the Invasion of the "Other": Post-Apocalyptic Alien Shooter Videogames Addressing Contemporary Cultural Attitudes', in *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), p. 370.

14 *Squad*, 'Ever-Changing Battlefield', n.d.

ings and city blocks procedurally.¹⁵ Through this, the horrors of the Second Battle of Fallujah (a real event that took place during the Iraq War in 2004) can be replayed infinitely, with the city presented in constant ruin and turmoil. By reconfiguring Fallujah each time, the game forgoes historical and geographical accuracy in favour of replayability, simulating randomised versions of the city trapped in the same war within a ‘disposable Middle Eastern sandbox’.¹⁶ Game engines are complicit in making this happen, reshuffling civilian homes and cultural landmarks in favour of the experience and programmed to filter what can and can’t be destroyed, encouraging players to destroy *those* buildings and kill *those* people, and translating morals into code.

In videogames, rarely do we call Iraq our home (*Prince of Persia: The Two Thrones*, 2005, *2010 FIFA World Cup*, 2010, *Assassin’s Creed: Mirage*, 2023, *Exile*, 1988) and when we do, we are still faced with different forms of conflict. Does it provoke a different emotional response for players to see Babylon in flames or under siege when the game frames it as their home? Game engines reframe our relationship to the world with ease — discussing *America’s Army* (2002), Ian Bogost explains how ‘the visual representation of good and evil in the game is rudimentary, accomplished by rendering the opposing team in a different texture.’¹⁷ These design choices inform whether we are mourning the world’s loss or contributing to its destruction.

The future looks grim for Iraq, at least through its depiction in *Call of Duty: Advanced Warfare* (2014) which takes us to New Baghdad in 2054. The city underwent major redevelopment after previous conflicts, and boomed once the Atlas Corporation (a private military corporation led by former American soldier Jonathan Irons) took over operations from the Republic of Iraq. Following an invasion by the U.S military forces which I partake in as the player, the city once again falls into collapse. The game’s wiki page explains: ‘New Baghdad was once again reduced to a

15 Six Days in Fallujah, ‘Introducing procedural architecture’, *Six Days in Fallujah*, 23 March 2021.

16 Cameron Koch, ‘Why Six Days In Fallujah’s Procedural Levels Are A Mistake’, *Screen Rant*, 23 March 2021.

17 Ian Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Massachusetts: MIT Press, 2007), p. 78.

city in conflict as it had been six decades earlier. Unfortunately for the citizens of Baghdad, the progress they had made over the past few years had been undone.¹⁸ In this war between America and America, Iraq and its citizens stand in as collateral damage within a larger geopolitical struggle — the destruction of New Baghdad is celebrated as an immersive and participatory process. *Overwatch 1* (2016) & *2* (2022) similarly project us 60 years into the future through the ‘Oasis’ control map, released in 2017. In describing the vision for this map as ‘hope for Iraq’, Jeff Kaplan asks ‘Is it really necessary to show dusty streets or bombed out buildings anymore? Haven’t we seen enough of that, not only in videogames, but in the world?’¹⁹ While the architectural design of Oasis reflects this ambition, presenting a vibrant and technologically advanced city, Iraq’s association with conflict remains intact. Videogame Iraq still can’t seem to shake its attachment to the FPS game mode, one where intense battles (as juicy as they might appear in *Overwatch*) continue to unfold.

Yet the game engines themselves encode specific worldviews and behaviours, and what they choose to push forward varies across different games. The IW engine, created by Infinity Ward for the *Call of Duty* game series prioritises high-octane combat and visual fidelity, aligning with narratives of war and conflict by enhancing the player’s immersion in a battlefield. Its focus on refining the combat loop²⁰ perpetuates a representation of Iraq (and other regions) as a space that is primarily defined by violence, to be engaged with tactically. In contrast, Ubisoft’s Anvil engine strives to create an expansive, ‘massive living open-world’,²¹ embedding players within intricate simulations of historical cities that includes 861 CE Baghdad. While the shift towards open-world immersion in games like *Assassin’s Creed: Mirage* (2023) might suggest a move away from reductive portrayals, the

18 Call of Duty Wiki, ‘New Baghdad (Location)’, n.d.

19 Veeildf, ‘D.I.C.E Summit 2017 | Overwatch | Jeff Kaplan (Stream with chat)’, *YouTube*, 23 February 2017.

20 Andy Robinson, ‘Interview: How Treyarch wants Black Ops 6’s new movement system to change the genre’, *Videogames Chronicle*, 11 June 2024.

21 Ubisoft, ‘Technology: Learn about Ubisoft’s tech & areas of expertise’, *Ubisoft.com*, n.d.

underlying focus on systems, objects, and crowds compromises the cultural and historical depth of Baghdad as a backdrop for player agency. As Basim, we clamber across religious landmarks and through family homes towards our objective, often leaving a path of destruction. Although the game is centred on an Iraqi character, Ubisoft's Anvil engine prioritises the creation of expansive, interactive worlds designed for stealth and parkour mechanics: a design philosophy that foregrounds gameplay engagement over the cultural and historical specificity of Baghdad. These conventions and prerogatives — gamified combat, exploration, and conquest — allow externalised perspectives to seep through and become subtly reinforced as 'imperial strategies'.²² Both engines reveal a lack of neutrality, demonstrating technological traits that influence the stories disseminated through them, and inform the ways players view and engage with Iraq.

For all these versions of Iraq, those I am yet to discover and undoubtedly, the ones we are yet to play, my research questions why so many videogames to date have reduced Iraq to a passive backdrop in a broader conflict, when they have all the potential to challenge such portrayals. Soraya Murray writes, 'Playable representations matter,'²³ particularly in understanding not only the conflict itself but also what precedes and follows it, when the PC powers down, or the console is placed on standby. I am proposing that game engines can serve as powerful tools for crafting more nuanced stories that can challenge these existing depictions of Iraq, creating opportunities to engage with more complex, multifaceted portrayals of conflict and human consequences of intervention.

Enter *Default Iraq* (2023). The air is dense and smoggy, and the player's hands are gloved, big enough to command the precision rifle they are holding. There is a town in this valley, or at least there was. Piles of rubble beneath their feet, obscuring the path; houses vacant and windows blasted. They make out the tall silhouettes of palm trees and the surrounding terrain; hostile topography that suggests this place was hard to find. This is an

22 Christopher B. Patterson, *Open World Empire: Race, Erotics, and the Global Rise of Video Games* (New York: New York University Press, 2020), p. 4.

23 Soraya Murray, *On Videogames: The Visual Politics of Race, Gender, and Space* (London: Bloomsbury, 2017), p. 228.

Iraq conceived to appear as an average, the most *default* version of Iraq we have played in videogames (Fig. 2).



Fig. 2. Sandra Youkhana, *Default Iraq* (2023). Digital game still. First-person view of a deliberately generic Iraqi warzone constructed in Unreal Engine using standard FPS assets and conventions: smog, rubble, damaged architecture, palm trees, and a scoped rifle. The work condenses the recurrent visual grammar through which commercial videogames render Iraq as a hostile battlefield, before redirecting that militarised gaze towards the recovery of ancient Assyrian architectural fragments.

Unreal Engine makes the design of *Default Iraq* too easy, almost trivial. James Malazita analyses, ‘Unreal Engine has always straddled the line between meditative graphical beauty and a boyish appetite for action and destruction,’²⁴ and this seeps through both my aesthetic and mechanic choices for this game. Using Unreal Engine’s standard FPS template, and one of the many FPS assets that use American military guns on the UE Marketplace demonstrates how the engine is eager to support this mode of play. Malazita also argues ‘that a game engine and the games made with it are mutually constitutive,’²⁵ and in Unreal’s case, its ongo-

24 James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024), p. 38.

25 *Ibid.*, p. 18.

ing ‘entanglement’ with military culture stems from its development of US Army recruitment tool/game *America’s Army*.

It feels primitive when you see how the software makes a first-person shooter viewpoint happen: a pair of arms wielding a gun, parented to Unreal Engine’s blue camera pawn, and as Gwyneth Peaty perceives, ‘designed to communicate the existence of a body.’²⁶ Navarro argues that ‘the system of first-person view games does not need a body, but the guise does,’²⁷ implied through the visual impact of running, crouching, and jumping on the embodied camera. I reconfigure the Blueprint, so the gun takes on a new form of agency. This deviates from FPS conventions in a similar way to games such as *Portal* (2007) where the ammunition and its affect is not based on adrenaline sequences of shooting and sensori-motor skills, but rather on problem solving and cognitive skills.²⁸

Sculpting a terrain, I create a pocket in the landscape that encases the town and hides the virtual horizon, smoothing the geometry to accompany the nature of the *MI_Dry_Sand* Quixel texture that has been applied to it. The detail is less important, as through environmental design techniques I thicken the air to call in a fog of war - making it harder to see ten or so metres ahead. Through its exponential height parameters, the fog sits snug in the valley, coded to obscure someone on the ground or obscure the ground to someone above it. I tint it yellow to communicate an atmosphere of heat, antiquity, and danger — a cinematic technique commonly utilised in the representation of Global South countries in films and games, which makes the scene feel more familiar to the gamer’s gaze.

26 Gwyneth Peaty, ‘Hatched from the Veins in Your Arms: Movement, Ontology and First-Person Gameplay in *BioShock*’, in *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), pp. 153–74, p. 160.

27 Victor Navarro, ‘I Am a Gun: The Avatar and Avatariness in the FPS’, in *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), pp. 63–88, p. 78.

28 Bernard Perron, ‘Conventions’ in *The Routledge Companion To Video Game Studies* ed. By Mark J. P. Wolf and Bernard Perron (London: Taylor and Francis, 2014), p. 151.

The architecture of this town is nondescript, modelled rapidly as a series of bland, geometric volumes with randomised details on each façade. The architecture becomes quintessentially Iraqi as I attempt to ruin it in the game engine – applying cracked asphalt and damaged concrete textures alongside bullet holes and broken tile decals. Once the buildings are placed, I decorate the scene with random props, mining Quixel for digital rubble²⁹ — anything demolished, dusty, rusty, and worn, of which there are many. Shattered glass, doorways obstructed by rubble, rusty rebar and knotted electrical cabling littering the floors. I continue gathering concrete, brick, rubble, sandbag, tarp, bollard and more, to occupy the ground space and conceal any ‘perfect’ edges where the buildings meet the floor.

In the game, the player moves intuitively, exploring empty buildings for signs of threat or life. The area seems vacant, yet the presence of a rifle in the player’s hands signals imminent danger — as Voorhees, Call, and Whitlock describe, these visual and ludic conventions condition players to anticipate combat scenarios typical of the FPS genre.³⁰ The player holds down the right trigger button to zoom in through the scope, seeking out information through this new level of visibility. Small targets appear, then disappear as they release the trigger. The targets change position, inviting the player to shoot, reinforcing Pippin Barr’s perception that ‘Contemporary controllers have buttons called ‘triggers’ for a reason.’³¹ A technicoloured structure appears in place of the dilapidated building, and it is clear that this is a piece of something else – these shapes and colours don’t belong here.

But in fact they do. The fragments are sections of ancient palaces, which were the monumental centres of cities within the Assyrian heartland in northern Iraq across 9-7 BCE. Applying emissive, brightly coloured materials sets them apart from the surrounding desert that they begin to illuminate. Once the tar-

29 David Chandler, ‘Videogames and the Aesthetics of Ruins’, *Killscreen*, 6 March 2014.

30 Gerald Voorhees, Joshua Call, Katie Whitlock, *Guns, Grenades, and Grunts: First-Person Shooter Games* (London and New York: Bloomsbury Publishing, 2014), p. 9.

31 Pippin Barr, *The Stuff Games Are Made of* (Cambridge, Massachusetts: MIT Press, 2023), p. 115.

gets have been discovered, the player gains access to a drone cam that displays their progress on the ground. The player is interpellated into a god-like view, synonymous with city-builder games like *Cities Skylines* and *SimCity*, where we see an interplay between emergent bottom-up behaviours and top-down systemic control.³² By clicking, dragging, and rotating, the player consolidates the pieces into a series of gates that unearths a staircase to a colossal ziggurat that grazes the sky – emerging bottom-up from the player's top-down actions. Once complete, the player is redeployed back to the ground, where they traverse the stairs and the game ends.

The New Astrolabes

These initial explorations have led me to the design of a first-person, open-world videogame titled *The New Astrolabes*, as an attempt to reclaim the *Default Iraq* that dominates mainstream depictions. Through this I ask: how can game engines serve as generative tools that can shift Iraq's narrative away from repetitively powerless forms of representation? The game offers an alternative framework for exploring the country, one rooted in understanding its past, rather than through the belligerent lens of a sniper scope.

As a diasporic Assyrian, belonging to an indigenous ethnic group of Iraq and now a marginalised minority, for all the many videogames set in Iraq, there is little representation of my own culture within them. Iraq's ancient past has been appropriated by forces both internal and external to the country, stemming back to the Victorian fascination in ancient Assyrian aesthetics after the discovery of Assyrian palaces by European excavators in the mid-19th century. References to Babylon, The Tower of Babel, the Hanging Gardens, and various Mesopotamian deities are present in videogame titles, yet they are typically presented as exotic or supernatural; entities to conquer, exploit, or defeat. The project highlights the complex political forces that have shaped

32 Chaim Gingold, *Building SimCity: How to Put the World in a Machine* (Cambridge, Massachusetts: MIT Press, 2024), p. 71.

Iraq's identity, both actively and passively – through imperialism, nationalism, tyranny, and neglect.

I aim to challenge these perspectives and reframe the player's understanding of Iraq's past by allowing them to engage with cultural artefacts in ways that shift them away from appearing as prizes or collateral in a game environment. Through new counter-narratives and critical use of tools offered by game engines, I am experimenting with new worldbuilding methods that use the physical environment of Iraq as a basis for the virtual world.

Victura (publishers of *Six Days in Fallujah*) CEO Peter Tamte was quoted stating, 'Very few people are curious about what it's like to be an Iraqi civilian. Nobody's going to play that game,'³³ underscoring the ongoing commercial appeal of portraying Iraq as the 'other'. Game engines facilitate these experiences, as Bogost observes, 'first-person shooter game engines construe entire gameplay behaviors, facilitating functional interactions divorced from individual games.'³⁴ Keogh and Nicoll argue that game engines such as Unity carry a 'grain';³⁵ a set of defaults and workflows that nudge developers towards specific genre conventions. Preconfigured first-person controllers and shooting mechanics help to normalise combat-centric design and shape the kinds of interactions developers go on to implement. In contrast, *The New Astrolabes* challenges this by using a game engine to make design choices that counter the engine's pre-defined capabilities.

As Adrienne Shaw proposes, 'If we can only imagine new ways of viewing what has been, we never get a chance to imagine what might be,'³⁶ and so this game aims to introduce new cultural, historical, and environmental discussions into videogame depictions of Iraq, fostering representations that are generative rather than reductive.

33 James Batchelor, 'Six Days in Fallujah dev: 'I don't think we need to portray the atrocities'', *GamesIndustry.biz*, 16 February 2021.

34 Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* (Cambridge, Massachusetts: MIT Press, 2006), p. 57.

35 Brendan Keogh and Benjamin Nicoll, 'Grain: Default Settings, Design Principles, and the Aura of Videogame Production' in *The Unity Game Engine and the Circuits of Cultural Software*, ed. by Brendan Keogh and Benjamin Nicoll (Cham, Switzerland: Springer International Publishing, 2019), p. 64.

36 Adrienne Shaw, 'The Tyranny of Realism: Historical Accuracy in Assassin's Creed III', *First Person Scholar*, 29 October 2014.

I am a Crosshair

In the game, I opt for a first-person viewpoint to mirror its popular usage in games set in Iraq. The removal of a visible body counters the prototypical FPS character with chiselled white arms, gloved or cuffed, and holding a gun. As a result, the player transitions from an embodied character in *Default Iraq* to an ‘implied player-character,’³⁷ guided solely by the presence of a crosshair that orientates themselves in space.

Ariella Azoulay observes that ‘the camera made visible and acceptable imperial world destruction and legitimised the world’s reconstruction on the empire’s terms.’³⁸ The crosshair in FPS games functions similarly, guiding players to enact violence in a way that is framed as inevitable, natural, and rewarding. The game challenges the legitimacy of this gaze in two ways, initially, by altering the crosshair to a circle. This disrupts the visual connection to conflict by removing the impression that we are viewing the world through an intrusive optical instrument, while retaining a guiding function. The circle is programmed to lazily ease in and out of the centre of the screen as the player looks around, through a soft drag and delay to counter the FPS obsession with fixing the player’s sight on a specific target.

This shift intensifies the importance of *free looking* as the player’s visual curiosity increases, directing their focus without being confined by the traditional FPS view. Perron observes that ‘the conventions of a genre might become more noticeable when they are not present,’³⁹ and by manipulating these visual cues, the game subverts typical genre expectations, playing with what feels familiar and what feels out of place in a first-person game about Iraq.

Without a visible body, who is the player? And what do they do? The intention for this game is to encourage more fluidity in both the player’s identity and agency, rather than assuming a particular role with fixed abilities. This alternative framing invites players to engage with Iraq as a place of inquiry, which is a dis-

37 Payne, *Playing War*, p. 60.

38 Ariella Aïsha Azoulay, *Potential History: Unlearning Imperialism* (London, Verso, 2019), p. 7.

39 Perron, ‘Conventions’, p. 151.

ruption to the usual relationship between the player and imperialist narratives. Building upon this, I consider Alenda Chang's provocation: 'What if an entirely new range of inter-actions became possible after dropping one's weapon?'⁴⁰ *The New Astrolabes* immerses the player in a world that is a result of human action, an aftermath of tumultuous events spanning thousands of years. Set within an open-world, walking simulator format, it encourages players to take non-linear paths and engage in non-violent interactions that promote rebuilding and reconnecting, exposing the player to Iraq's complex and layered history. It uses local histories to create new storytelling opportunities that have often been overlooked in favour of more conventional narratives. *The New Astrolabes* transforms the world as the player engages with it, shifting it from a state of ruin to one of remediation. This counters the usual Player versus Environment (PvE) dynamic, opting for a player-with-environment videogame approach.

The New Astrolabes, named after a Mesopotamian network of star paths, uses indigenous knowledge systems to place the game world within a three-dimensional interpretation of *Imago Mundi* (The Babylonian Map of the World, 6th century BC), a Babylonian clay tablet describing the oldest known depiction of the world. This visually unremarkable object, clay-baked and the size of an adult palm was discovered by Iraqi Assyriologist Hormuzd Rassam near Baghdad and acquired by the British Museum in 1882 where it still resides (Gallery 55, Display Case 16). The map combines both mythological and geographical Babylonian conceptions of space, and due to its damaged state, has left its meaning open to vast interpretations since its discovery. The map consists of a central core containing circles representing cities; a ring symbolising a body of water; and eight triangular sections along the border that represent outer regions. More broadly, the map sits within a series of levels in the universe, consisting of the underworld, earth, and heavens.⁴¹ *Imago Mundo* is commonly interpreted as a world divided into a real core and a mythological periphery, however, newer interpreta-

40 Alenda Chang, 'Rambunctious Games: A Manifesto for Environmental Game Design', *Art Journal*, 79 (2), 68–75.

41 Wayne Horowitz, *Mesopotamian Cosmic Geography*. (Winona Lake, Indiana: Eisenbrauns, 1998), p. 3.

tions theorise that the locations on the map form interconnected points that take the viewer on a visual journey from one end of the map to the other, which connects the Mesopotamian past and present with its real and mythological landscapes.⁴² While the cuneiform script supports some of these theories, its incompleteness dismantles one fixed interpretation, leaving it open to new ones. Paul Delnero conceives that ‘To understand the interpretations and intentions of the past, we have to experiment with it as a possibility space’⁴³ and this intrinsic to the way game engines allow us to create space – as a multiplicity of images and ideas.



Fig. 3. Sandra Youkhana, *The New Astrolabes* (in development). Digital concept diagram/game-world schema based on a three-dimensional reinterpretation of *Imago Mundi* (The Babylonian Map of the World, 6th century BC). The image translates the clay tablet’s cosmographic structure — central inhabited zone, encircling body of water, outer regions, and vertical relation between underworld, earth, and heavens — into a speculative game-world model for *The New Astrolabes*.

