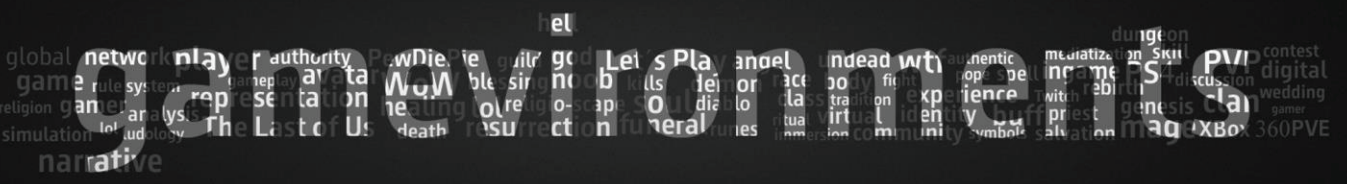
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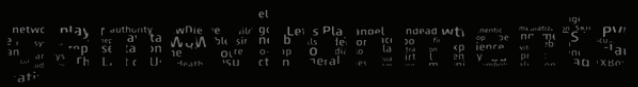

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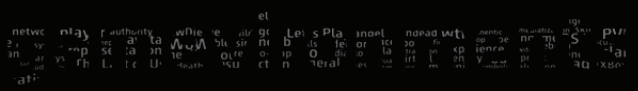

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Surveying the Frontier. Subjective Rendering and Occlusion in Open-World Westerns

Joshua D. Miner

Abstract
The last decade has seen open-world design transform the western genre in video games by recentering land as a thematic and mechanical component. As a description of both environment design and gameplay, open worlds offer highly interactable spaces, made coherent by narrative despite limited spatial linearity. A subjective camera that constructs the player's perspective aids in this coherence. This article examines subjective rendering, a modality of image synthesis that focalizes the player's shared decision-making with rendering algorithms, arguing that this dynamic in open-world westerns configures the player's view of Indigenous bodies and objects. Subjective rendering techniques, particularly occlusion and simplification methods that remove geometry from view, reorganize gamic vision and limit how developers can complicate the in-built ways of seeing through the renderer. Occlusion then becomes both a principle of open-world design and a technical metaphor for examining how rendering structures exploration and possibility. This raises the stakes for gamic environments in westerns: both game and player determine how a shifting landscape that is so central to the conflict between settler and Indigenous figures materializes. Alternate approaches to these questions introduce interesting claims about the logic of settler digitality, a function of the algorithmic grammar of mainstream video games. Ultimately, renderers are cultural engines, not objective ones.

Keywords: Open World Video Games, Subjective Rendering, Occlusion, Culling, Settler Digitality, Indigeneity, gamevironments

To cite this article: Miner, Joshua D., 2020. Surveying the Frontier. Subjective Rendering and Occlusion in Open-World Westerns. *gamevironments* 12, 114-143. Available at http://www.gamevironments.uni-bremen.de.

> Mrs. Ditkiss: "Well, I for one am grateful, Mrs. Bush, that they are finally bringing civilization to this *savage* land!"
> Mrs. Bush: "I could not agree with you more, my dear. My daddy settled this land, and I know he'll be lookin' down on us, *pleased* at how we helped the natives."
> Mrs. Ditkiss: "Yes, they've lost their land, but they've *gained* access to heaven." (*Red Dead Redemption* 2010)

During the intro titles to *Red Dead Redemption*, protagonist John Marston overhears two elderly white women aboard a train in 1911 express the above sentiments on settler expansionism and *the natives*, as Indigenous characters serve to establish the genre and themes of the story that will follow. Fast-forward to the release of *Red Dead Redemption 2* (2018) and *This Land Is My Land* (2019), which capped a revival of the western in video games that began with the first installment of the *Red Dead* series, *Red Dead Revolver* (2004), and followed with Activision's *Gun* (2005).[i] While *Gun* features a cast of characters based on historical figures of the Old West (with all its accompanying romance), the *Red Dead* series sought to improve upon its flat Indigenous characters in a fictionalized western U.S. near the turn of the twentieth century. With *Red Dead Redemption 2*, the series integrated meaningful Indigenous narratives and a Black-Native cowboy, alluding to more complex social dynamics than typically present in the genre. *This Land Is My Land*, by contrast, rejects complexity but inverts the genre: the player inhabits a generic Plains-style Native avatar and must mount a resistance against the violent encroachment of white settlers. Yet both rely on open worlds to tell their stories. The last decade has seen open-world and sandbox designs like these transform the western genre, in part, by centering land in gameplay.

But why westerns? Open worlds are well-suited to a genre typically set in a vast frontier, where *manifest destiny* has put the status of such land in question. While all westerns implicitly refer to settler expansionism, *RDR2* and *This Land Is My Land*

situate their narrative, characters and game mechanics in this dynamic. As an emergent quality of environment design and gameplay, an open world offers players a highly explorable and manipulable game environment with limited spatial linearity. Yet this relies on the real-time generation of more complex and interactable geometry. A central component of open-world and sandbox games is that they present as simulation onscreen, not merely as a likeness of actuality elaborated by narrow gameplay. Improved physics and interaction, photorealistic textures and lighting, an open level design and objectives – these are aimed at enhancing the quality of *RDR2* and *This Land Is My Land* as simulations. The elderly women's comments above resonate in the interrelation of modeled environments and bodies, where specific rendering methods help draw a simulated world – its 2D image – by more efficiently processing increasingly open, active and photorealistic landscapes in the player's view. *Culling* (i.e. removing obscured geometry from the rendering process) denotes a subset of techniques, for example, that achieve this while structuring player subjectivity and interaction, since terrain, objects, or other characters are concealed by the frustum (view frame) or intervening geometry and don't need to be drawn. The real-time organization of player vision through a subjective camera therefore enables more sophisticated worlds. This highlights the technics of simulation, capturing what Ian Bogost (2007, 112) describes as "the gap between rule-based representations and a user's subjectivity." The relation of player to world raises the stakes for gamic environments in westerns: both game and player determine how a shifting landscape that is so central to the conflict between settler and Indigenous figures materializes.

This article examines subjective rendering methods in western action-adventure games relative to how they structure the player's view of the Indigenous bodies and places, in order to bring this dynamic into focus for open worlds in general. A

materialist approach reveals how ostensibly neutral technical processes shape the discursive construction of a game, together with artist and player. Subjective gameplay rose to prominence in video games across the sixth, seventh and eighth generations of gaming consoles because of an increased focus on photorealism, lifelike interaction, and open worlds. Though other titles sit on the edge of the open-world western,[ii] *Red Dead Redemption 2* and *This Is My Land* offer the most recent examples. Both feature explorable worlds carefully designed to guide the player through western geographic and social terrain