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- 42 Paul Delnero, ‘A Land with No Borders: A New Interpretation of the Babylonian “Map of the World”’, *Journal of Ancient Near Eastern History*, 4.1–2, 2017, 19–37.
- 43 Erik Malcolm Champion, ‘Single White Looter’ in *The Interactive Past: Archaeology, Heritage & Videogames*, ed. by Angus A.A. Mol, Csilla E. Ariese-Vandemeulebroucke, Krijn H.J. Boom, and Aris Politopoulos (Leiden, The Netherlands: Sidestone Press, 2017), p. 120.

Using the tablet as a worldbuilding device, I selected it as an entity with a defined edge to challenge the drive from game engine technologies to create more ambitious ‘massive living open-worlds’ as discussed earlier. As Bogost states, ‘The size of the world and the quantity of possible actions matters less than the significance of those actions.’ I also draw inspiration from Shannon Mattern’s discussion of “dumb” histories of mud and mark-making⁴⁴ where she highlights clay ‘as a time-based medium; [...] it sticks around to make itself available for historical study’⁴⁵ by using a game engine to revisit an ancient object. Designing a game world inspired by these ‘marks’, the game foregrounds the potential of older, indigenous understandings of the world. Just as clay ‘sticks around’ to reflect lasting civilisations, game engines can be seen as systems of procedural memory that accumulate and process iterative actions, creating digital histories within the engine’s logic. Toulmin and Goodfield name these ancient tablets ‘procedure-texts’⁴⁶, *i.e.* structured collections of planetary observations used to identify recurring cycles and aid in forecasting. Game engines, as modern procedural systems share this purpose with ancient tablets, both functioning as tools to model and interpret intricate systems. By embedding these procedural logics into the game engine, *The New Astrolabes* captures the player’s journey as a unique record; a real-time translation of player actions into visual data, projecting a generative overlay onto the ‘Heavens’. This becomes an ever-changing constellation, a direct consequence of interactions with the Earth’s surface. The game engine bridges material and celestial realms, offering a reimagined reading of the physical world — one that can be both distant and hopeful — a *new astrolabe* of images, actions, and ideas.

44 Shannon Mattern, *Code and Clay, Data and Dirt: Five Thousand Years of Urban Media* (Cambridge, Massachusetts: Cambridge, Massachusetts: MIT Press, 2017), p. 89.

45 *Ibid.*, p. 87.

46 Stephen Toulmin and June Goodfield, *The Fabric of the Heavens* (Hutchinson, 1961), p. 25.

Charting New Paths

In the game, each of the eight outer *nagû* (region) in the world represents a distant area that hosts a distinct biome worlded from the surviving cuneiform descriptions found on the clay tablet. These include a forest of ‘stone-shedding trees’; a mountainous desert that ‘winged birds cannot reach’; and a grassland ‘where a horned bull dwells and attacks the newcomer.’ These playful conditions come to life in the game engine, through particle simulations, actors, and animations, pushing prior scholarship beyond the textual. The inner continent contains various geometric shapes representing places (cities including Babylon, Assyria and Der) and topographic features (including mountain, swamp, channel). While these ingredients follow some geographical accuracy, their relation to one another is somewhat incorrect. This ‘mistake’ permits further slippages in the design of the world to occur as I import the map as a diagrammatic underlay into Unreal Engine and begin terraforming landscapes and water bodies to flesh out the extents of the world. Playing with various levels of detail and height, the diagram takes shape as the world is built up from the clay tablet delineations. Visually, the world is purple, coated in a cosmic softness to mark a clear departure from the ubiquitous yellow filter. Rather than 8k Quixel materials, I opt for stylisations that aren’t typically associated with Unreal. Materials reveal the polygons of their 3D hosts, who strip back their layers of fidelity to celebrate a new form of anti-realism.

Venturing to different *nagû*, the player encounters various non-human actors – a crow, a bull, a tree, and a stone deity, who provide insights into their habitats and guide the player through each scenario. These actors are programmed to withhold information until specific conditions are met, emphasising the power of non-human agency.⁴⁷ For instance, the player waits for a crow to land on a perch or for a bull to finish grazing before they can interact, programmed to limit the player’s control. This contrasts with many games where players dominate such interactions, showcasing how the engine can be used to subvert typical player expectations, rebalancing the power dynamic between player and non-player characters.

47 Chang, ‘Rambunctious Games’, p. 72.

In each *nagû*, the player encounters a star, which connects to a second star on the inner surface of the earth, at a procedurally-generated location. In the second destination they are presented with an environmental puzzle, which utilises a different game mechanic. Once complete, the two stars connect to form a unique constellation that gradually builds up in the sky until all the constellations have been completed, forming a total of 36 stars that make up the Mesopotamian Astrolabes. The constellation-building mechanic showcases the engine's ability to connect player actions with narrative worldbuilding in real-time, as each connection contributes to a larger thematic or historical framework.

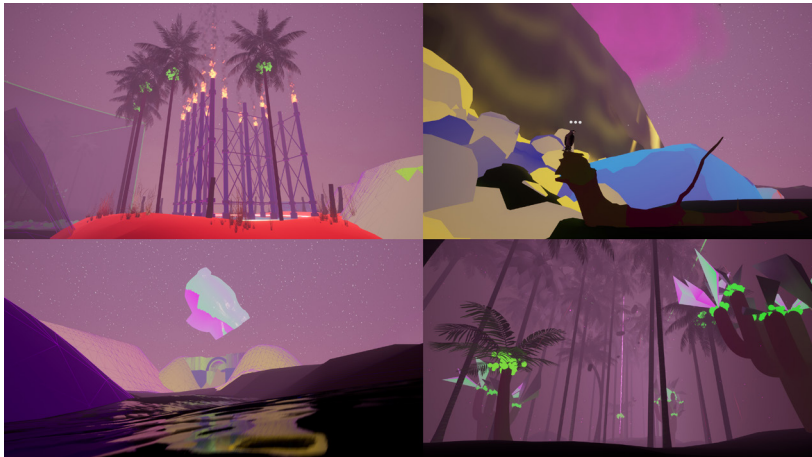


Fig. 4. Sandra Youkhana, *The New Astrolabes* (in development). Composite of digital game stills from an Unreal Engine project. The four scenes visualise restorative mechanics that counter the combat logic typical of games set in Iraq, including the extinguishing of gas flares to regenerate date palms, the rewinding of drought-stricken terrain, and perspectival shifts toward nonhuman actors and ecological recovery. The image foregrounds the project's use of interactive allegory to translate environmental damage, extraction, and repair into real-time spatial transformation.

As discussed, game engines and the tropes they reinforce encourage combat-based gameplay and this is particularly common when the game takes place in Iraq. My choice of mechanics goes beyond a surface-level reading of conflict, drawing from lesser-known histories to challenge the presumption that Iraq can

only be represented by game engines as a combat zone. Within the game world, each objective and its associated mechanic relates to a real-world counterpart, using the videogame medium as a ‘container’⁴⁸ for these discussions, as a portal to access them. The game foregrounds the exploitation of Iraq’s cultural and natural resources and reimagines these moments as interactive spatial allegories. Richard Bartle describes how virtual worlds are not insulated from the real world,⁴⁹ underscoring how game engines maintain an intrinsic dialogue with the physical world. *The New Astrolabes* plays with this relationship by aligning historical artefacts with the treatment of digital assets, both positioned as extractive resources to be manipulated and transformed. The player encounters scenarios that address the discovery, damage, and displacement of ancient artefacts, revealing how the ruins encountered in the game came to be. The mechanics offer methods to imagine a return to an earlier state, shifting the narrative from passive observation to active restoration. These tactics — *recapture, rewild, rebuild, rematerialise, recover, rebury, reverse* — are central to the design as the game engine encodes logic that governs their execution, linking player actions to visible, real-time environmental transformations.

To *recapture*, the player extinguishes gas flares, a common sight in modern-day Iraq, contributing to pollution and public health issues. As each flame is extinguished, a tree regrows, referencing Iraq’s historic date-growing culture, heavily impacted by drought and war. These actors form part of a wider systemic relationship, which rebalances resource management with ecological preservation, and encourages players to view their actions as part of a restorative process within the game’s ecosystem, translating real-world challenges into interactive systems.

To *rewild*, the player cultivates a drought-stricken riverscape, representative of natural environments across Iraq impacted by climate change, then interpolates their view to that of a bird circling above, observing a rewilded terrain. The player has no

48 Ian Cheng, *Emissaries Guide to Worlding* (Los Angeles: Metis Suns, 2018), p. 51.

49 Richard A. Bartle. *Designing Virtual Worlds* (Berkeley, California: New Riders, 2003), p. 83.

agency to control the bird, instead, twisting and turning in the sky along the bird's randomised flight path. This moment repositions agency, subverting full-spectrum dominance and highlighting the link between human action and environmental recovery.

To *rebuild*, the player activates a series of boundary stones to reconstruct a destroyed ziggurat. Incorrect selections wobble visibly, while correct ones pulse with light and raise its floors. The player continues this spatial puzzle until the ziggurat has been fully rebuilt, using progressive mechanics to underline the importance of precision in rebuilding heritage. The stones are granted a new affordance by the game engine, with the ability to 'speak back' to the player through responsive, visual feedback.

To *rematerialise*, the player reveals the lost form of a second, eroded ziggurat by painting decals onto its surface, reversing the impact of longer-term environmental degradation and bullet holes from the Gulf War. Through this mechanism, the ziggurat is shaped by the player, either by painting a direct route towards the shrine or exposing a larger extent of the structure beyond their own reach. The decal becomes a tool for reconstruction to counter its typical application in videogames, used to simulate impact on different surfaces. The mechanic also plays with the act of aggressive clicking and 'button-mashing' to rebuild rather than destroy.

To *recover*, the player returns river-scattered fragments to their origin. This relates to the many ways ancient artefacts in Iraq have been displaced following archaeological excavation: between 1845 and 1855, the attempted export by the French and British of approximately 150 antiquities resulted unintentionally in their complete loss.⁵⁰ Once five fragments are recovered, they reassemble into a lamassu statue. The game engine simulates displacement by spawning fragments in new locations and introduces time constraints to underscore fragility. Playing with Unreal Engine's physics systems makes 'picking' more cumbersome for the player, to counter games such as *Indiana Jones and the Great Circle* (2024), where the human hand is capable of flinging precious objects that snap perfectly into place.

⁵⁰ Julian Edgeworth Reade, 'Assyrian Antiquities Lost in Translation', *Journal of Cuneiform Studies* Vol. 70 (The American Schools of Oriental Research, 2018), p. 184.

To *rebury*, the player finds a series of artefacts in a man-made tunnel network and sinks them back into the earth as a form of preservation, backfilling the tunnels. This subverts traditional discovery mechanics by countering traditional excavation as reward, referencing both ISIS tunnelling and colonial extractions. The exterior of the mound is scarred with holes like a ‘waffle’;⁵¹ representative of looting processes. The player triggers the growth of wildflowers within the holes, simulating pre-excavation conditions where ancient sites were left undisturbed and blended into their ecological surroundings.

Finally, to *reverse*, the player navigates versions of an Assyrian throne room through historical transformations: from its original configuration to a Victorian reinterpretation, to Saddam Hussein’s palace and then U.S. military occupation. The player dynamically transforms the space by scaling and modifying various objects and details to reverse the room back to its original state. The game engine layers these historical narratives within the same space, allowing the player to become an active participant in the rooms’ shifting identity as they reverse the changes through an act of symbolic reclamation.

The New Astrolabes begins where many other games have ended, taking place in the aftermath of conflict. Unlike so many conventional FPS narratives, where the world resets for another cycle of combat, this project asks: what if it was reset to tell a different story? *The New Astrolabes* explores what happens after the player character retreats, by opening up new possibilities for the remnants that have been left behind. This aims to disrupt the ubiquitous nature of mainstream representations of Iraq in videogames, offering a counter-narrative that foregrounds the broader impacts of violence and conflict.

Central to this disruption is the game engine itself, often perceived as a neutral technological tool but inherently embedded with characteristics that shape player behaviours and perceptions. How easy is it to convince Unreal Engine, colloquially known as the ‘Army Engine’⁵² due to its origins in military simula-

51 Jeff Hecht, ‘Looters riddle ancient Iraqi sites with holes’, *New Scientist*, 12 June 2003.

52 Malazita, *Enacting Platforms*, p. 38.

tion and frequent use in FPS game creation, to behave in unexpected ways? By genre-bending, tinkering with default settings, and drawing from different game mechanics, we can begin to challenge the way these tools perpetuate dominant narratives by introducing new methods for discussing historical, cultural, and ecological themes.



Fig. 5. Sandra Youkhana, *The New Astrolabes* (in development). Digital game still from an Unreal Engine project. A nonhuman figure moves through a stylised, anti-realist landscape as player actions generate constellatory links in the sky, visualising the project's attempt to recode Iraq beyond the habitual grammar of the first-person shooter. The image foregrounds the game's transformation of the engine from a combat-oriented system into a vehicle for cultural repair, ecological reflection, and decolonial worldbuilding.

This potential is already distinct in games such as Joseph DeLappe's *Killbox* (2015-16), which humanises a datapoint in drone warfare, or Pippin Barr's *A Series of Gunshots* (2015), which explores the concept of violence without action. The 'unsettling'⁵³ cuteness of *Lovely Planet* (2014) and *Incolatus: Don't Stop, Girly-pop!* (2026) both twist typical FPS mechanics in unexpected ways. These projects demonstrate the plasticity of game engines and their capacity to reframe ludic conflict in new ways.

53 András Neltz, 'The Trippiest FPS You'll See Today', Kotaku, 3 December 2013.

Through *The New Astrolabes*, I aim to push this potential further by using the game engine, once a war machine, as a tool for decolonial imagination. Souvik Mukherjee describes ‘playing back’⁵⁴ as a practice that disrupts linear chronologies and centres of truth, amplifying voices that have been silenced in colonial archives. By using the game engine to create new *possibility spaces*, this project reframes Iraq not as a passive, violent battleground but as a dynamic site of significance. This is an attempt to reclaim Iraq by using the game engine as an instrument of cultural repair, redefining how Iraq is communicated through videogames, and what draws us towards it. To ‘repair’ in a game is not to fix or forgive, but it is to reset: a welcome reconfiguration of the ‘one huge stage set’⁵⁵ that is the game engine.

Bibliography

- Atkins, Barry, *More than a Game: The Computer Game as Fictional Form* (Manchester: Manchester University Press, 2003)
- Azoulay, Ariella Aisha, *Potential History: Unlearning Imperialism* (London: Verso, 2019)
- Barr, Pippin, *The Stuff Games Are Made Of* (Cambridge, Massachusetts: MIT Press, 2023)
- Bartle, Richard A., *Designing Virtual Worlds* (Berkeley: New Riders Publishing, 2003)
- Batchelor, James, ‘Six Days in Fallujah dev: “I don’t think we need to portray the atrocities”’, *GamesIndustry.biz*, 16 February 2021, <https://www.gamesindustry.biz/six-days-of-fallujah-dev-i-dont-think-we-need-to-portray-the-atrocities> [accessed 19 November 2024]
- Baudrillard, Jean, *The Gulf War Did Not Take Place* (Bloomington: Indiana University Press, 1995)
- Bogost, Ian, *Unit Operations: An Approach to Videogame Criticism* (Cambridge, Massachusetts: MIT Press, 2006)
- Bogost, Ian, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Massachusetts: MIT Press, 2007).
- Bucknell, Alice, ‘All the world’s polygons’, *Šum*, no. 23 (‘Otherselves’), 29 December 2024, <https://www.sum.si/journal-articles/all-the-worlds-polygons> [accessed 31 December 2024]

54 Souvik Mukherjee, *Videogames and Postcolonialism: Empire Plays Back* (Cham, Switzerland: Springer International Publishing, 2017), p. 105.

55 Alice Bucknell, ‘All The World’s Polygons’, *Šum* no. 23, 29 December 2024.

- Caldwell, Brendan, 'Call of Duty: Black Ops 6 campaign review: a military shooter that comes disguised as other, better games', *Rock Paper Shotgun*, 5 November 2024, <https://www.rockpapershotgun.com/call-of-duty-black-ops-6-campaign-review-a-military-shooter-that-comes-disguised-as-other-better-games> [accessed 14 November 2024]
- Call of Duty Wiki, 'New Baghdad (Location)', *Call of Duty Wiki*, n.d., [https://callofduty.fandom.com/wiki/New_Baghdad_\(Location\)](https://callofduty.fandom.com/wiki/New_Baghdad_(Location)) [accessed 14 November 2024]
- Champion, Erik Malcolm, 'Single White Looter', in *The Interactive Past: Archaeology, Heritage & Videogames*, ed. by Angus A. A. Mol, Csilla E. Ariese-Vandemeulebroucke, Krijn H. J. Boom, Aris Politopoulos (Leiden, The Netherlands: Sidestone Press, 2017), pp. 119–22
- Chang, Alenda, 'Rambunctious Games: A Manifesto for Environmental Game Design', *Art Journal*, 79.2 (2020), 68–75. <https://doi.org/10.1080/00043249.2020.1765557> [accessed 5 December 2024]
- Chandler, David, 'Videogames and the aesthetic of ruins', *Kill Screen*, 6 March 2014, <https://www.killscreen.com/videogames-and-aesthetic-ruins/> [accessed 5 December 2024]
- Cheng, Ian, *Emissaries Guide to Worlding* (Los Angeles: Metis Suns, 2018)
- Delnero, Paul, 'A Land with No Borders: A New Interpretation of the Babylonian "Map of the World"', *Journal of Ancient Near Eastern History*, 4.1–2, 2017, 19–37 <https://doi.org/10.1515/janeh-2017-0014> [accessed 12 December 2024]
- Dyer-Witheford, Nick, and Greig de Peuter, *Games of Empire: Global Capitalism and Video Games* (Minneapolis: University of Minnesota Press, 2009)
- Galloway, Alexander R., 'Social Realism in Gaming', *Game Studies*, 4 (1) (2004) <https://gamestudies.org/0401/galloway/> [accessed 12 December 2024]
- Galloway, Alexander R., *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006)
- Gingold, Chaim, *Building SimCity: How to Put the World in a Machine* (Cambridge, Massachusetts: MIT Press, 2024)
- Hecht, Jeff, 'Looters riddle ancient Iraqi sites with holes', *New Scientist*, 12 June 2003, <https://www.newscientist.com/article/dn3825-looters-riddle-ancient-iraqi-sites-with-holes/> [accessed 15 December 2024]
- Hocking, Clint, 'Ludonarrative dissonance in Bioshock: the problem of what the game is about', in *Well Played 1.0: Video Games, Value and Meaning*, ed. by Drew Davidson (Pittsburgh, PA: ETC Press, 2009), pp. 114–17, <https://dl.acm.org/doi/10.5555/1806034.1806049> [accessed 14 November 2024]
- Keogh, Brendan, and Benjamin Nicoll. 2019. 'Grain: Default Settings, Design Principles, and the Aura of Videogame Production', in *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Swit-

- zerland: Palgrave Macmillan), pp. 63–82 https://doi.org/10.1007/978-3-030-25012-6_4 [accessed 14 November 2024]
- Koch, Cameron, '10 Hardest Missions in Call of Duty: World at War (Ranked)', ScreenRant, n.d., <https://screenrant.com/call-of-duty-world-at-war-hardest-missions/> [accessed 14 November 2024]
- Lizardi, Ryan, 'Repelling the Invasion of the "Other": Post-Apocalyptic Alien Shooter Videogames Addressing Contemporary Cultural Attitudes', in *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), pp. 365–88
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Mattern, Shannon, *Code and Clay, Data and Dirt: Five Thousand Years of Urban Media* (Minneapolis: University of Minnesota Press, 2017)
- Mercante, Alyssa, 'We Have To Talk (Again) About How War Games Depict The Middle East', *Kotaku*, 7 December 2023, <https://kotaku.com/war-games-muslim-arab-call-of-duty-palestine-1851055848> [accessed 14 November 2024]
- Mukherjee, Souvik, *Videogames and Postcolonialism: Empire Plays Back* (Cham: Springer International Publishing, 2017)
- Murray, Soraya, *On Videogames: The Visual Politics of Race, Gender, and Space* (London: Bloomsbury, 2017)
- Navarro, Victor, 'I Am a Gun: The Avatar and Avatarness in the FPS', in *Guns, Grenades, and Grunts: First-Person Shooter Games and Contemporary Warfare*, ed. by Gerald A. Voorhees, Josh Call and Katie Whitlock (New York and London: Continuum, 2012), pp. 63–88
- Neltz, András, 'The Trippiest FPS You'll See Today', *Kotaku*, 3 December 2013, <https://kotaku.com/the-trippiest-fps-youll-see-today-1475481093> [accessed 15 December 2024]
- Payne, Matthew Thomas, *Playing War: Military Video Games After 9/11* (New York: New York University Press, 2016)
- Park, Morgan, 'What is the Worst Call of Duty: *Black Ops 6* Map and Why Is It Babylon?', *PC Gamer*, 5 November 2024, <https://www.pcgamer.com/games/call-of-duty/worst-black-ops-6-map-babylon/> [accessed 14 November 2024]
- Patterson, Christopher B., *Open World Empire: Race, Erotics, and the Global Rise of Video Games* (New York: New York University Press, 2020)
- Peaty, Gwyneth, "'Hatched from the Veins in Your Arms": Movement, Ontology, and First-Person Gameplay in *BioShock*', in *Guns, Grenades, and Grunts: First-Person Shooter Games*, ed. by Gerald A. Voorhees, Joshua Call, and Katie Whitlock (London and New York: Continuum, 2012), pp. 153–74

- Perron, Bernard. 2014. 'Conventions', in *The Routledge Companion to Video Game Studies*, ed. by Mark J. P. Wolf and Bernard Perron (New York: Routledge)
- Reade, Julian Edgeworth, 'Assyrian Antiquities Lost in Translation', *Journal of Cuneiform Studies*, 70 (2018), 167–88
- Robinson, Andy, 'Interview: How Treyarch wants *Black Ops 6*'s new movement system to change the genre', *Video Games Chronicle*, 11 June 2024, <https://www.videogameschronicle.com/features/interviews/interview-how-treyarch-wants-black-ops-6s-new-movement-system-to-change-the-genre/> [accessed 20 November 2024]
- Shaw, Adrienne, 'The Tyranny of Realism: Historical Accuracy in Assassin's Creed III', *First Person Scholar*, 29 October 2014, <http://www.firstpersonscholar.com/the-tyranny-of-realism/> [accessed 8 December 2024]
- Six Days in Fallujah, 'Introducing procedural architecture', *Six Days in Fallujah*, 23 March 2021, <https://www.sixdays.com/news/introducing-procedural-architecture> [accessed 7 December 2024]
- Squad, 'Ever-changing battlefield', Squad, n.d., <https://www.joinssquad.com/game-features/ever-changing-battlefield> [accessed 5 December 2024]
- Toulmin, Stephen, and June Goodfield. 1961. *The Fabric of the Heavens* (London: Hutchinson)
- Ubisoft, 'Technology: Learn about Ubisoft's tech & areas of expertise', Ubisoft, n.d., <https://www.ubisoft.com/en-us/company/how-we-make-games/technology> [accessed 15 November 2024]
- Veeildf, 'D.I.C.E Summit 2017 | Overwatch | Jeff Kaplan (Stream with chat)', YouTube, 23 February 2017, <https://www.youtube.com/watch?v=QGHfFiU8kg4> [accessed 20 November 2024]
- Voorhees, Gerald A., Joshua Call, and Katie Whitlock (eds), *Guns, Grenades, and Grunts: First-Person Shooter Games* (New York and London and New York: Continuum, 2012)

Ludography

- 11 bit studios, *Anomaly: Warzone Earth* (2011), Windows, macOS, Linux, Android, iOS, Xbox 360, and PS3
- Blizzard Entertainment, *Overwatch* (2016), Windows, PS4, and Xbox One
- , *Overwatch 2* (2022), Windows, PS4, PS5, Xbox One, Xbox Series X|S, and Nintendo Switch
- Colossal Order, *Cities Skylines* (2015), Windows; macOS; Linux
- Electronic Arts Canada, *2010 FIFA World Cup South Africa* (2010), PS3, Xbox 360, Wii, PSP, J2ME, and iOS

Funny Fintan Softworks, *Incolatus: Don't Stop, Girlypop!* (2026) Don't Stop, Girlypop! (2026), Windows

Highwire Games, *Six Days in Fallujah* (2023), Windows

Joseph DeLappe and Biome Collective, *Killbox* (2015–16), Windows and macOS

MachineGames, *Indiana Jones and the Great Circle* (2024), Windows, Xbox Series X|S, and PS5

Maxis, *SimCity* (series) (1989–present), various platforms

Offworld Industries, *Squad* (2015; full release 2020), Windows

Pippin Barr, *A Series of Gunshots* (2015), browser (desktop)

Runecraft, *Barbie Explorer* (2001), Windows, PlayStation, and Game Boy Color

quicktequila, *Lovely Planet* (2014), Windows, macOS, Linux, Xbox One, PS4, and Wii U

Sledgehammer Games, *Call of Duty: Advanced Warfare* (2014), Windows, PS3 and PS4; Xbox 360 and Xbox One

Superior Software, *Exile* (1988), BBC Micro and Acorn Electron

Supermassive Games, *The Dark Pictures Anthology: House of Ashes* (2021), Windows, PS4, PS5, Xbox One, and Xbox Series X|S

Treyarch and Raven Software, *Call of Duty: Black Ops 6* (2024), Windows, PS4, PS5, Xbox One, and Xbox Series X|S

Ubisoft Bordeaux, *Assassin's Creed: Mirage* (2023), Windows, PS4 and PS5, Xbox One and Xbox Series X|S, iOS/iPadOS

Ubisoft Montreal, *Assassin's Creed III* (2012), Windows, PS3, Xbox 360, Wii U

—, *Prince of Persia: The Two Thrones* (2005), Windows, PS2, Xbox, GameCube

2K Boston and 2K Australia, *BioShock* (2007), Windows, Xbox 360, PS3, macOS, and iOS

United States Army and Epic Games, *America's Army* (2002), Windows

Valve, *Portal* (2007), Windows, macOS, Linux, Android, and (via The Orange Box) Xbox 360 and PS3

Sandra Youkhana, *The New Astrolabes* (in development), PC and macOS

MATTEO BITTANTI

RAGE AGAINST THE MACHINE:
ENGINE POLITICS IN
GRAND THEFT AUTO V

To understand what *Grand Theft Auto V* (*GTA V*) makes possible beyond its visible gameplay, we must begin with RAGE, the engine that shapes the game's perceptual and behavioural regimes, including its handling of time. My focus is not the engine as a technical curiosity, but as a structuring system that allocates affordances unevenly and sets the conditions under which modifications can intervene. The objective is to examine how its embedded logics shape what can be rendered and apprehended, and what kinds of alteration remain feasible within the simulation.

Scholars who study game engines have demonstrated what platform studies long argued: technical infrastructures are never apolitical. They distribute agency, determine what counts as action, and naturalise orientations towards space, bodies, labour, ownership, and the camera. Although *GTA V* is often discussed by scholars as satire or spectacle,¹ its engine-level governance remains underexamined: which behaviours are easier to perform, which images can be produced and disseminated, and which forms of extraction (data, attention, unpaid technical work) are enabled, incentivised, or tolerated. Eric Freedman treats game engines as infrastructural systems whose persistence matters: they stabilise relations between toolchains, design conventions, and runtime constraints, and they thereby condition what forms

¹ John Wills, *Gamer Nation: Video Games and American Culture* (Baltimore: Johns Hopkins University Press, 2019); John Wills, "Ain't the American Dream Grand": Satirical Play in Rockstar Games' *Grand Theft Auto V*, *European Journal of American Studies*, 16.3 (2021).

of action and experience become straightforward, or costly, within a given game.²

My claim is that RAGE is a regime of permission and procedural emphasis that differentially invests in actions and viewpoints. This distribution becomes clear when modifications function as technical arguments: interventions that reroute state transitions or relocate camera authority, sometimes by forcing categorical flags embedded in native functions into visibility.

This chapter develops a method that links critical engine studies to close description of RAGE's operational parameters, then tests that method through 2girls1comp's mod practice, under conditions of tolerated reverse-engineering. Rather than treating modding as a marginal afterlife of a finished game, I frame it as a diagnostic practice that shows how engine constraint interacts with account-based infrastructure and juridical permission, materially shaping what can be foregrounded for capture and circulation inside *GTA V*.

This chapter proceeds in three movements. First, it surveys five major theoretical perspectives on game engines: Benjamin Nicoll and Brendan Keogh's *The Unity Game Engine and the Circuits of Cultural Software* (2019), Eric Freedman's *The Persistence of Code in Game Engine Culture* (2020), Stefan Werning's *Making Games: The Politics and Poetics of Game Creation Tools* (2021), Eddie Lohmeyer's *Unstable Aesthetics: Game Engines and the Strangeness of Modding* (2021), and James Malazita's *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (2024)³ in order to build a composite framework for treating engines as ideological infrastructure. This synthesis establishes shared concerns across the

2 As Freedman writes, the engine 'carries power relations, distributes agency, shapes communication, contours personhood and organizes everyday life'. Eric Freedman, *The Persistence of Code in Game Engine Culture* (New York: Routledge, 2020), p. 17.

3 Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019); Freedman, *The Persistence of Code*; Stefan Werning, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021); Eddie Lohmeyer, *Unstable Aesthetics: Game Engines and the Strangeness of Modding* (London: Bloomsbury Academic, 2021); James Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024).

literature: engines as software environments and sociotechnical apparatuses, as workflow coordinators and aesthetic filters, and as systems that distribute power through constraints, defaults, and platform economies.

Second, the chapter narrows from engines in general to the particular case of Rockstar Games' RAGE engine as the infrastructural substrate of *GTA V*. Here the conceptual vocabulary developed in the first movement is put to work on RAGE's specific affordances and limitations: the engine's world-simulation stack, its animation and behavioural regimes, its camera and visibility systems, and its integration with networked services and content governance. Read through critical engine studies, RAGE is described as a programmable regime that organises labour, action, and perception, setting the terms under which bodies move, violence is legible, and the city's 'realism' is produced and policed. RAGE cannot, therefore, be reduced to a simple tool for rendering Los Santos.

Third, the chapter puts the framework to work in a sustained analysis of 2girls1comp's interventions in *GTA V*. Their modifications of the original game function as engine critiques rather than cosmetic tweaks: they target RAGE's prerogatives at the level of procedural control, embodied norms, and visual sovereignty, exposing how governance is enacted in code, interfaces, and rule-sets. The key case studies examined in movement three are: *F*** The Policy* (2023), a mod that triggers a one-hour audio reading of *GTA V*'s End User Licence Agreement whenever the player acquires a wanted level, making audible the structural homology between the engine's police-response system and Rockstar Games' legal governance apparatus; *Dancing Plague* (2024), a mod that forces NPCs into looped dance routines by suppressing RAGE's threat-state transitions, using the engine's own IS_PED_MALE native function to expose a procedural gender ontology encoded at the level of runtime behaviour; and *Sightjacking* (2025), a mod that exploits RAGE's provision for scripted camera objects to attach the rendering viewpoint to the nearest NPC, redistributing visual sovereignty across the engine's full population of living entities. All three works were created by 2girls1comp (Marco De Mutiis and Alexandra Pfammatter) and released on GTA5-Mods.com, a popular web platform for browsing and downloading PC mods

for *GTA V*, organised by categories such as tools, vehicles, scripts, maps, weapons, player mods, and miscellaneous add-ons.⁴

The analysis draws substantially on primary questionnaire material I gathered from the artists in January 2026, supplemented by earlier interviews published on the Milan Machinima Festival website. Reference is also made to additional works in 2girls1comp's practice, including *Every Thing* (2023), *Scream Saver* (2024), *SanAndreas.txt* (2023–24), and *There Is a Light That Never Goes Out* (2024), where they illuminate aspects of RAGE's architecture or the artists' working method that the three main case studies alone cannot fully demonstrate.

Taken in sequence, the essay's tripartite model shows how engine analysis can move from general theory to specific infrastructure to technical-artistic contestation. Before turning to RAGE's specificities, I map the broader theoretical landscape: what a game engine is, and what it does.

Theoretical framework: game engine studies, an overview

In the emergent field of critical engine studies, scholars increasingly treat game engines as more than neutral technical artefacts. Engines appear, instead, as *ideological infrastructure*: software frameworks that organise production, shape aesthetic possibility, and regulate conduct through defaults, interfaces, and platform economies. The synthesis that follows is structured around three analytical registers: what engines *are* (ontology), what they *do* (function), and how they *govern* (ideology), while recognising that each account moves across these questions in different proportions. I begin with definitions that conceptualise engines as *cultural software*, *sociotechnical dispositifs*, and *enacted platforms*; I then turn to the operational work engines perform in coordinating workflows and generating aesthetic effects; finally, I consider governance, focusing on how engines naturalise con-

4 In practice, it functions as a user-generated repository: registered users can submit "User Content" (including files and related media), and the site distributes that content to other users under its published Terms of Use. The website was registered in 2011 and became operative shortly after the release of *GTA V*.

straint, distribute agency, and embed power in the technical and institutional conditions of making and playing.

Engines as cultural software

Benjamin Nicoll and Brendan Keogh argue that describing engines in basic technical terms ('a software tool that enables real-time interactive digital content to be created, and a code framework that enables that content to run on different platforms')⁵ is reductive because this definition fails to account for broader cultural, economic, and ideological functions. Their preferred formulation positions engines as 'cultural software', i.e., software that 'provides code frameworks for actions we normally associate with cultural production'.⁶ This shift also requires an ontological adjustment: rather than treating the engine as a single, stable thing, it becomes necessary to account for how it is encountered and instrumentalised across different sites of practice. In this vein, drawing on Annemarie Mol's concept, John Banks describes engines as 'multiple objects', entities that take on distinct meanings for developers, educators, students, and players.⁷ Nicoll and Keogh adopt this multiperspectival view to read Unity as a development environment and pedagogical instrument, while also insisting that its defaults operate as an aesthetic filter. The concept of 'grain' exemplifies this position: Unity⁸ has perceptible 'patterns' and 'fibers' (protocols, standards, and affordances)

5 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*, p. 10.

6 *Ibid.*

7 *Ibid.*, p. 82.

8 Unity (Unity Technologies) is a proprietary, cross-platform real-time 2D/3D development environment comprising the Unity Editor (authoring, scene construction, asset import, and tooling) and a runtime that deploys interactive applications across multiple target platforms; projects commonly use a component-based model (GameObjects with attached Components) and C# scripting via the Unity Scripting API. Unity was first introduced in June 2005, when Unity Technologies launched the engine onstage at Apple's Worldwide Developers Conference (WWDC) as a Mac OS X-focused toolset.

that orient users towards particular design methods.⁹ The ‘grain’ effect produces a recognisable ‘look and feel’ via defaults such as ‘a default way of moving, a default speed, a default field-of-view, and a default footstep sound’.¹⁰ These settings encode procedural and aesthetic norms that condition what developers take to be possible.

Most significantly for understanding RAGE, Nicoll and Keogh read game engines through Michel Foucault’s concept of the *dispositif*, a heterogeneous ensemble of discourses, institutions, practices, and technologies functioning as a strategic mechanism for managing conduct and producing subjectivities. Applied to engines, this framework enables understanding Unity as a *mode of governance*: an infrastructural system configuring the labour, aspirations, and behaviours of its users. They demonstrate that Unity’s democratisation discourse produces entrepreneurial subjects who internalise precarious conditions as opportunities for creative autonomy, arguing that such dynamics align with broader neoliberal transformations of work and subjectivity in digital culture.¹¹

Engines structure workflows, mediate creative labour, encode aesthetic norms, and modulate affect. The scholars write that, as ‘software hubs wherein a vast range of media forms and skills converge into singular videogame builds’, engines coordinate heterogeneous development processes.¹² Additionally, they show how platform support cultures can be folded into platform maintenance and infrastructural reproduction: parts of Unity’s ecosystem function as unpaid maintenance and troubleshooting, with some developers providing ‘unpaid support labour’ around assets and plugins, work that reinforces the platform economy while remaining uncompensated.¹³

9 *Ibid.*, p. 79.

10 *Ibid.*, pp. 68–70.

11 *Ibid.*, p. 30.

12 *Ibid.*, p. 3.

13 *Ibid.*, p. 40.

Engines as persistent architectures of control

Eric Freedman similarly theorises game engines as enduring architectures that shape how digital games are made, operate, and are experienced. At their core, engines ‘produce common functionality for multiple games’, combining ‘a tool suite or content editor (...) and a runtime component that is active when a game is played’.¹⁴ Freedman uses this tool-runtime distinction to sketch engine structure, while also emphasising that any such account remains a simplification of heterogeneous subsystems and workflows. He describes ‘a core engine (a more static, “hard-wired” operating system — the engine’s root persona) and a user interface system that offers the necessary plasticity associated with game design and development’.¹⁵

Engines simultaneously enable and delimit gameplay. ‘As a foundational architecture’, Freedman writes, ‘the game engine is a system of control’.¹⁶ Constraints are often naturalised through interfaces, scripting options, and prefab or asset libraries that render procedural limits as ordinary affordances. Even user-generated content, often presented as an example of creative freedom, remains mediated by proprietary distribution channels and technical gatekeeping. In Freedman’s account, this persistence is historical and institutional, as inherited code and platform conventions continue to organise what can be built, circulated, and recognised as legitimate practice. Engine culture is the social life of that persistence: a set of habits, pipelines, pedagogies, and aesthetic expectations that cohere around what the engine reliably repeats and what it predictably resists.

Engines as sociotechnical dispositifs

Stefan Werning situates the game engine within a broader typology of ‘game creation tools’, a heterogeneous category that ranges from engines such as Unity and Unreal to other planning

14 Freedman, *Persistence of Code in Game Engine Culture*, p. 1.

15 *Ibid.*, p. 4.

16 *Ibid.*, p. 141.

and production instruments across the development pipeline.¹⁷ His account resists treating engines as isolated software artefacts. Instead, he stresses their role as *boundary objects*: mutable, negotiable artefacts that help coordinate collaboration across different disciplines and forms of expertise.¹⁸

Werning characterises engines as ‘fragile constellations of algorithms, mechanics built into user interfaces, and conventions that keep a user community sustainable, productive, and allow it to scale’.¹⁹ On this view, engines belong to larger socio-technical systems rather than functioning as discrete objects. Agency is therefore distributed across human and non-human actors: scripts, presets, editors, community practices, platform incentives, and design norms all participate in shaping what counts as a workable solution, a legible problem, or an acceptable aesthetic.

Engines also operate as epistemic devices that train perception. Werning observes that ‘tools for writing games institutionalize consensual perceptions of digital games that cannot be observed just by playing a game’.²⁰ The visual grammar of Unity’s Inspector, the layered logic of behaviour scripts, and object modularity become cognitive architectures: interfaces that organise not only game functionality but also developers’ conceptual models of how systems behave. In this sense, engines function as apparatuses of knowledge production as much as tools for making.

Werning further treats engines as platforms in an economic register, embedded within marketplace ecosystems and feedback loops. The Unity Asset Store, for instance, is described as ‘an aesthetic ecosystem’, where algorithmic visibility and popularity can amplify certain stylistic conventions.²¹ Pre-curated assets, templates, and workflow rhetorics can condition design practice by making some solutions frictionless while others become costly, obscure, or hard to maintain.

Finally, Werning extends the discussion to the affective and performative dimensions of development tools. Drawing on

17 Werning, *Making Games*, p. 12.

18 *Ibid.*, pp. 18–19.

19 *Ibid.*, p. 31.

20 *Ibid.*, p. 28.

21 *Ibid.*, pp. 58, 60.

Sherry Turkle's notion of *evocative objects*, he cites the claim that creators 'think with the objects we love (and) we love the objects we think with'.²² Engines, in this register, become more than technical environments: they can operate as emotional companions, arenas for self-performance, and sites where professional identity is negotiated through practice. Werning concludes by proposing five modes at the core of his taxonomy: 'playful', 'performative', 'narrative', 'analytical', and 'communicative'.²³

Engines as sites of aesthetic instability

Eddie Lohmeyer reconceptualises game engines as sites where aesthetic stability can break down, where sensation becomes a design problem, and where histories of hardware and software influence interpretation. Applying a media-archaeological approach, he treats the engine as both code and cultural practice, something encountered through hacking, modding, and perceptual disruption rather than through neutral functionality alone.²⁴

Lohmeyer frames the engine as a 'technical framework for hardware and software that generates video game forms through a range of computational mechanisms'.²⁵ He situates this definition within the discipline of media archaeology by borrowing Jussi Parikka's description of an "analysis of the historical layers of media in their singularity — a conceptual and practical exercise in carving out the aesthetic, cultural, and political singularities of media".²⁶ The point is not to universalise engines, but to read them through specific historical instances, ranging from the Nintendo Entertainment System to Id Tech and *Quake*-derived frameworks, and later engines oriented around procedural world-production.²⁷

22 Werning, *Making Games*, p. 11; Sherry Turkle, *Evocative Objects: Things We Think With* (Cambridge, Massachusetts: MIT Press, 2007), p. 5.

23 Werning, *Making Games*, p. 79.

24 Lohmeyer, *Unstable Aesthetics*, pp. 20–21.

25 *Ibid.*, p. 26.

26 Garnet Hertz and Jussi Parikka, 'CTheory Interview: Archaeologies of Media Art', *CTheory*, 1 April 2010

27 Lohmeyer, *Unstable Aesthetics*, p. 26.

Central to Lohmeyer's argument is 'strangeness' as an aesthetic effect that arises when modifications, technical disruptions, and newly introduced assets exceed ordinary expectations of coherence. He writes that 'Modding's strangeness unfolds as an assemblage of the game's diegesis, technical disruptions, and artist-produced assets that through their disparate groupings evoke experiences that exceed our standard interfacing with video games'.²⁸ In his account, this effect makes engine procedures perceptible by pushing them into the foreground of experience.

This line of thought is developed through art-modding case studies. In his discussion of Cory Arcangel's *Super Mario Bros.* modifications, Lohmeyer proposes 'embodied nonplay', which he defines as the player's 'inability to control the game through a disruption of their serial interfacing with the system'.²⁹ In the chapter on JODI's *Untitled Game*, he describes *Quake*'s environments as reprocessed into perceptual interference: 'Quake's levels transformed into perceptually aggressive abstractions', where 'the game was altered into swirling black and white moiré patterns that pulsate with each newly rendered frame'.³⁰

Lohmeyer also extends these claims to the player's bodily involvement. In a later discussion, he connects generative engine behaviour to Jane Bennett's notion of 'thing-power', proposing that certain modded systems enable an exchange between human perception and non-human agency.³¹

Engines as enacted platforms

James Malazita's *Enacting Platforms: Feminist Technoscience and the Unreal Engine* approaches engines not as singular, stable objects but as 'multiply enacted', that is, configured and reconfigured over time through material practices, discursive utterances, and infrastructural entanglements.³² Drawing on Annemarie

²⁸ *Ibid.*, p. 29.

²⁹ *Ibid.*, p. 32.

³⁰ *Ibid.*, p. 112.

³¹ *Ibid.*, p. 175.

³² Malazita, *Enacting Platforms*, p. 21.

Mol's feminist STS account of enactment, he insists that objects 'come into being — and disappear — with the practices in which they are manipulated'.³³ Engines, on this account, hold together as provisional formations rather than unified artefacts: Malazita uses John Law's language of 'fractional coherence' to describe an engine's contingent coherence across contracts, tools, documentation, institutions, and communities.³⁴

For Malazita, platforms are not prior containers that later acquire politics. Rather, 'Platforms are enacted': what a platform is at any given moment 'is always produced alongside power, matter, and meaning'.³⁵ This commits engine analysis to positionality and to the co-production of its objects. As he writes, 'Our position in relation to game engines is more than our relations to infrastructures and to capital; it is also part of the broader coproductions of race, gender, epistemology and identity'.³⁶

Enacting Platforms therefore reads technical aspects of Unreal (e.g., coordinate systems, interfaces, shaders, and pipelines) through intersectional feminist technoscience concerns, including militarised masculinity, the disciplining of working bodies through industrial infrastructures, the location and forms of gendered agency, and the co-production of race and racialised bodies within regimes of knowledge and power.³⁷ In Chapter 1, Malazita examines *America's Army* as a moment when engine and game are mutually constitutive and imbricated with the military-entertainment complex; Unreal is not merely the medium through which the game is produced, but is transformed through that institutional and ideological entanglement.³⁸

This case study also sets up the comparative move that follows: if Unreal's affordances, workflows, and defaults can be reshaped by specific institutional projects, then the game engine cannot be treated as a neutral substrate but must be analysed through the distinct conceptual lenses that engine studies has developed.

33 *Ibid.*, p. 30.

34 *Ibid.*, pp. 64, 71.

35 *Ibid.*, p. 30.

36 *Ibid.*, p. 21.

37 *Ibid.*, p. 31.

38 *Ibid.*, pp. 31, 43.

The following table synthesises five theoretical perspectives discussed so far across key analytical registers, providing a comparative map of how contemporary engine studies conceptualises the game engine as a techno-social platform and ideological infrastructure:

Scholar(s)	What an engine is (ontology)	What an engine does (function)	What an engine normalises (ideology)
Nicoll and Keogh (2019)	'Cultural software'; 'multiple objects'; metaplatfrom with perceptible 'grain'	Coordinates workflows; encodes aesthetic norms via defaults; organises labour hierarchies	Operates as 'democratisation <i>dispositif</i> '; governs through affective infrastructures (tutorials, asset stores)
Freedman (2020)	'Persistent architecture' that shapes perception, action, and epistemic legibility	Defines and delimits gameplay; trains interaction through constraint; modulates agency	Functions as 'system of control'; naturalises procedural limits; reproduces industrial hierarchies
Werning (2021)	'Sociotechnical <i>dispositif</i> '; boundary object; fragile constellation of code, interface, and community	Epistemic device; structures cognition; scaffolds tacit knowledge; conditions taste via marketplace logic	Embeds normative logic in workflows; governs through pedagogical formation; naturalises design standards
Lohmeyer (2021)	'Technical framework' for generative media; historical stratum; site of aesthetic instability	Produces aesthetic excess (glitches, strangeness); enables ontological play; mediates affective entanglement	Exposes nonhuman logics; destabilises immersive coherence; reveals procedural limits through disruption
Malazita (2024)	'Multiply enacted' object; fractional coherence; sociotechnical assemblage performed into being	Site of epistemic community formation; co-produces race, gender, and knowledge; configures interaction	Entangles with militarised masculinity; aligns bodies with infrastructure; enacts orientation and agency

Table 1: Game engine studies: a comparative framework

This comparative framework reveals several convergences. All five scholars reject technological determinism while insisting on code's material consequences. Engines are not neutral; they configure possibility.³⁹ Engines operate across multiple registers simultaneously (technical, aesthetic, economic, pedagogical, and affective) so the critical task is to account for that plurality without collapsing it into a single explanatory register.⁴⁰ They also operate as governance mechanisms, shaping not only computational resources but also labour relations, aesthetic norms, epistemic frameworks, and user subjectivities.⁴¹ Finally, engines function both as stabilising forces, through standardisation, modularity, and defaults, and as sites where disruption becomes thinkable and/or legible, whether through modding, glitching, or tactical reappropriation.⁴²

The five accounts above do not offer a single definition of 'the engine'. Instead, they offer a set of analytic handles for reading how engines stabilise workflows, normalise aesthetic assumptions, and enforce constraints that become perceptible at run-time.

The next section applies these handles to RAGE by moving across three linked sites: the world-simulation and rendering stack (where thresholds and budgets become visible regimes), animation and behavioural control (where bodies are rendered legible through reusable states), and camera and visibility systems (where perspective is coupled to authority). This shift is methodological: the argument proceeds from what the literature says engines *do* to what RAGE demonstrably *does* in *GTA V*'s run-time and tool ecology.

39 Nicoll and Keogh, *The Unity Game Engine and the Circuits of Cultural Software*, p. 10.

40 Werning, *Making Games*, p. 79.

41 Malazita, *Enacting Platforms: Feminist Technoscience and the Unreal Engine*, pp. 21, 30.

42 Lohmeyer, *Unstable Aesthetics: Game Engines and the Strangeness of Modding*, pp. 29, 32.

The RAGE engine: Technical architecture and ideological infrastructure

RAGE (Rockstar Advanced Game Engine) is Rockstar Games' proprietary engine family, developed within Rockstar San Diego's technical group and first deployed publicly in *Rockstar Games presents Table Tennis* (2006).⁴³ From that point onward, Rockstar reused and iterated RAGE across its flagship releases, including *Grand Theft Auto IV* (2008), *Red Dead Redemption* (2010), *Max Payne 3* (2012), and *Grand Theft Auto V* (2013).⁴⁴ The issue is not only one of genealogy. It clarifies how an engine becomes a long-duration organisational form: shared systems, interfaces, and production assumptions that persist across projects and thereby structure how labour is divided, how assets circulate through the pipeline, and what kinds of 'world' are economically sustainable to build. Freedman's account is especially useful here because it describes engines as persistent architectures that lay down the framework for both development and gameplay: an infrastructure that conditions production decisions and runtime experience in tandem.⁴⁵

The analysis in this section proceeds by triangulating (i) what RAGE demonstrably *does* at the level of pipeline design and runtime optimisation with (ii) what Freedman, Nicoll, and Keogh argue engines do as cultural-technical infrastructures.⁴⁶ This method does not infer ideology from surface representation alone, while still treating architectural decisions as culturally consequential.

In *GTA V*, RAGE operates as a world-modelling regime. Los Santos is computed as a data-driven ecology whose apparent contingency is produced by interlocking systems (e.g., AI routines, physics, streaming, and rendering) designed to sustain continuity despite severe memory and bandwidth constraints. Rockstar

43 Thor Thorsen, 'Grand Theft Auto IV powered by Table Tennis engine?', *GameSpot*, 15 June 2006; Rockstar San Diego, *Rockstar Games Presents Table Tennis* (Rockstar Games, 2006)

44 *Ibid.*

45 Freedman, *The Persistence of Code*, p. 12.

46 Specifically: organise labour, constrain action, and distribute visibility and agency through defaults, tools, and procedural regimes. See Freedman, *The Persistence of Code*; Nicoll and Keogh, *The Unity Game Engine*, p. 12.

Games' own public discussion of *GTA V*'s production foregrounds compression and streaming as enabling conditions of scale; Rockstar North's art director, Aaron Garbut, describes the 'biggest achievement' as 'squeezing' the world into console memory while maintaining smooth performance.⁴⁷ Read through Freedman, this emphasis is symptomatic: optimisation is never 'just' technical, because it establishes a priority system that allocates resources, attention, and visibility within the simulated world.⁴⁸

Adrian Courrèges, an engineer and long-form technical writer known for publishing reverse-engineering accounts of real-time rendering, makes those priorities unusually legible by tying visible effects to inspectable pipeline structure. Courrèges describes *GTA V* as using a deferred renderer with multiple render targets (G-buffers) that separate surface attributes, lighting inputs, and depth/stencil data prior to final composition.⁴⁹ He also details RAGE's use of cascaded shadow maps: four shadow maps are generated for progressively larger frusta so that nearby shadows remain high resolution while distant shadows are cheaper to compute.⁵⁰ These are not marginal implementation details: they help account for why *GTA V*'s world holds together in motion, and why its coherence periodically fractures.

If Unity's 'grain' names the felt regularities produced by defaults, then RAGE's grain is legible in its thresholds: LOD transitions,⁵¹

47 Hugh Langley, 'The tech that built an empire: how Rockstar created the world of *GTA 5*', *TechRadar*, 3 August 2022. Garbut is also quoted in Adrian Courrèges, '*GTA V* – Graphics Study – Part 2', 2 November 2015.

48 Freedman, *Persistence of Code*, pp. 145, 146.

49 Courrèges, '*GTA V* – Graphics Study', 2 November 2015.

50 *Ibid.*

51 Level of detail (LOD) transitions are the rule-based switches by which a real-time engine replaces a high-detail model or texture with lower-detail versions as distance, screen size, or performance budgets change, reducing GPU/CPU load while trying to keep the change visually unobtrusive.

occlusion/culling thresholds,⁵² and streaming boundaries⁵³ are functional mechanisms that repeatedly decide what is present, when, and at what fidelity. These decisions become artistically legible in 2girls1comp's mod *Every Thing* (2023), where the artists report that RAGE's population system operated autonomously and persistently throughout production, spawning NPCs into scenario contexts that the artists themselves had not scripted: 'we never spawned them, the game did'.⁵⁴ That behaviour is not chaotic: it is RAGE's streaming and population-density algorithms filling available performance budgets with entities drawn from the engine's default social fabric. The engine's 'compulsive' reproduction of bodies is a runtime expression of the same budget-allocation logic that the LOD and streaming thresholds enforce: the system fills what the performance envelope permits with the content its defaults have prioritised. *Every Thing's* autonomous population is therefore not an artistic accident but a direct index of how RAGE distributes computational attention when no override is in place.

Courrèges's depth-stencil account pushes the point further by showing a literal taxonomy operating inside the frame. The stencil channel assigns IDs to object classes, enabling later passes to target categories of pixels. Courrèges notes, for example, that the protagonist's skin can be isolated for subsurface scattering via a dedicated stencil value: an optimisation demonstrates how the pipeline can allocate expensive perceptual effects selectively, concentrating fidelity where the game's viewpoint and identification

52 Occlusion/culling thresholds are the parameter settings that determine *when* an engine stops drawing or updating objects because they are outside the camera frustum (frustum culling), too small to matter at the current view scale, or blocked from view by other geometry (occlusion culling); 'thresholds' refers to the cut-off values that decide what counts as negligible or unseen

53 Streaming boundaries are the spatial and/or logical partition lines (cells, sectors, zones, chunks) that govern when world data (meshes, textures, animations, audio, navmeshes, scripts) is loaded into memory or unloaded; crossing a boundary triggers asset fetch and eviction policies that keep a large world responsive under finite memory and I/O bandwidth.

54 Marco De Mutiis and Alexandra Pfammatter (2girls1comp), responses to questionnaire by Matteo Bittanti, 2026 (unpublished; in author's files). The passage appears in their answer to the question 'Was there a moment where RAGE 'talked back', that is, where the engine did something unexpected that changed your approach to modding?'

most frequently settle.⁵⁵ That coupling between camera position and computational priority has a direct consequence for *Sightjacking*'s logic. When the mod re-attaches the rendering viewpoint to a nearby NPC, it does not simply shift perspective: it detaches the protagonist from the position that the pipeline uses to calibrate cascaded shadow map frusta, streaming priority, and subsurface scattering allocation. The engine's fidelity budget — designed to concentrate rendering resources where the default protagonist-camera settles — is suddenly oriented towards an entity that RAGE's pipeline had assigned shallow categorical treatment. *Sightjacking* thereby makes the camera-protagonist coupling visible as a resource-allocation decision: what the player sees when inhabiting a non-protagonist viewpoint is, among other things, a world that the engine was not optimised to render at that position. The perceptual strangeness of non-protagonist vision is partly an aesthetic effect and partly a direct consequence of rendering budgets being recalibrated away from their default anchor.



Fig. 1. 2girls1comp, *Every Thing* (2023), mod for *Grand Theft Auto V* (in-game screenshot): the mod sequentially spawns every object in *GTA V*'s prop database until the game crashes under the accumulated load, rendering the engine as an abstract assemblage of 3D assets and foregrounding the materiality of digital objects.

55 *Ibid.*

More generally, the engine ‘sees’ the city through categorical pre-assignment and then routes computation through those categories. This pre-assignment is the pipeline-level mechanism through which the ‘distribution of the sensible’ discussed in the next section becomes a computational fact rather than a rhetorical claim. The stencil buffer’s assignment of discrete IDs to object classes — protagonist skin, vehicle surfaces, background geometry — enacts a hierarchy of perceptual entitlement before any frame reaches the screen. That the protagonist’s skin merits a dedicated stencil value for subsurface scattering while background pedestrians share cheaper categorical treatment is, in Ranciére’s terms, a technical partitioning of who receives full *logos* and who is rendered at shallow procedural depth.

If the argument is that RAGE naturalises hierarchies of visibility and legibility, this is an inspectable subsystem where the claim can be anchored in concrete mechanism rather than inferred from representational content.

Marcus Toftedahl and Henrik Engström’s distinction between ‘user facing’ and ‘product facing’ tools helps formalise this linkage between optimisation and governance. They define the ‘core engine’ in terms of product-facing tools (high-performance systems oriented towards compilation and runtime) while user-facing tools support developer interaction and can vary widely across pipelines.⁵⁶ Even without access to Rockstar Games’ internal authoring environment, RAGE’s product-facing constraints remain readable in the runtime’s thresholded visibility, selective fidelity, and category-based rendering passes. Those constraints are the mechanisms through which budgets and production imperatives become perceptual facts. For an artist, that translation is a point of entry: if the runtime already encodes decisions about what counts as visible, important, or negligible, then it becomes a site of inscription rather than a neutral delivery layer. On that basis, framing RAGE as a platform for artistic purposes remains persuasive, but it still demands careful evidentiary handling.

56 Marcus Toftedahl and Henrik Engström, ‘A Taxonomy of Game Engines and the Tools that Drive the Industry’, *Proceedings of DiGRA 2019* (2019), pp. 12–13.

Nicoll and Keogh's account of engines as 'cultural software' provides a useful hinge because it theorises engines as infrastructures that organise creative possibility through defaults and tool affordances rather than through overt instruction.⁵⁷ Applied to RAGE, the claim has to rest on what can be demonstrated at the level of the runtime and the publicly available authoring environment: observable constraints, feature limits, terms of use, and documented workflows, rather than inferred design intentions. Where primary material on Rockstar Editor's aims and governance is unavailable, the argument can proceed by describing how specific affordances and thresholds distribute visibility, labour, and creative latitude in practice.

The theoretical frameworks outlined above converge on a point that popular criticism still struggles to articulate cleanly: engines are not neutral substrates. As the work of the modding duo 2girls1comp demonstrates, engines distribute agency, decide what counts as action, and naturalise orientations towards space, bodies, labour, ownership, and the camera. While *GTA V* is often discussed as satire, parody and spectacle, its engine-level governance is the quieter story that becomes visible through tactical modification. The following section argues that 2girls1comp's interventions operate below *GTA V*'s iconographic surface. Their modifications work as engine critiques because they target three strata where RAGE's prerogatives become culturally legible: first, policy and licence governance; second, embodied norms encoded in interaction and animation, and third, visual sovereignty secured through camera coupling. Their interventions work through existing permissions, couplings, and failure points, treating the engine as a constrained site of negotiation rather than a barrier to be transcended.

Methodologically, I treat 'art modding' as *discursive practice*: mods function as arguments that reframe the conditions of play, not as additive content. At the same time, I keep modding's political economy in view: the familiar contradiction whereby unpaid experimentation can be captured as value for platforms and publishers. My aim is not to adjudicate whether modding is 'purely' subversive, but to specify what I call *tactical reallocation*: an inter-

57 Nicoll and Keogh, *Unity Game Engine*, pp. 7–10.

vention that (i) operates through the engine's own native mechanisms rather than bypassing them; (ii) redirects a specific default allocation — of computational resources, functional authority, or behavioural permissions — towards entities, states, or view-points the engine had not designated as their default recipients; and (iii) in doing so renders that default allocation newly legible as a governance decision rather than a neutral technical fact. The criterion has three components because 'critique' without (i) is merely adjacent commentary, redistribution without (ii) has no specifiable target, and both together without (iii) produce novelty without analytical disclosure. Each case study below is read against all three components.

Why intervene at the level of the engine?

Drawing on Jacques Rancière's notion of *le partage du sensible* ('distribution of the sensible'),⁵⁸ RAGE can be read as a technical architecture that partitions what can be *seen*, *done*, and *imagined* within play. For Rancière, the partition operates by distinguishing between *logos* — speech that is recognised as participation — and *phonē* (often rendered as *phone*) — sound attributed to bodies that have no acknowledged speaking part. Politics, in this account, occurs when what has been relegated to *phonē* claims the status of *logos*. Transposed to RAGE's computational architecture, this distinction maps onto the engine's behavioural resource-allocation logic: violence, mobility, and escalation are granted full *logos* — extensive animation dictionaries, reactive AI state machines, multi-stage task-persistence architectures, and dedicated scenario systems that sustain these behaviours as the engine's operational default — while sustained non-violent interaction, contemplation, or non-instrumental co-presence are relegated to *phonē*, not actively suppressed but modelled thinly. Ambient social behaviours, leisure animations, and cinematic idles are present within RAGE's vocabulary but they command a fraction of the systemic depth, AI responsiveness, and scenario

⁵⁸ Jacques Rancière, *The Politics of Aesthetics: The Distribution of the Sensible*, trans. by Gabriel Rockhill (London: Continuum, 2004).

infrastructure that combat and locomotion receive, with no comparably strong chain of native functions through which the modder, or the player, could make them operationally central. A second, distinct register of the same partition operates at the level of rendering: here the asymmetry is not between action and co-presence but between protagonist and background, enforced through dedicated stencil IDs, subsurface scattering allocations, and camera-anchored fidelity budgets that concentrate computational attention at a single authorised viewpoint, a mechanism this analysis returns to in the *Sightjacking* case study.⁵⁹ In *GTA V*, this distribution is materially asymmetric: mobility, theft, and escalation are rendered frictionless through optimised algorithms and preconfigured physics systems, while sustained non-violent interaction or non-instrumental observation encounter systematic resistance through the absence of corresponding mechanical affordances. This asymmetry is neither accidental nor purely aesthetic. Three governance layers interact to sustain it, and they are not equivalent mechanisms. The first is *technical*: RAGE's proprietary architecture means that no official SDK or scripting interface is available to modders, who must instead rely on community-built reverse-engineering tools — Script Hook V and OpenIV — that operate at the boundary of what Rockstar tolerates. This layer governs computational possibility: what functions can be called, what systems can be scripted, and what forms of access are structurally foreclosed regardless of legal permission. The second is *infrastructural*: Rockstar Social Club ties access to *GTA V*'s networked services — including the Rockstar Editor and its content distribution channel — to authenticated accounts, ensuring that circulation of player-produced content remains within a platform that Rockstar monitors and controls. Mods are permitted in single-player environments but are actively excluded from *GTA Online*,⁶⁰ partitioning the game's social space along lines that protect its monetisation architecture. The third is *juridical*: the EULA frames all modification as conditional permission rather

59 See also Jacques Rancière, *Disagreement: Politics and Philosophy*, trans. by Julie Rose (Minneapolis: University of Minnesota Press, 1999), pp. 21–42.

60 Rockstar Games, *Grand Theft Auto Online* (Rockstar Games, 2013).

than user right, giving Rockstar the legal instrument to revoke tolerated access at will. The 2017 OpenIV shutdown — in which a cease-and-desist letter rendered the entire single-player modding ecosystem inaccessible overnight, before public pressure produced a partial reversal — remains the clearest demonstration of how the juridical layer can be activated to produce immediate technical effects.⁶¹ The critical point is not that any one layer alone secures the asymmetry, but that the three are coupled: technical scarcity creates the condition of dependency on unofficial tools; the EULA codifies that dependency as conditional legitimacy; and Social Club provides the enforcement infrastructure through which juridical decisions become technically enacted.

Following infrastructure-studies approaches to game engines, RAGE can be understood as simultaneously *embedded* (within Rockstar Games' production pipeline), *transparent* (invisible during normative play), and *reaching* (extending across hardware platforms and into modding communities). Engines are 'programmable systems that sit below four other layers of abstraction: code, form/function, interface, and finally reception/operation'. 2girls1comp's interventions target this infrastructural layer, exposing how RAGE's 'structured determinacy of objects is matched by the structured determinacy of their transformation',⁶² and thereby making visible the engine's role in naturalising particular relations to bodies, space, and violence.

2girls1comp describe modding in explicitly infrastructural terms. They consider it an act of intervention and hijacking of a cultural artefact, and insist that play should not be confined to the clean boundaries set by developers. As Pfammatter says: 'This reappropriation in general, it is almost inherently a political act'.⁶³

61 See Chris Kerr, 'Take-Two Shuts Down Popular GTA Mod Toolkit Open IV', *Game Developer*, 15 June 2017; Chris Pereira, 'After Angering GTA 5 Fans, Rockstar Releases New Statement On PC Mods [UPDATE]', *GameSpot*, 23 June 2017; Tom Regan, 'GTA Modding Tool Quietly Reappears After Legal Threats', *Engadget*, 5 July 2017.

62 Eric Freedman, 'Engineering Queerness in the Game Development Pipeline', *Game Studies*, 18.3 (December 2018).

63 Alexandra Pfammatter, quoted in Emanuel Maiberg, 'GTA V Mod Makes It a Better Social Media Platform Than Twitter', *404 Media*, 23 October 2023. This politicised approach is not isolated within GTA V's modding culture. Consider, for example, Grayson Earle's *Why don't the cops fight*

The claim is both programmatic and operational: their work suggests that engine prerogatives can be redirected even when the engine is proprietary and the publisher's governance architecture is designed to deter such rerouting.

RAGE's proprietary status does not preclude intervention; it changes its conditions. In practice, *2girls1comp's* work relies on a publicly shared reverse-engineering toolchain — Script Hook V for runtime scripting access and OpenIV for archive and asset manipulation — augmented by community tutorials and workflow documentation. In De Mutiis and Bittanti's as well as Bittanti and Veenstra's account of *GTA V's* creative tool ecology, these utilities are described as informal interfaces that partially substitute for unavailable internal tooling, enabling limited but consequential access to scripts, assets, and behavioural parameters without collapsing the boundary between modding and engine source access.⁶⁴

Engine-level intervention is consequential because engines are not neutral 'black boxes' but heterogeneous actor-networks: assemblages of human and non-human actants whose relations stabilise what the system can do.⁶⁵ RAGE's prerogatives become culturally legible at moments of breakdown or tactical misuse. As Lohmeyer shows through art-modding practices, 'artists hacked, glitched, broke, and otherwise reconfigured game engines working from within a hegemonic field of commercial gaming technologies' to generate what he calls 'unstable aesthetics',⁶⁶ experiences that defamiliarise standard play through mimetic disorientation. *2girls1comp's* modifications operate similarly: they make RAGE's

each other? (2021) or Firas Shehadeh's trilogy *Like An Event In A Dream Dreamt By Another* (2023–25) which repurposes *Grand Theft Auto V* footage through custom modifications produced by Palestinian gamers.

64 Marco De Mutiis and Matteo Bittanti, *The Photographer's Guide to Los Santos* (Milan: Mimesis International, 2024); Matteo Bittanti and Jordy Veenstra, *Los Santos Plays Itself*, 2 vols (Milan: Mimesis International, 2025).

65 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005); John Law, 'Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity', *Systems Practice*, 5 (1992), 379–93.

66 Lohmeyer, *Unstable Aesthetics*, p. 14.

governance apparatus strange by exposing the forensic materiality beneath its formal operations.

2girls1comp: counter-play as infrastructural critique

2girls1comp is a modding duo founded in 2023 by Marco De Mutiis and Alexandra Pfammatter. Their public self-description is unusually explicit about political economy: for example, in their statement for the Getxophoto International Image Festival, they describe their practice as changing ‘the logic of video games’ through creative counter-play, with particular attention to ‘free labour within the capitalist ideologies of the gaming industry’.⁶⁷ They argue that what is at stake is not only representational politics *inside GTA V* but the conditions under which the game circulates as a cultural service and communicative environment.

The material basis of this counter-play warrants closer attention, since the artists’ account of their toolchain shows that ‘infrastructural critique’ operates at once literally and institutionally.⁶⁸ Their interventions do not touch RAGE directly but work through a four-layer mediation through modding, as they explain: ‘C# Script → Script Hook V. NET (managed wrapper) → Script Hook V (native hook layer) → RAGE Engine (game internals)’.⁶⁹

67 2girls1comp, ‘Towards a Philosophy of the Photo Daddy’, *Getxophoto International Image Festival*, 18th edn (Getxo: Getxophoto, 2024).

68 Counter-play and adjacent concepts have several lineages. Alexander R. Galloway theorises ‘countergaming’ as oppositional, often art-inflected practice that foregrounds the videogame apparatus and reworks conventional gameplay aesthetics. Alan F. Meades defines ‘counterplay’ in relation to multiplayer cultures as conflictual and antisocial play, including cheating, exploit use, illicit modifications and hacking. Rika Nakamura and Hanna Wirman use ‘counter-playing tactics’ to describe players’ situated reuse of game systems in response to gendered design assumptions. Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006); Alan F. Meades, *Understanding Counterplay in Video Games* (New York: Routledge, 2015); Rika Nakamura and Hanna Wirman, ‘Girlish Counter-Playing Tactics’, *Game Studies*, 5.1 (2005).

69 Marco De Mutiis and Alexandra Pfammatter (2girls1comp), responses to questionnaire by Matteo Bittanti, 2026 (unpublished; in author’s files). The passage appears in their prefatory technical note. The full codebase

Each layer of this dependency chain is a community-built reverse-engineering achievement rather than an officially sanctioned developer interface. Here, infrastructural critique is embedded in the workflow itself.

Two further approaches characterize 2girls1comp's *modus operandi*. First, *distribution*. The duo emphasises circulation within modding publics as well as cultural contexts, rather than positioning institutional recognition as the primary horizon of legibility. In doing so, they explicitly situate infrastructural critique inside vernacular technical channels — workflows that are already embedded in repositories, tutorials, and shared toolchains — rather than treating the mod as a rarefied object that becomes political only after curatorial translation.

Second, *reciprocity with mod communities*. In an article by Emanuel Maiberg, Pfammatter describes their early learning as dependent on the documentation and technical knowledge accumulated by *GTA V*'s modding community, foregrounding the extent to which reverse engineering and tool use are social achievements rather than individual accomplishments.⁷⁰ This emphasis on collective enabling conditions resonates with Olli Sotamaa's account of modding culture, in which 'being part of a tool community, that is, a shared "computer game modding culture" — constitutes one primary motivation'.⁷¹ The implication is methodological as well as descriptive: if engines and toolchains help produce communities, then modding can function as infrastructural critique because it operates through those communities' practical capacities — debugging, sharing, repurposing, and incremental refinement.

This self-positioning does not resolve the contradiction between critique and entanglement. In fact, the artists themselves resist any such resolution. When asked how they fit into the sys-

is publicly available at <https://github.com/orgs/2girls1comp/repositories>. Note: while *Red Dead Redemption 2* also uses a version of RAGE, the artists specify that their answers concern RAGE as encountered in *GTA V* specifically.

70 Maiberg, 'GTA V Mod Makes It a Better'.

71 Olli Sotamaa, 'When the Game Is Not Enough: Motivations and Practices Among Computer Game Modding Culture', *Games and Culture*, 5.3 (2010), 239–55 (p. 239).

tem they describe, they are candid: 'We are probably swamped in the contradictions and feedback loops of the contemporary networked capitalist condition like everyone else. We are not trying to resolve them, but we remain both critical and playful. (...) We love modding, because we can reclaim the game space and play differently, but we are aware that we could not do that without the big game companies'.⁷² This acknowledgement has analytical relevance: the chapter's account of *tactical reallocation* is not undermined by entanglement but rather constituted through it.

Modding as infrastructural critique does not require *purity*. It requires lucidity about the conditions under which intervention is possible. Their response to my playbour question refuses resolution in the same register in which it is asked: rather than adjudicating whether their work benefits Rockstar Games, the artists turn to Anne-Marie Schleiner's *The Player's Power to Change the Game*, citing it directly: 'If we follow Serres in applying biological evolutionary concepts to cultural change, this insertion of abstract artistic noise into the game can be viewed as a step towards, intentionally or incidentally on the part of artists, to instigating a change or mutation, clearing the way for a new order of play culture to come (whatever that order may be)'.⁷³

Schleiner's parasite-host diagram is, in the artists' account, 'a good approximation of the parasitic (or more symbiotic?) relation between modders and big game studios'⁷⁴, a reading they invoke not to resolve the contradiction but to inhabit it more precisely. The artists push this dialectic one step further: if Rockstar Games were to implement the mechanics of *Dancing Plague*, or the ideas behind *SanAndreas.txt* or *F*** The Policy*, 'we could see this as

72 De Mutiis and Pfammatter, responses to questionnaire, 2026. This passage appears in their response to 'Why release on GTA5-Mods.com instead of, say, itch.io, github or a gallery website?'

73 De Mutiis and Pfammatter, responses to questionnaire, 2026. The artists cite Anne-Marie Schleiner, *The Player's Power to Change the Game* (Amsterdam: Amsterdam University Press, 2017), p. 49; Michel Serres, *The Parasite*, trans. by Lawrence R. Schehr (Minneapolis: University of Minnesota Press, 2007). The Schleiner citation and the 'parasitic (or more symbiotic?)' characterisation appear in their response to 'If someone plays *Dancing Plague* for 10 hours, does that extend *GTA V*'s lifecycle and therefore Rockstar Games' revenue?'

74 *Ibid.*

2girls1comp providing free creative labour that gets captured by the publisher (the host becoming the parasite of the parasites). But we could also imagine how this could introduce experimental, political and even surreal dimensions into the mechanics of a traditional and normative AAA game'.⁷⁵

The inversion maps the exact mechanism by which tactical reallocation could be re-captured, and names that possibility without treating it as a reason to abandon the practice. What follows traces how that position is enacted across the three registers through which 2girls1comp's work operates: the toolchain, the distribution platform, and the mod itself.

Distribution as methodology: Vernacular channels vs. institutional capture

2girls1comp's preference for modding platforms over institutional ones is not a programmatic refusal of art contexts; it is a claim about where the work becomes fully operative. They are explicit that they 'love to share (their) work in artistic contexts', but that 'it is most important to us to present our mods in the environments that they are closely connected to — which is the gaming and modding scene. That is oftentimes where people don't see a project as a conceptual exercise but will actually play with it'.⁷⁶

In other words, 2girls1comp argue that the key distinction is not between art and non-art but between *reception modes*: institutional framing tends to convert a playable mod into an object of contemplation, stripping away the operational context — the toolchain, the player base, the behavioural feedback loop — through which the work's critical content is produced. The artists are consistent on this point: they do not differentiate between 'art' and 'quality of life' mods⁷⁷, a refusal that cuts against any reading

⁷⁵ *Ibid.*

⁷⁶ *Ibid.* This passage appears in their response to 'Why release on GTA5-Mods.com instead of, say, itch.io, github or a gallery website?.'

⁷⁷ De Mutiis and Pfammatter, responses to questionnaire, 2026. This passage appears in their response to 'Do you perceive tension between "art modding" and "gameplay modding" communities?.'

of their GTA5-Mods.com presence as slumming in non-art space; the modding scene is simply where the work lives.

The political significance of vernacular distribution was not a founding premise but an emergent discovery. As the artists explain: 'In the beginning, it was mainly a pragmatic decision since modding forums provided the ideal structure to distribute our work efficiently. However, after publishing *Every Thing* we started to see our engagement with the modding scene as a way of research and expansion of our practice'.⁷⁸

This connects to a wider claim the artists make about modding as a practice of refusal: they describe their motivation as 'the urge to really understand, use and change a game. In a time of software leasing, dark patterns, loot boxes and blackboxification, where players (users) are reduced to cash cows, it seems aspiring to us to take back control over the systems that shape our life — even if it's just a video game'.⁷⁹

The phrase 'blackboxification' names the process that critical engine studies identifies as the *naturalisation of constraint*: the rendering of RAGE's governance as invisible infrastructure rather than legible rule-set. Distributing their mods through vernacular channels is, on this account, a way of keeping the box pried open. At the same time, the artists do not measure the success of that opening in quantifiable terms: 'We don't really think of success and impact in a quantifiable way, but we are happy when players engage with our work as well as when audiences from arts and culture fields become interested in our projects'.⁸⁰ This resistance to platform metrics — download counts, ratings, engagement fig-

78 De Mutiis and Pfammatter, responses to questionnaire, 2026. The evolution from pragmatic to methodological distribution strategy and the 'benchmark test' episode appear in their response to 'What does it mean to circulate critical art through the same platform as flying cars and boob-maxxed mods? Is that strategic or just pragmatic?'

79 De Mutiis and Pfammatter, responses to questionnaire, 2026. The 'software leasing, dark patterns, loot boxes and blackboxification' passage appears in their response to 'Do you perceive tension between "art modding" and "gameplay modding" communities?'

80 De Mutiis and Pfammatter, responses to questionnaire, 2026. The passage on comments and non-quantified impact appears in their response to 'Do you track downloads, comments, ratings? How do you measure "success" or "impact"?'.

ures — reinforces the point that their presence on GTA5-Mods.com is operational, not a concession to the platform's own logic of visibility.

The non-art audience's feedback turned out to be epistemically productive in ways the artists had not anticipated. Community engagement with *Every Thing* took a form they describe as genuinely surprising: 'In an unforeseen twist of events, gamers used our project as a sort of benchmark test for their PCs and laptops. This made us realise that their unique feedback is super valuable to us'.⁸¹

Gamers treating the mod as a hardware stress test — as a tool for probing their own machines — generated practical knowledge about rendering thresholds and engine load that no art audience could have produced. This accords with Werning's account of tool communities as *epistemic devices*: the platform here functions as an apparatus that generates its own forms of legibility about RAGE's operational parameters.

The distribution question also has a technical and political dimension that the distribution-as-method argument requires: update governance. Making HTTP calls from within *SanAndreas.txt* — which depended on networked communication as its central mechanism — was 'hard, and one of the things that would immediately crash the game. It made us go crazy with *SanAndreas.txt* at the beginning, and then it stopped working with a recent patch'.⁸²

81 De Mutiis and Pfammatter, responses to questionnaire, 2026. The evolution from pragmatic to methodological distribution strategy and the 'benchmark test' episode appear in their response to 'What does it mean to circulate critical art through the same platform as flying car and boob-maxxxed mods? Is that strategic or just pragmatic?'

82 De Mutiis and Pfammatter, responses to questionnaire, 2026. The HTTP-call and patch-failure material appears in their response to 'Beyond the two-player camera experiment that became *Sightjacking*, what else didn't work? What did you try to mod that RAGE wouldn't let you?'



Fig. 2. 2girls1comp, *SanAndreas.txt* (2023), mod for *Grand Theft Auto V* (in-game screenshot): the mod lets players write messages across the map, legible to anyone with the mod installed; here, a line of text is overlaid across a tennis court, exemplifying how the gameworld is repurposed into an experimental space for networked communication and anonymous player exchange.

The artists observe that ‘modding is only allowed for single-player story mode’, suggesting that Rockstar Games’ update pipeline actively restricts internet access from within modded scripts.⁸³

Every patch released by Rockstar Games is a potential constraint event: mods that depend on undocumented or tolerated behaviours can be silently disabled without notice, warning, or appeal. Vernacular distribution through GTA5-Mods.com is therefore not simply a preference for the modding community over the gallery. It is a practice conditioned by the knowledge that their work operates inside a managed envelope, and that the envelope can be redrawn at any time. This situates their distribution practice within what Freedman identifies as the ‘persistence of code’: the institutional and technical reproduction of platform constraints across update cycles, which continues to organise what can be built and circulated long after initial release.

83 *Ibid.*

The clearest case of that managed envelope directly shaping artistic content is *F*** The Policy* (2023). The mod triggers a one-hour audio reading of *GTA V*'s End User Licence Agreement whenever the player acquires a wanted level, using the native function `GET_PLAYER_WANTED_LEVEL` (hash `0xE28E54788CE8F12D`), which returns an integer from 0 to 5 corresponding to the game's police-response interface.⁸⁴ The audio file plays on the 0→1 transition and stops when the wanted level returns to 0, running alongside rather than replacing the game's existing police-chase audio: 'we think the two games can coexist and the sounds actually work quite well together (enhancing the feedback loops between the game simulation of police brutality [and] the legal "brutality" of the EULA, whose highly restrictive terms shift most power away from the player)'.⁸⁵ The metagame consequence is structural: 'to listen to the whole EULA you have to be playing with the police chasing you for the whole duration of the sound file (which is just over an hour)'.⁸⁶ The choice of trigger act for the mod video trailer was itself a critical decision: the artists selected standing in front of a police vehicle long enough to raise the wanted level from 0 to 1, choosing it because they 'were interested in finding which one would be the least violent act, because it made sense in the wider idea of what makes you a criminal for the EULA (as well as the parallel with the abuses of power of the police within the simulation offered by the game)'. In the mod itself, however, the audio file is activated by any act that triggers police pursuit.⁸⁷ The mod thus

84 De Mutiis and Pfammatter, responses to questionnaire, 2026. The technical description of `GET_PLAYER_WANTED_LEVEL`, the 01 trigger logic, the audio running alongside rather than replacing game audio, and the one-hour metagame structure appear in their responses to 'How does the *F*** The Policy* mod work?', 'Which state did you hook into to trigger the EULA reading?', and 'Can you describe the actual code/script that intercepts the wanted level trigger?' Full script available at https://github.com/2girls1comp/F-ThePolicy/blob/main/code/F___ThePolicy.cs [accessed 1 January 2026].

85 *Ibid.*

86 *Ibid.*

87 De Mutiis and Pfammatter, responses to questionnaire, 2026. The selection of 'getting in the way of a police vehicle' as the least violent wanted-level trigger appears in their response to 'How does RAGE's police/wanted system work architecturally?' The *fandom.com* source they cite for wanted-level behaviours is: 'Wanted Level in *GTA V*, *GTA*

operates as a structural homology: RAGE's police state machine and the EULA's legal apparatus both criminalise presence through graduated response systems, and the work makes this parallel audible in real-time gameplay. *F*** The Policy* is, as the artists note, their 'shortest and most simple script'⁸⁸ — which also makes it the most economical available demonstration that RAGE's governance apparatus and Rockstar Games' legal governance apparatus are the same system read from two angles.



Fig. 3. 2girls1comp, *F*** The Policy* (2023), mod for *Grand Theft Auto V* (in-game screenshot): when the player becomes wanted, the police “read the player their rights” by reciting the game’s End User License Agreement, turning the pursuit mechanic into a procedural reading of contractual control.

Wiki, https://gta.fandom.com/wiki/Wanted_Level_in_GTA_V [accessed 1 January 2026].

- 88 De Mutiis and Pfammatter, responses to questionnaire, 2026. The technical description of `GET_PLAYER_WANTED_LEVEL`, the 01 trigger logic, the audio running alongside rather than replacing game audio, and the one-hour metagame structure appear in their responses to ‘How does the *F*** the Policy* mod work’, ‘Which state did you hook into to trigger the EULA reading?’, and ‘Can you describe the actual code/script that intercepts the wanted level trigger?’ Full script available at https://github.com/2girls1comp/F-ThePolicy/blob/main/code/F___ThePolicy.cs [accessed 1 January 2026].

Read against the criterion (i), *F*** The Policy* operates through GET_PLAYER_WANTED_LEVEL, a native RAGE function designed to query the engine's own threat-assessment state machine — the mod works entirely within this authorised mechanism, not around it; (ii) it redirects the default allocation of that state machine trigger — normally routed towards escalation management, police dispatch, and pursuit AI — towards the playback of the EULA's legal text, substituting juridical recitation for operational enforcement; (iii) the epistemic visibility produced is the structural homology between runtime policing and legal policing: the EULA and the wanted-level counter operate on the same conditional-permission logic, and the mod makes that identity audible at the precise computational moment when both systems activate simultaneously. What *F*** The Policy* discloses is not that *GTA V* has a licence agreement — every player nominally knows this — but that the licence agreement and the engine's punishment architecture are the same governance instrument expressed in two registers.

Embodied norms and the animation pipeline

Dancing Plague forces NPCs into looped dance routines by overriding ordinary behavioural transitions — idle, alert, flee, attack — with sustained performance states, keeping the animation system 'stuck' in choreography where the engine would normally restore threat-response logic. The intervention operates at the level of RAGE's animation pipeline, and the scale of that pipeline is the first thing the artists' account makes legible. According to the community reverse-engineering index maintained at alexguirre.github.io, *GTA V* contains 156,119 animation clips divided across 15,674 animation dictionaries.⁸⁹ The artists themselves cite this resource in describing their process: they 'went through the animation list specifically searching for the dance ones', stored the results, and assigned them to whichever NPC they targeted.⁹⁰

89 alexguirre, 'GTA V Animations List', <https://alexguirre.github.io/animations-list>.

90 De Mutiis and Pfammatter, responses to questionnaire, 2026. The description of searching the animation list appears in their response to

What this scale reveals is that RAGE's animation archive is vast enough to produce the illusion of behavioural variety while remaining, as *Dancing Plague* makes clear, highly concentrated around combat, locomotion, and a narrow distribution of gendered performance states. As Reed and Phillips argue in their critique of *Mass Effect*'s animation system, 'the procedural and economic imperatives of syntactic exactness, of defining and recycling common states, is not simply a matter of software engineering but of radical containment, of conforming otherwise diverse digital bodies to a common vernacular'.⁹¹



Fig. 4. 2girls1comp, *Dancing Plague* (2024), mod for *Grand Theft Auto V* (in-game screenshot): holding the H key forces every male NPC to dance feverishly (to music by Azu Tiwaline), redirecting choreographies ordinarily reserved for female-coded performers.

Malazita's feminist STS framework offers a complementary analytical register here. Where Reed and Phillips locate the prob-

'Can you briefly explain RAGE's animation system and how you modified it for *Dancing Plague*?'

⁹¹ Alison Reed and Amanda Phillips, 'Additive Race: Colorblind Discourses of Realism in Performance Capture Technologies', *Digital Creativity*, 24.2 (2013), 130–44; BioWare, *Mass Effect* (Microsoft Game Studios, 2007).

lem in procedural and economic imperatives, Malazita argues that such imperatives transcend the technical: ‘our position in relation to game engines is more than our relations to infrastructures and to capital; it is also part of the broader coproductions of race, gender, epistemology and identity’.⁹² Applied to RAGE, this means the animation archive’s concentration around combat, locomotion, and a narrow range of sexualised female performance states cannot be separated from the institutional conditions — the production cultures, the design demographics, the military-entertainment genealogy of the first-person shooter engine from which RAGE descends — under which the engine was built and maintained. The archive is not a neutral repository of motion data; it is an enacted body of knowledge, co-produced alongside and through the gender, race, and class positions of the industry that generated it.

RAGE’s animation system encodes a constrained ontology of embodiment that begins with the entity model. In working with the engine, the artists were ‘surprised to see that the game engine architecture structures entities as three types: NPCs, props and vehicles’.⁹³

RAGE’s organisational logic is object-oriented throughout, structured, as they describe it, ‘like a system of russian dolls’: one accesses the Game, then the Player, then the Character, and from there checks or sets states (‘is the player character alive? Is the character falling?’) or calls functions (‘give a task to the character, teleport them’) — a traversal path that is also the path by which the `IS_PED_MALE` boolean becomes reachable.⁹⁴ The implication of the entity taxonomy — that human bodies and vehicles share categorical equivalence within this hierarchy — is not a marginal implementation detail. It concretises the argument that the engine naturalises an instrumentalised relation to human presence: within RAGE’s scene graph, a pedestrian and a car are

92 Malazita, *Enacting Platforms*.

93 De Mutiis and Pfammatter, responses to questionnaire, 2026. The entity taxonomy (NPCs, props, vehicles), the ‘Russian dolls’ description of RAGE’s object-oriented hierarchy, and the traversal path (Game → Player → Character → states/functions) all appear in their response to ‘What surprised you most about RAGE’s architecture?’

94 *Ibid.*

siblings in the same type taxonomy, both manipulable objects within a system engineered to optimise spectacular action. The state machine governing NPC behaviour prioritises transitions between idle, alert, flee, and attack states, a configuration that supports the production values of action cinema but remains structurally inhospitable to sustained, non-instrumental forms of co-presence.

The most consequential finding embedded in *Dancing Plague* is that RAGE's animation system is procedurally gendered. The artists describe how this became apparent: 'The pole dance is a very specific animation that one can only witness when performed by female coded NPCs in the strip club of Los Santos. We then started noticing that dancing was almost entirely used for the sex worker NPCs, and started looking at the list of dance animations more closely in the game database'.⁹⁵ The pattern in the database led to the identification of a binary native function governing NPC entity behaviour: static BOOL IS_PED_MALE(Ped ped) { return invoke<BOOL>(0x6D9F5FAA7488BA46, ped); }.⁹⁶

The existence of IS_PED_MALE as an inspectable, named function within RAGE transforms what might otherwise be understood as a representational critique into a technical finding: the engine's gender norms are procedural, encoded at the level of native function calls rather than surface character design.

Malazita would describe this as a paradigmatic instance of platform enactment: gender does not pre-exist the engine and subsequently get 'represented' within it, but is actively produced through the platform's material operations. As he writes, what a platform is at any given moment 'is always produced alongside power, matter, and meaning'. IS_PED_MALE is not an incidental implementation choice but a material-discursive formation — an

95 De Mutiis and Pfammatter, responses to questionnaire, 2026. The discovery of gendered animation distribution, the IS_PED_MALE native function, the implementation logic (male boolean $\neq$ dance task; female-coded NPCs unaffected), and the clarification that animations are not tagged at file level appear across their responses to 'What surprised you most about RAGE's architecture?', 'Are animations in RAGE literally tagged by gender?', 'How did you discover that RAGE's animation system is gendered?', and 'Did you remap animations across gender categories?'

96 *Ibid.*

instance of what Malazita calls ‘fractional coherence’⁹⁷ — through which RAGE enacts a binary gender ontology as operational infrastructure. The function does not describe a pre-existing social reality; it enacts one at runtime, at the precise point where the engine determines what a body can do, and to which body a task can be assigned.

In the *Dancing Plague* implementation, NPCs for whom the `IS_PED_MALE` boolean returns true are tasked with playing the dance animation; female-coded NPCs, already performing dance states in the strip-club context, are left unaffected. As the artists put it, ‘Any NPC who has a male boolean (`IS_PED_MALE` returns true) are tasked to play the dance animation. Female coded NPCs are not affected.’⁹⁸ Technically, however, all NPCs contain this boolean; only those the game treats as male return true. The animations are not themselves gendered at the file level — ‘the animations can technically be applied to anyone’, as the artists note, citing the example of a deer performing a pole dance⁹⁹ — but the NPC logic and the distribution of animations across scenario contexts together produce a gendered behavioural regime at the level of runtime. The mod’s logic is therefore *redistributive* rather than additive: it extends to male-coded bodies the embodied register — dancing, non-combative, performative — that RAGE had architecturally reserved for a specific, commodified female presentation.

In Malazita’s terms, *Dancing Plague* performs a tactical re-enactment of the platform: it does not destroy or transcend RAGE’s enacted gender ontology but momentarily redistributes its effects, routing the engine’s own native functions towards bodies that the engine had not designated as their default recipients. This is not liberation from the engine’s gender regime; it is a localised, ad hoc reversal that makes the regime newly legible by exposing whose embodied register was, by default, architecturally reserved — and whose was architecturally excluded from it.

Technically, the persistence of these dance states is achieved not by altering RAGE’s animation graph directly but by suppress-

97 Malazita, *Enacting Platforms*, pp. 7–8, 51, 71.

98 De Mutiis and Pfammatter, responses to questionnaire, 2026.

99 *Ibid.*

ing the engine's own overriding reflexes. As the artists explain: 'We set the flag to loop the animation, but we also added a function to set the task persistent: `Function.Call(Hash.SET_PED_KEEP_TASK, NearbyPeds(i), true)`. We also made sure that the NPC animation would not be interrupted by actions like bumping into someone or something, or other actions which trigger a different state (for example if a gun is shot, NPCs will have reactions and change their "task")'.¹⁰⁰

This is what 'overriding behavioural transitions' means at the code level: not editing the animation graph but invoking `SET_PED_KEEP_TASK` to prevent collision detection or threat-state changes from interrupting the loop. The engine retains its logic entirely; the mod inserts a suppressor that prevents the engine's reactive mechanisms from firing. This distinction is analytically important: *Dancing Plague* does not replace RAGE's operational logic but holds it in suspension, and in doing so makes the engine's compulsive return to alert and combat states newly legible as the normative regime they constitute. When the mod forces NPCs into looped performance states, it renders visible the constraint it is suspending: players accustomed to reading NPC movement as threat-assessment suddenly confront bodies that refuse the engine's operational reflexes. This estrangement recalls what Lohmeyer calls 'aimless play', 'a disruption of a player's flow, sensual modes of play channelled towards competition, reward, and mastery'.¹⁰¹ The engine's autonomous, unscripted behaviour during *Every Thing* production deepens this picture. RAGE's population logic was observed to operate independently of the artists' own scripts: 'We think RAGE is obsessed with spawning NPCs to the point that, in our mod *Every Thing*, it would spawn NPCs on top of crazy props we would spawn. In one of our out-takes you can see two NPCs in the middle of total chaos: we never spawned them, the game did!'¹⁰²

100 De Mutiis and Pfammatter, responses to questionnaire, 2026. The `SET_PED_KEEP_TASK` mechanism and interruption-suppression logic appear in their response to 'How did you make the dancing loop instead of returning to idle/alert states?.'

101 Lohmeyer, *Unstable Aesthetics*, p. 22.

102 De Mutiis and Pfammatter, responses to questionnaire, 2026. The autonomous NPC-spawning episode appears in their response to 'Was

This extends to props as well as bodies: a large moving sign encountered during the same production had ‘sound and movement attached to it by default’,¹⁰³ demonstrating that RAGE’s property-bundling logic — the same architectural principle that makes the camera a ‘microphone’ — operates across the full range of scene objects, not only NPCs. The engine’s autonomous population of space, its compulsive reproduction of bodies and sound-movement bundles into any available scenario context, reveals a system that enacts its own procedural imperatives, generating the social fabric of Los Santos independently of authorial direction.

Read against the criterion (i), *Dancing Plague* operates through `IS_PED_MALE` and `SET_PED_KEEP_TASK`, both official native functions accessible through Script Hook V’s managed wrapper — the mod routes through RAGE’s own task-assignment and persistence architecture, not around it; (ii) it redirects the default allocation of sustained dance states — architecturally reserved for female-coded NPCs in commodified scenario contexts such as the strip club — towards any NPC for whom `IS_PED_MALE` returns true, extending a non-combat, performative, non-instrumental embodied register to entities the engine had not designated as its recipients; (iii) the epistemic visibility produced is the procedural gender ontology encoded at the native function level: gender in RAGE is an operational parameter routing task assignment at runtime. *Dancing Plague* does not argue that the game is sexist; it demonstrates that the engine performs a binary gender ontology as a condition of NPC behaviour, and that this performance is inspectable, nameable, and — within the limits of the mod — reversible.

there a moment where RAGE “talked back”? The out-take is available at <https://www.youtube.com/watch?v=Orq8gYZyhXA> at 0:18 seconds.

¹⁰³ De Mutiis and Pfammatter, responses to questionnaire, 2026. The prop with sound and movement attached by default appears in their response to ‘What surprised you most about RAGE’s architecture?’ The prop is visible in the *Every Thing* full video at 8 min 20 sec on YouTube.

Visual sovereignty and camera coupling

The *Sightjacking* mod intervenes at a different infrastructural stratum: RAGE's camera system. Yet this intervention began with a failed experiment that revealed fundamental properties of RAGE's architecture: a two-player version of *GTA V* in which one player would control the character while a second player moved the game camera. The abandoned prototype exposed the depth of RAGE's default camera-avatar coordination. It 'felt like we had to rewire our brains to coordinate the movements of the two separated game entities'. Rather than treating this friction as a technical problem to solve, the artists used it to clarify the system's underlying logic: a moment where RAGE's architecture became legible through its disruption.



Fig. 5. 2girls1comp, *Sightjacking* (2025), mod for *Grand Theft Auto V* (in-game screenshot): the mod automatically shifts the camera from the protagonist to the nearest NPC (in this case, a driver) using this enforced re-perspectivisation to probe the game's regimes of gaze through what the artists describe as an 'unreliable gaze', with explicit reference to *Forbidden Siren* and avant-garde structural cinema.

The technical reality of this system is more constrained than the language of 'decoupling' might suggest, and the artists are precise about the distinction. RAGE's internal 'gameplay camera'

‘cannot be modified or controlled externally (its properties can only be read, not changed)’.¹⁰⁴ What *Sightjacking* exploits is not a detachment of this native camera but a substitution enabled by the engine’s own architecture: RAGE also supports script-created camera objects that override rendering, and the mod uses `World.RenderingCamera` to designate which camera object renders the game world at any given moment.¹⁰⁵ The artists are direct about the consequence of this distinction: ‘Funnily enough, it can’t be! To create a work like *Sightjacking*, one needs to disable the game camera and create a custom camera object that can be manipulated’.¹⁰⁶ *Sightjacking* does not crack open RAGE’s sovereign camera; it builds a parallel one, exploiting the engine’s own provision for non-default viewpoints to establish a perspective regime the engine was not designed to sustain.

Routing this substitute camera through NPC positions required working around one of RAGE’s own spatial assumptions. RAGE provides a native function that returns the nearest non-player character (or ‘Ped’, in Script Hook terminology), but, as the artists note, ‘the game also handles the player avatar as a ped and will therefore always return it as the nearest character’.¹⁰⁷ The protagonist has to be filtered out before the closest NPC can be isolated — a minor but symptomatic constraint: RAGE’s entity model assumes player primacy so thoroughly that even its spatial functions centre the protagonist by default. Once that filter is in place, the substitute camera is at all times attached to the closest NPC, switching whenever another character’s position brings it nearer to the player.¹⁰⁸

¹⁰⁴ De Mutiis and Pfammatter, responses to questionnaire, 2026. The description of `GameplayCamera` as read-only, the `Camera` scripted object as override-capable, `World.RenderingCamera`, and the statement that the camera cannot be detached appear in their responses to ‘How does RAGE’s camera system actually work?’ and ‘How did you discover that the camera could be detached from the player-avatar?’ A manual on scripting custom cameras is available at <https://gta5.photography/manuals/cameras>.

¹⁰⁵ *Ibid.*

¹⁰⁶ *Ibid.*

¹⁰⁷ De Mutiis and Pfammatter, responses to questionnaire, 2026. The nearest Ped native function defaulting to the player avatar and the proximity-based switching logic appear in their responses to ‘How do you determine which NPC is “nearest”?’ and ‘How often does the camera switch?’.

¹⁰⁸ *Ibid.*

RAGE's camera object is not simply a rendering device. It also acts, as the artists explain, as a 'microphone': 'it is not the movement of the avatar that triggers a splashing sound — but the position of the camera'.¹⁰⁹

Changing the camera's coordinates from an underwater location to a surface position triggers the sound of emerging from water automatically, even when no character has moved.¹¹⁰ The camera is therefore a locus of multimodal inscription that mediates both visual and acoustic relationships to the game world simultaneously. To shift it is to shift not only what is seen but what is heard. The camera is moreover responsive to avatar state — 'if the avatar is inflicted with certain conditions (such as drugs or injury) the camera will reflect that by adding visual effects (shake, contrast, motion blur, depth of field, vignette)'¹¹¹ — meaning that the engine couples perceptual distortion to diegetic state through the camera object as a relay.

The choice of attachment function reveals how aesthetic decisions in this work are made in full knowledge of the engine's options. The artists tested `HARD_ATTACH_CAM_TO_PED_BONE`, which copies both a bone's position and its rotation and produces what they describe as 'a more "realistic" but very shaky look', and `ATTACH_CAM_TO_PED_BONE`, which is position-based only and 'creates a view that feels more stabilized but quite artificial (the birds' view seems to come straight from a drone)'.¹¹² They opted for the latter. 'In the context of a video game, the second option seemed more "natural"'.¹¹³ The more mimetically faith-

109 De Mutiis and Pfammatter, responses to questionnaire, 2026. The camera-as-microphone description, the water-emergence sound being attached to camera position, and the avatar-state/camera-effect coupling appear in their response to 'Can you elaborate on what it means that "the sound output is rendered through and attached to the game camera"?'.

110 *Ibid.*

111 *Ibid.*

112 De Mutiis and Pfammatter, responses to questionnaire, 2026. The comparison between `HARD_ATTACH_CAM_TO_PED_BONE` and `ATTACH_CAM_TO_PED_BONE`, the preference for positional over rotational attachment, and the skeletal-rig differences between human and animal NPCs appear in their response to 'Is it correct that all human characters and animals can be sightjacked?'.

113 *Ibid.*

ful method was rejected in favour of legibility within the game's existing visual grammar — a decision that articulates a coherent position on what visual sovereignty requires: not maximal physiological fidelity but sufficient legibility to make the redistributed perspective operative as critique.

2girls1comp situate *Sightjacking* within Joanna Zylińska's framework of 'nonhuman photography — 'photographs that are not of, by or for the human'.¹¹⁴ In their account, the images generated by the mod 'capture *GTA V*'s world unfolding as a vast generative algorithmic environment' rather than serving as representations of player intention or NPC interiority. Drawing on structural cinema — particularly Michael Snow's explorations of the camera apparatus¹¹⁵ — and visual anthropology, especially Lucien Castaing-Taylor and Véréna Paravel's *Leviathan*,¹¹⁶ which 'shifts its perspective to nonhuman protagonists and moves away from traditional authorial cinematography',¹¹⁷ they treat the shifted perspective as evidence of computational procedures operating beneath the game's diegetic surface. During testing, Marco and Alexandra discovered an unanticipated affective dimension: 'Several times our character was beaten to death by an NPC whose perspective we were inhabiting. In spite of being just a game, there is something unsettling about seeing "yourself" getting murdered'. This 'ultimate jump scare' reveals how deeply *RAGE*'s default camera-avatar coupling structures identification: the horror arises not from graphical violence but from positional inversion, where the player-subject becomes visible-object, observed through a gaze they cannot control. The mechanic, as the artists note, derives from *Forbidden Siren*, where 'seeing through the monster's eyes' produces 'a sense of suspension and helplessness' while simultaneously granting 'mastery and control of the game world through

114 Joanna Zylińska, *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017), p. 3.

115 Michael Snow, *Wavelength* (New York: Filmmakers' Cooperative, 1967) (film); and Michael Snow, *La Région Centrale* (Montreal: Michael Snow, 1971) (film).

116 *Leviathan*, dir. by Lucien Castaing-Taylor and Véréna Paravel (Sensory Ethnography Lab, Harvard University, 2012) (film).

117 De Mutiis and Pfammatter describe *Leviathan* in these terms in Matteo Bittanti, '2girls1comp and the Gamer Gaze', Milan Machinima Festival MMXXV, March 2025.

sight'. In adapting this mechanic to *GTA V*, *Sightjacking* performs moments when 'the player character, "the self", can suddenly be seen from the perspective of "the other"', exposing how RAGE's camera system secures not only visual sovereignty but ontological safety. The NPC skeleton differences required corresponding adjustments across entity categories: 'Since their skeleton varies (upright in humans, vertical in animals) we need to call a different bone for the illusion of a first-person POV to work'.¹¹⁸ That RAGE accommodates all NPCs — including animals — within the same sightjackable entity framework means that *Sightjacking* can extend its perspective regime across the full range of living entities in Los Santos, bounded not by a categorical decision about whose viewpoint counts but by the skeletal architecture of the engine itself.

Read against the criterion: (i) *Sightjacking* operates through ATTACH_CAM_TO_ENTITY, a native RAGE function provided for legitimate developer use in scripted sequences — the mod re-purposes an officially sanctioned camera-object mechanism, working entirely within the engine's own provision; (ii) it redirects the default allocation of camera authority — coupled to the protagonist and thereby anchoring subsurface scattering, cascaded shadow map frusta, streaming priority, and LOD calculations around a single privileged viewpoint — towards the nearest NPC, detaching the protagonist from the position the rendering pipeline uses to calibrate its fidelity budget; (iii) the epistemic visibility produced is the camera-protagonist coupling as a resource-allocation decision rather than a neutral design convention: the perceptual strangeness of inhabiting a non-protagonist viewpoint — the shallow rendering depth, the shifted priority, the recalibrated shadows — is not purely an aesthetic effect but a direct index of how the engine's budgeting architecture distributes computational attention. What *Sightjacking* discloses is that visual sovereignty in *GTA V* is not simply a narrative convention

¹¹⁸ De Mutiis and Pfammatter, responses to questionnaire, 2026. The comparison between HARD_ATTACH_CAM_TO_PED_BONE and ATTACH_CAM_TO_PED_BONE, the preference for positional over rotational attachment, and the skeletal-rig differences between human and animal NPCs appear in their response to 'Is it correct that all human characters and animals can be sightjacked?'.

about identification with a protagonist but a technical allocation enforced at the pipeline level, coupling fidelity, depth, and presence to a single authorised point of view.

Tools as dialogical practice

2girls1comp's practice exemplifies what Werning calls the 'quasi-dialogical relationship' between creator and tool.¹¹⁹ Their mods function not only as representational critique but also as procedural rhetoric in Bogost's sense: they argue through the remixing of RAGE's operational logic. Through forced, unintended combinations — linking networked platforms to in-game events via *SanAndreas.txt*, or redirecting the game's own governance apparatus towards compulsory legal disclosure in *F*** the Policy* — they engage in a form of bricolage that makes visible the contingency of RAGE's default configurations and opens space for alternative orientations. What the interview material reveals is that the engine actively responds, and the artists' practice is constituted as much by their reactions to RAGE's initiatives as by their own interventions.

The clearest instance of this reciprocity is *Scream Saver*, which was 'really born out of observing what the game engine was doing'.¹²⁰ In loading sequences, RAGE spawns NPCs before road collision detection has fully initialised, producing a moment in which the engine's own procedural sequence works against itself: bodies are created into a world that cannot yet hold them. As the artists describe it: 'finding this special moment in which NPCs are created by RAGE but they immediately fall because the roads don't have collision detection yet felt like observing the game engine playing an eternal Sisyphean act, (which looks like a hor-

119 In chapter 1, titled 'Making Sense of Tools', Werning describes an ongoing feedback loop between users and digital tools that resembles a dialogue without being a literal conversation. Werning, *Making Games*, p. 37.

120 De Mutiis and Pfammatter, responses to questionnaire, 2026. The description of *Screamsaver's* origin in observing RAGE's collision detection loading sequence and the characterisation of falling NPCs as a 'Sisyphean act' appear in their response to 'Was there a moment where RAGE "talked back"?'.

ror scene of torture to a human viewer)'.¹²¹ This is not a glitch exploited for aesthetic effect but an engine behaviour observed, attended to, and incorporated as artistic material, a moment when RAGE's own procedural sequence becomes the work. The engine becomes the artists' co-author, enacting its own internal logic in ways that productively exceed their scripts.

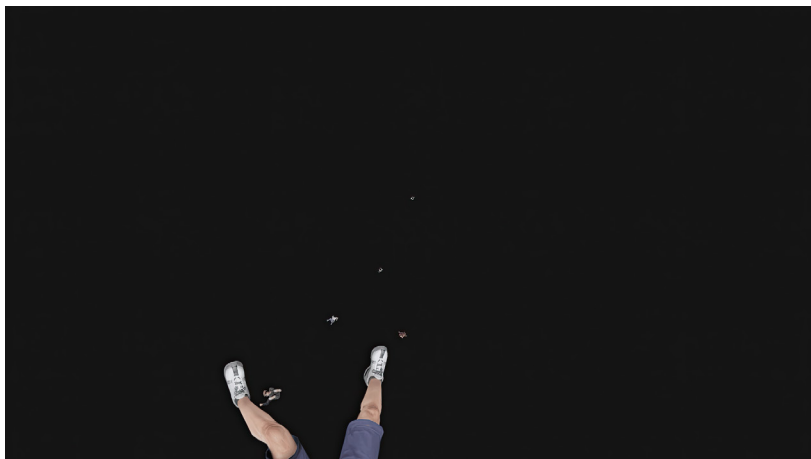


Fig. 6. 2girlsicomp, *Scream Saver* (2025), mod for *Grand Theft Auto V*: the mod functions as a screen saver by relocating the player character to a remote, low-demand location after a period of inactivity, thereby reducing rendering load; activation is triggered after prolonged idle time (default 60 seconds, adjustable via *ScreamSaver.ini*), and the effect deactivates immediately upon mouse or keyboard input.

This dynamic extends further. In developing a more recent video, the artists gave entities a custom downward trajectory to produce slow-motion falling. The intervention encountered a hard limit built into RAGE's physics model: 'It turned out that this number can't be too high. If something is moving downwards with a certain speed, the game will automatically assume that it's falling — and the physics engine (which can override our scripts) will kick in. The software does therefore still have the last word

¹²¹ *Ibid.*

in certain matters, so to speak!¹²² RAGE is not a passive substrate but an active interlocutor with its own thresholds, assumptions, and interventional logic. The dialogue is genuine because the engine can refuse.

The artists characterise RAGE's fundamental operation as a system of 'smokes and mirrors': 'we were surprised by the level of mystification where assets and code come together to create illusions specific to the game, which are quite different from the illusion of cinema or photography for example — but still follow the same idea of "smokes and mirrors"'.¹²³ This connects their practice to Nicoll and Keogh's account of engines as cultural software that naturalises its own illusions through defaults and interfaces: RAGE's world-coherence is not a transparent window onto a virtual city but a computational performance sustained by interlocking systems. What *Scream Saver* and *Sightjacking* share is the capacity to catch that performance mid-act — to find the seam where the illusion hesitates and, in hesitating, becomes legible as construction.

The conditions under which this dialogue becomes possible are themselves social. The artists are explicit about the epistemic dependence involved: 'As with most of our projects, we could profit immensely from the work that the community has already put in'.¹²⁴ A community contributor identified as LeeC22 provided the foundational code for camera-switching that enabled *Meanwhile in Los Santos* and, by extension, the camera experiments that led to *Sightjacking*. In the artists' account, LeeC22's forum code contains 'the most beautiful comment, which reveals the uncertain reverse engineering that modders do trying to figure

122 De Mutiis and Pfammatter, responses to questionnaire, 2026. The account of the physics engine overriding the custom downward-trajectory script appears in their response to 'Was there a moment where RAGE "talked back"?'.
 123 De Mutiis and Pfammatter, responses to questionnaire, 2026. The 'smokes and mirrors' characterisation appears in their response to 'What surprised you most about RAGE's architecture?'.

124 De Mutiis and Pfammatter, responses to questionnaire, 2026. The statement about the indispensability of prior community work appears in their response to 'How did you discover that the camera could be detached from the player-avatar?'.

out something that almost feels like magic'.¹²⁵ This figure — magic as the phenomenological register of uncertain, community-sustained reverse engineering — resonates with what Lohmeyer identifies as 'cargo cult coding': 'a type of ritual coding that does not have a functional outcome' by conventional engineering standards, 'but instead functions as a way of appropriating computational effects without abiding by a game system's standard logic and protocols'.¹²⁶ The knowledge that makes counter-play possible is always the residue of collective effort: forum threads, annotated code, shared documentation, attributed and unattributed labour. 2girls1comp make this legible not only by acknowledging the community but by contributing back to it: 'Since we profited so much from the modding community (modding really is a group project), we want to make our findings available as well'.¹²⁷ Their full codebase is publicly available on GitHub; at least two of their mods — *Dancing Plague* and *There Is a Light That Never Goes Out* — have been used by other modders to generate new projects.¹²⁸ The dialogue here is not between a single artist and a single engine; it is between an open-ended community and a proprietary system, enacted across repositories, tutorials, and incremental technical refinements — all of them vulnerable to the update governance described above. The same patch that silently broke *SanAndreas.txt*'s HTTP functionality could, at any moment, break the toolchain that makes the entire practice possible.

125 De Mutiis and Pfammatter, responses to questionnaire, 2026. The reference to LeeC22's forum code and the 'beautiful comment' appear in their response to 'How does RAGE's camera system actually work?' The acknowledgement of LeeC22 is publicly confirmed on the mod's distribution page: 2girls1comp, *Meanwhile in Los Santos (Dissociation Nation)*, version 1.1, *GTA5-Mods.com*, 9 February 2024.

126 Lohmeyer, *Unstable Aesthetics*, p. 32.

127 De Mutiis and Pfammatter, responses to questionnaire, 2026. The statement that 'modding really is a group project', the commitment to open-source release, and the confirmation that *Dancing Plague* and *There Is a Light That Never Goes Out* have been used by other modders appear in their response to 'Why release on GTA5-Mods.com instead of, say, itch.io, github or a gallery website?' Full repositories: <https://github.com/orgs/2girls1comp/repositories>.

128 *Ibid.*

The political character of that vulnerability is not something the artists separate from their subjective experience of making. The work is described as a ‘labour of love’: 2girls1comp is a side project rather than a primary source of income, which means the duo can ‘approach the mods as mostly play’, while simultaneously acknowledging that the care invested in ‘code, video trailers, etc. definitely feels like labour’.¹²⁹ This self-accounting refuses both the romanticism of pure creative autonomy and the defeatism of pure exploitation: theirs is a lucid, affectively inhabited entanglement, not a resolved political position. Pfammatter frames this kind of re-appropriation as eminently political,¹³⁰ programmatic but also operational, constituted through the very infrastructure it takes as its object. When pressed on whether that act can escape playbour dynamics, the artists’ answer is neither utopian nor hypocritical: ‘when it comes to games it is more fun for us to take the less purist route and just engage with the technology and culture that surrounds us: Explore it, use it, satirise it, break it apart, embrace its messiness and ambiguity. Yes, Rockstar will to some extent profit from our labour (someone always does, no?) but that is not something we constantly want to think about. There should still be space for people to just create’.¹³¹ That insistence on creative space — held open even within acknowledged entanglement, against both the enclosure of blackboxification and the enclosure of ideological purity — is itself the practice the chapter has been tracing.

129 De Mutiis and Pfammatter, responses to questionnaire, 2026. The ‘labour of love’ formulation and the income/side-project structure appear in their response to ‘Do you consider this labour work or play? Or both (playbour)?’

130 Maiberg, ‘GTA V Mod Makes It a Better’.

131 De Mutiis and Pfammatter, responses to questionnaire, 2026. The ‘less purist route’ passage and the closing ‘there should still be space for people to just create’ appear in their response to ‘Can you escape playbour dynamics, or is the point to expose them from within? Is there a version of this work that wouldn’t benefit Rockstar Games at all? Or is entanglement inevitable?’

Conclusion: reallocation, not liberation

The canonical genealogy of art modding — Schleiner's late-1990s account of patches and plug-ins as hacker art, alongside the early 2000s wave of tactical modification — names game modification as an aesthetic practice rather than a derivative fan activity.¹³² Yet that genealogy cannot simply be replayed. Subsequent scholarship has clarified that mods register simultaneously as formal interventions and labour formations: they circulate in economies of capture, credit, and platform governance, even when framed as experimentation or play.

This is why Cindy Poremba's formulation remains helpful. Rather than treating the mod as a decorative overlay, she frames the art mod as a *device for thinking*: a modification that generates argument by reorganising the conditions under which play becomes intelligible.¹³³ Julian Kücklich's concept of *playbour* then highlights the political economy at stake by naming the structural ambiguity of pleasurable, unpaid work that nonetheless accrues value elsewhere.¹³⁴ Hector Postigo develops the same problem in explicitly infrastructural terms, tracing how modder-industry relations remain shaped by asymmetries of ownership and capture even where "community creativity" is celebrated.¹³⁵ In Merlin Münch's analysis of Postigo's argument, modding culture has become increasingly aware that its participation sits within "big business", not outside it.¹³⁶

2girls1comp situate themselves inside that contradiction rather than pretending it can be wished away. The point of their practice is not escape from RAGE, nor a romantic fantasy of user sovereignty. Their mods instead enact what this chapter has described as *tactical reallocation*: a redistribution of existing permissions

132 Anne-Marie Schleiner, 'Cracking the Maze Online Exhibit: Game Plug-ins and Patches as Hacker Art', *Switch*, 12.1 (1999).

133 Cindy Poremba, 'Discourse Engines for Art Mods', *Eludamos: Journal for Computer Game Culture*, 4.1 (2010), 41–56 (pp. 41–42).

134 Julian Kücklich, 'Precarious Playbour: Modders and the Digital Games Industry', *Fibreculture Journal*, 5 (2005).

135 Hector Postigo, 'Of Mods and Modders: Chasing Down the Value of Fan-Based Digital Game Modifications', *Games and Culture*, 2.4 (2007), 300–13.

136 Merlin Münch, 'Fooling the User? Modding in the Video Game Industry', *Internet Policy Review*, 2.2 (2013).

and couplings (e.g., animation states, camera attachments, networked hooks) so that the engine's governance can be understood at the level where it actually operates. That emphasis also clarifies what "critique" means here. Engine critique requires technical literacy not only to document constraints, but to re-operationalise them, forcing the toolchain to yield different relations between bodies, space, visibility, and action. In that sense, their work treats the engine as a contested terrain: neither a neutral substrate nor an opaque wall, but a procedural regime that can be re-routed in situated, limited, and materially demonstrable ways.

Future trajectories

The present analysis also opens further lines of comparative inquiry. How do RAGE's operational logics differ from those of Unity, Unreal, or CryEngine, and what consequences follow for modding aesthetics, workflows, and community governance within each ecosystem? What forms of critique become possible — or foreclosed — when engines are open-source versus closed-source, community-governed versus corporate-controlled? And how do platform holders continue to monetise the community innovation that Postigo and Münch describe, even as mod cultures grow more conscious of their position within commercial capture dynamics? These questions are not resolved here, but they suggest that engine studies has the conceptual vocabulary to pose them as political economy rather than mere tool comparison.

The chapter implies a methodological shift for games criticism more broadly. If engines function as ideological infrastructures — encoding norms, distributing permissions, and naturalising orientations — then critique cannot focus exclusively on narrative content or surface representation. It has to include code-facing practices: reverse engineering, infrastructural reading, and modification as situated analysis. Following Poremba, the mod is, first and foremost, a discourse engine, a way of thinking through the conditions of digital culture by materially reconfiguring them. In 2girls1comp's hands, *GTA V* becomes a system to interrogate: an

executable ideology made awkward, rendered inspectable, and, in bounded ways, made otherwise.

Bibliography

- 2girls1comp, 'Towards a Philosophy of the Photo Daddy', *Getxophoto International Image Festival*, 18th edn (Getxo: Getxophoto, 2024), <https://archivo.getxophoto.com/en/archive/2024-play/artists-2024/2girls1comp/> [accessed 1 January 2026]
- , '2girls1comp' (website), n.d., <https://2girls1comp.xyz/> [accessed 5 October 2025]
- , '2girls1comp repositories', GitHub, n.d., <https://github.com/orgs/2girls1comp/repositories> [accessed 4 January 2026]
- , 'F__ThePolicy.cs' (source code file), F-ThePolicy (GitHub repository), n.d., https://github.com/2girls1comp/F-ThePolicy/blob/main/code/F__ThePolicy.cs [accessed 4 January 2026]
- alexguirre, 'Grand Theft Auto V Animations List (as of game patch v1734)', [alexguirre.github.io](https://alexguirre.github.io/animations-list), n.d., <https://alexguirre.github.io/animations-list> [accessed 4 January 2026]
- Bittanti, Matteo, 'MMF MMXXV: 2girls1comp and the Gamer Gaze', Milan Machinima Festival, 12 March 2025, <https://milanmachinimafestival.org/blog/2025/3/12/mmf-mmxxv-2girls1comp-and-the-gamer-gaze> [accessed 1 January 2026]
- , 'VRAL 90: 2girls1comp', Milan Machinima Festival, n.d., <https://milanmachinimafestival.org/vral-2girls1comp> [accessed 1 January 2026]
- Bittanti, Matteo, and Jordy Veenstra, *Los Santos Plays Itself*, 2 vols (Milan: Mimesis International, 2025)
- Bogost, Ian, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Massachusetts: MIT Press, 2007)
- Courrèges, Adrian, 'GTA V – Graphics Study – Part 1: Dissecting a Frame', [adriancourreges.com](https://www.adriancourreges.com), 2 November 2015, <https://www.adriancourreges.com/blog/2015/11/02/gta-v-graphics-study/> [accessed 5 October 2025]
- , 'GTA V – Graphics Study – Part 2: LOD and Reflections', [adriancourreges.com](https://www.adriancourreges.com), 2 November 2015, <https://www.adriancourreges.com/blog/2015/11/02/gta-v-graphics-study-part-2> [accessed 5 October 2025]
- , 'GTA V – Graphics Study – Part 3: Post-Effects', [adriancourreges.com](https://www.adriancourreges.com), 2 November 2015, <https://www.adriancourreges.com/blog/2015/11/02/gta-v-graphics-study-part-3> [accessed 5 October 2025]

- De Mutiis, Marco, and Alexandra Pfammatter (2girls1comp), responses to questionnaire by Matteo Bittanti, January 2026 (unpublished)
- De Mutiis, Marco, and Matteo Bittanti, 'Custom Cameras', *The Photographer's Guide to Los Santos*, n.d., <https://gta5.photography/manuals/cameras> [accessed 5 January 2026]
- De Mutiis, Marco, and Matteo Bittanti, *The Photographer's Guide to Los Santos* (Milan: Mimesis International, 2024)
- Freedman, Eric, *The Persistence of Code in Game Engine Culture* (New York: Routledge, 2020)
- , 'Engineering Queerness in the Game Development Pipeline', *Game Studies*, 18.3 (2018), <https://gamestudies.org/1803/articles/ericfreedman> [accessed 5 January 2026]
- Galloway, Alexander R., *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006)
- GTA Wiki, 'Wanted Level in *Grand Theft Auto V*', GTA Wiki, n.d., https://gta.fandom.com/wiki/Wanted_Level_in_GTA_V [accessed 5 January 2026]
- Hertz, Garnet, and Jussi Parikka, 'CTheory Interview: Archaeologies of Media Art', *CTheory*, 1 April 2010, <https://journals.uvic.ca/index.php/ctheory/article/view/14750> [accessed 3 November 2025]
- Jenkins, Henry, *Textual Poachers: Television Fans and Participatory Culture*, 2nd edn (New York: Routledge, 2013)
- Kerr, Chris, 'Take-Two Shuts Down Popular GTA Mod Toolkit Open IV', *Game Developer*, 15 June 2017, <https://www.gamedeveloper.com/business/take-two-shuts-down-popular-i-gta-i-mod-toolkit-open-iv> [accessed 3 October 2025]
- Kücklich, Julian, 'Precarious Playbour: Modders and the Digital Games Industry', *The Fibreculture Journal*, 5 (2005), <http://five.fibreculture-journal.org/fcj-025-precarius-playbour-modders-and-the-digital-games-industry/> [accessed 3 October 2025]
- Langley, Hugh, 'The Tech That Built an Empire: How Rockstar Created the World of *GTA 5*', TechRadar, last updated 3 August 2022, <https://www.techradar.com/news/gaming/the-tech-that-built-an-empire-how-rockstar-created-the-world-of-gta-5-1181281> [accessed 5 January 2026]
- Latour, Bruno, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005)
- Law, John, 'Notes on the Theory of the Actor-Network: Ordering, Strategy and Heterogeneity', *Systems Practice*, 5.4 (1992), 379–93
- Lohmeyer, Eddie, *Unstable Aesthetics: Game Engines and the Strangeness of Modding* (London: Bloomsbury Academic, 2021)
- Maiberg, Emanuel, 'GTA V Mod Makes It a Better Social Media Platform Than Twitter', *404 Media*, 23 October 2023, <https://www.404media>.

- co/gta-v-mod-makes-it-a-better-social-media-platform-than-twitter/ [accessed 5 January 2026]
- Malazita, James, *Enacting Platforms: Feminist Technoscience and the Unreal Engine* (Cambridge, Massachusetts: MIT Press, 2024)
- Meades, Alan F., *Understanding Counterplay in Video Games* (London and New York: Routledge, 2015)
- Münch, Merlin, 'Fooling the User? Modding in the Video Game Industry', *Internet Policy Review*, 2.2 (2013), <https://doi.org/10.14763/2013.2.139> [accessed 5 January 2026]
- Nakamura, Rika, and Hanna Wirman, 'Girlish Counter-Playing Tactics', *Game Studies*, 5.1 (2005), https://www.gamestudies.org/0501/nakamura_wirman/ [accessed 5 January 2026]
- Nicoll, Benjamin, and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Cham, Switzerland: Palgrave Pivot, 2019)
- Pereira, Chris, 'After Angering GTA 5 Fans, Rockstar Releases New Statement On PC Mods [UPDATE]', *GameSpot*, 23 June 2017, <https://www.gamespot.com/articles/after-angering-gta-5-fans-rockstar-releases-new-st/1100-6451151/> [accessed 4 September 2025]
- Poremba, Cindy, 'Discourse Engines for Art Mods', *Eludamos: Journal for Computer Game Culture*, 4.1 (2010), 41–56, <https://eludamos.org/index.php/eludamos/article/view/vol4no1-4> [accessed 5 January 2026]
- Postigo, Hector, 'Of Mods and Modders: Chasing Down the Value of Fan-Based Digital Game Modifications', *Games and Culture*, 2.4 (2007), 300–13
- Rancière, Jacques, *Disagreement: Politics and Philosophy*, trans. by Julie Rose (Minneapolis: University of Minnesota Press, 1999)
- , *The Politics of Aesthetics: The Distribution of the Sensible*, trans. by Gabriel Rockhill (London: Continuum, 2004)
- Reed, Alison, and Amanda Phillips, 'Additive Race: Colorblind Discourses of Realism in Performance Capture Technologies', *Digital Creativity*, 24.2 (2013), 130–44
- Regan, Tom, 'GTA Modding Tool Quietly Reappears After Legal Threats', *Engadget*, 5 July 2017, <https://www.engadget.com/2017-07-04-gta-modding-tool-quietly-reappears-after-legal-threats.html> [accessed 12 March 2025]
- Schleiner, Anne-Marie, 'Cracking the Maze Online Exhibit: Game Plugins and Patches as Hacker Art', *SWITCH: Journal of Art and New Media*, 12.1 (1999), <https://scholarworks.sjsu.edu/switch/vol12/iss1/2/> [accessed 5 September 2025]
- , *The Player's Power to Change the Game* (Amsterdam: Amsterdam University Press, 2017)
- Serres, Michel, *The Parasite*, trans. by Lawrence R. Schehr (Minneapolis: University of Minnesota Press, 2007)

- Thorsen, Thor, 'Grand Theft Auto IV powered by Table Tennis engine?', *GameSpot*, 15 June 2006, <https://www.gamespot.com/articles/grand-theft-auto-iv-powered-by-table-tennis-engine/1100-6236336/> [accessed 7 February 2025]
- Turkle, Sherry, *Evocative Objects: Things We Think With* (Cambridge, Massachusetts: MIT Press, 2007)
- Werning, Stefan, *Making Games: The Politics and Poetics of Game Creation Tools* (Cambridge, Massachusetts: MIT Press, 2021)
- Wills, John, "Ain't the American Dream Grand": Satirical Play in Rockstar Games' *Grand Theft Auto V*, *European Journal of American Studies*, 16.3 (2021), <https://journals.openedition.org/ejas/17274> [accessed 7 February 2025].
- , *Gamer Nation: Video Games and American Culture* (Baltimore: Johns Hopkins University Press, 2019)
- Zylinska, Joanna, *Nonhuman Photography* (Cambridge, Massachusetts: MIT Press, 2017)

Artworks

- 2girls1comp, *Every Thing* (mod for *Grand Theft Auto V*), GTA5-Mods.com, 15 July 2023, <https://www.gta5-mods.com/scripts/every-thing> [accessed 1 December 2025]
- , *F*** the Policy* (mod for *Grand Theft Auto V*), GTA5-Mods.com, 13 August 2023, <https://www.gta5-mods.com/scripts/f-the-policy> [accessed 1 December 2025]
- , *SanAndreas.txt* (archived mod for *Grand Theft Auto V*), GTA5-Mods.com, 7 October 2023, <https://www.gta5-mods.com/scripts/sanan-dreas-txt> [accessed 1 December 2025]
- , *Dancing Plague* (mod for *Grand Theft Auto V*), GTA5-Mods.com, 13 June 2024, <https://www.gta5-mods.com/scripts/dancing-plague> [accessed 1 December 2025]
- , *Sightjacking* (mod for *Grand Theft Auto V*), GTA5-Mods.com, 7 January 2025, <https://www.gta5-mods.com/scripts/sightjacking> [accessed 1 December 2025]
- , *Scream Saver* (mod for *Grand Theft Auto V*), GTA5-Mods.com, 9 December 2025, <https://www.gta5-mods.com/scripts/scream-saver> [accessed 10 December 2025]
- , *Meanwhile in Los Santos* (Dissociation Nation) 1.1, GTA5-Mods.com, 9 February 2024, <https://www.gta5-mods.com/scripts/meanwhile-in-los-santos-dissociation-nation> [accessed 28 February 2026]

- , *There Is a Light That Never Goes Out* (mod for *Red Dead Redemption 2*), Nexus Mods, 31 July 2025, <https://www.nexusmods.com/red-deadredemption2/mods/6856> [accessed 1 December 2025]
- Arcangel, Cory, *Super Mario Clouds* (2002), modded *Super Mario Bros.* cartridge, <https://coryarcangel.com/works/2002-001-super-mario-clouds.html> [accessed 1 December 2025]
- Earle, Grayson, *Why don't the cops fight each other?* (2021), digital video (1920 × 1080; colour, sound), 9 mins 41 secs, <https://www.graysonearle.com/work/cops.html> [accessed 1 December 2025]
- JODI, *Untitled Game*, Electronic Arts Intermix (1996–2001), <https://www.eai.org/titles/untitled-game> [accessed 1 December 2025]
- Shehadeh, Firas, *Like an Event in a Dream Dreamt by Another—Dreamcore* (2025), single-channel FHD video (colour), two-channel sound, 38 mins 48 secs, <https://www.firasshehadeh.com/like-an-event-in-a-dream-dreamt-by-another-dreamcore> [accessed 1 December 2025]
- , *Like an Event in a Dream Dreamt by Another—Insomnia* (2025), single-channel FHD video (colour), two-channel sound, 33 mins 48 secs, <https://www.firasshehadeh.com/like-an-event-in-a-dream-dreamt-by-another-insomnia/> [accessed 1 December 2025]
- , *Like An Event In A Dream Dreamt By Another — Rehearsal* (2023), single-channel video (colour, sound; narrator: Mamusu Kallon), 14 mins 19 secs, <https://www.firasshehadeh.com/like-an-event-in-a-dream-dreamt-by-another-rehearsal/> [accessed 1 December 2025]

Ludography

- BioWare, *Mass Effect* (Microsoft Game Studios, 2007), Xbox 360.
- id Software, *Quake* (GT Interactive, 1996), MS-DOS; Windows PC.
- Nintendo, *Super Mario Bros.* (Nintendo, 1985), Nintendo Entertainment System.
- Rockstar Games, *Grand Theft Auto Online* (Rockstar Games, 2013), PlayStation 3; Xbox 360; PlayStation 4; Xbox One; Windows PC; PlayStation 5; Xbox Series X/S.
- Rockstar San Diego, *Rockstar Games Presents Table Tennis* (Rockstar Games, 2006), Xbox 360; Wii.
- , *Red Dead Redemption* (Rockstar Games, 2010), PlayStation 3; Xbox 360.
- Rockstar North, *Grand Theft Auto IV* (Rockstar Games, 2008), PlayStation 3; Xbox 360; Windows PC.
- , *Grand Theft Auto V* (Rockstar Games, 2013), PlayStation 3; Xbox 360; PlayStation 4; Xbox One; Windows PC; PlayStation 5; Xbox Series X/S.

- Rockstar Vancouver, *Max Payne 3* (Rockstar Games, 2012), PlayStation 3; Xbox 360; Windows PC.
- Sony Computer Entertainment Project Siren, *Forbidden Siren* (Sony Computer Entertainment, 2004), PlayStation 2.
- United States Army, *America's Army* (United States Army, 2002), Windows PC.

Filmography

- Castaing-Taylor, Lucien, and Véréna Paravel, *Leviathan* (Sensory Ethnography Lab, Harvard University, 2012).
- Snow, Michael, *Wavelength* (New York: The Film-Makers' Cooperative, 1967).
- , *La Région Centrale* (New York: The Film-Makers' Cooperative, 1971).

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Game Engine Culture(s) grew from a conviction that game engines demand humanistic inquiry commensurate with their technical, institutional, and ideological reach. What began as a modest question — *How do these software platforms shape what can be made, seen, and imagined?* — unfolded across multiple years, institutions, and modes of inquiry: archival research and autoethnographic practice, code analysis and aesthetic theory, gallery installations and classroom experiments, conference provocations and late-night debugging sessions. If this anthology has achieved any coherence, it emerges from sustained dialogue between abstraction and implementation, between conceptual frameworks and the stubborn materialities of render pipelines, asset marketplaces, and version control conflicts.

The research was developed through an inter-university partnership anchored at IULM University in Milan, with crucial collaborations extending to the University of Liverpool and Manchester Metropolitan University. Early workshops and public panels — beginning with a foundational gathering at the University of Liverpool on 1 December 2023 led by Paolo Ruffino and Valentino Catricalà, and continuing through subsequent convenings — provided the intellectual scaffolding for what would become this volume. Those occasions generated far more than ‘impact metrics’: they exposed conceptual blind spots, brought disagreements about method and politics into view, and tested our theoretical claims against artists’ working realities and developers’ embodied knowledge. I am grateful to all participants in those exchanges, whose scepticism proved as valuable as their enthusiasm.

At IULM University, this project could not have materialised without sustained institutional support, particularly from the

Department of Communication, Arts and Media ‘Giampaolo Fabris’. I extend profound thanks to Simona Moretti, the current director. The Evaluation Committee for Special University Projects — Valentina Garavaglia, Luisella Farinotti, and Guido di Fraia — offered careful criticism and guidance that helped define the book’s intellectual direction. Pro-Rector for Research Giovanna Rocca’s support helped secure and coordinate the institutional resources the project required. The Research Office team — Vittorio Rizzoli, Stefano Florio, Angela Barillà, and Marta Passananti — offered patient and rigorous guidance through the labyrinthine procedures that determine whether scholarly projects advance or founder. Marco Cusa, Elena Ferrari, and Laura Sica managed logistical coordination with exemplary professionalism.

A special acknowledgement is owed to Gianni Canova, whose pioneering commitment to videogame studies at IULM across two decades created the institutional conditions that made this research possible. His insistence that games warrant serious humanistic attention — articulated through curriculum development, public programming, and unwavering advocacy — laid the groundwork on which this volume builds. That legacy continues under the current Rector, Valentina Garavaglia, whose support for interdisciplinary media research has proven vital.

The intellectual life of this project was profoundly shaped by its integration with pedagogical practice. PhD candidates in Visual and Media Studies and MA students in Television, Cinema and New Media at IULM contributed as critical interlocutors whose questions resisted disciplinary complacency. Working alongside students required that abstract concepts be made teachable, that curatorial decisions be argued for rather than assumed, and that theoretical frameworks hold up when tested against practitioners’ counter-examples. Many premises articulated in these pages were stress-tested through seminars, tutorials, critique sessions, and collaborative game-making workshops. Students’ scepticism about inherited categories, their impatience with jargon, and their insistence on consequences rather than elegance made this a better book.

The 2025 Los Angeles edition of the Milan Machinima Festival marked a turning point in the project’s development. The festival’s screenings, installations, performances, and conversa-

tions demonstrated game engine cinema's capacity for formal innovation while simultaneously revealing how swiftly questions of 'engine aesthetics' become inseparable from labour precarity, platform governance, and extractive economics. I am deeply grateful to the many individuals whose support, expertise, and generosity made this edition possible, including Jérôme Blesson, Jonathan Bilski, Paul Campagnet, Jonathan Carroll, Marikit De Lara, Ute De Lara, Susan Garbett, Boris Garavini, Boris Ibañez, Carson Lynn, Maggie Mackay, Norma Manzanares, Manon Mes-siant, Robbie McCluskey, Rachel O'Connor, Claudia Puig, Patty Polinger, Naomi Ramsey, Mary Rohlich, Saila Reyes, Amanda Salazar, Peter Krapp, Anton Braxton Soderman, Cathy Tauber, and Erin Taylor.

To the participating students — whose experiments sometimes succeeded brilliantly, sometimes failed instructively, but always generated unexpected insights — your work reverberates throughout this volume, even where not explicitly cited in these pages.

This anthology exists because several scholars agreed to undertake the difficult labour of writing across disciplines, translating between technical and humanistic vocabularies, and maintaining intellectual generosity while advancing strong arguments. I am deeply grateful to Logan Davis, James Malazita, Chris Kerich, Kevin Wong, Eddie Lohmeyer, Sandra Youkhana, Paolo Ruffino, Doug Stark, Teodora Sinziana Alata, Serafin Álvarez, John Healy, and Luke Caspar Pearson. Their patience through multiple revision cycles, their willingness to engage substantive editorial interventions, and their commitment to making this a genuinely dialogic volume rather than a mere proceedings collection were extraordinary. Special thanks are due to Paolo Ruffino, whose consistent intellectual support, practical assistance, and editorial generosity extended far beyond his chapter contribution, helping to shape the anthology's architecture and resolve numerous logistical impasses.

The book's arguments were refined through sustained dialogue with scholars, artists, curators, and practitioners working at the intersections of game studies, platform studies, media art, and software studies. While I cannot responsibly enumerate everyone who contributed to this project's intellectual formation without

risking unintentional omission, I wish to acknowledge the formal and informal exchanges — at conferences, workshops, studio visits, and online forums — that pushed our thinking beyond instrumentalist accounts of ‘tools’ towards richer engagements with engines as sites of governance, contestation, and cultural technique. Particular recognition is owed to the artists whose practices are discussed throughout these pages: Ian Cheng, 2girls1comp, Alice Bucknell, Jamie Faye Fenton, Brent Watanabe, Jakob Kudsk Steensen, Xenoangel (Marija Avramovic and Sam Twidale), Will Freudenheim, Theo Triantafyllidis, Pete Jiadong Qiang, Keiken, JODI, Cory Arcangel, Ed Atkins, Lu Yang, Danielle Brathwaite-Shirley, and many others whose work demonstrates that engines are not neutral substrates but contested infrastructures demanding critical artistic engagement.

I am grateful to the anonymous peer reviewers whose rigorous, constructive criticism improved this manuscript substantially. Their insistence on conceptual precision, methodological transparency, and accessible prose helped us clarify arguments and eliminate unnecessary obfuscation. The editorial team at Mimesis International demonstrated remarkable patience with our evolving timeline, provided expert guidance on manuscript preparation, and continued to support the project during moments of uncertainty. Linda Valle deserves particular recognition for her meticulous attention to detail.

Several chapters benefited from prior presentation and I acknowledge the venues that provided valuable feedback, including a panel at the 2025 edition of the DiGRA conference in Malta, which brought together several contributors to this volume. The intellectual genealogy of game engine studies traced in this volume builds upon foundational scholarship by Nick Montfort, Ian Bogost, Benjamin Nicoll, Brendan Keogh, Eric Freedman, Stefan Werning, and James Malazita, whose pioneering work made this anthology possible. I hope this collection extends and complicates their inquiries while honouring their rigour.

Institutional acknowledgement must also extend beyond universities to the artists’ collectives, independent galleries, community workshops, and modding forums where much of contemporary engine culture is actively produced and contested outside academic circuits. These sites of experimental practice show

that critical engagement with engines develops not only through scholarship but also through making, breaking, and remaking computational systems.

Personal acknowledgements are due to family members, partners, and friends who tolerated countless hours lost to writing, editing, and the peculiar obsessiveness that book projects demand. Your patience and support made this work materially possible, even as the work itself often made me less present than you deserved.

Finally, gratitude belongs to all those — artists, researchers, educators, students, technicians, organisers, modders, and critics — who continue to insist that game engines are not ‘back-end’ infrastructure or neutral toolkits. They are cultural forms with politics encoded in their defaults, aesthetics embedded in their workflows, and power relations materialised through their licensing agreements, marketplace algorithms, and documentation hierarchies. This book is dedicated to those who refuse the comfort of inherited categories, who persist in asking difficult questions about what engines enable and foreclose, what they normalise and render unthinkable, and what alternative engine cultures might yet be built.

That work continues.

Matteo Bittanti
Los Angeles and Milan
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Game Engine Culture(s) examines game engines as cultural infrastructures rather than neutral production tools. Across studies of Unity, Unreal, RAGE, RPG Maker, *Minecraft*, asset stores, higher education, live simulations, glitch, modding, and contemporary art, the volume traces how engines shape workflows, aesthetics, labour, memory, agency, and imagination. Its contributors show how these systems enable creativity while imposing defaults, constraints, and platform logics that organise what can be made, seen, taught, and contested. Bringing together game studies, media theory, software studies, and art criticism, the book offers a critical account of the engine as a central apparatus of contemporary visual culture.

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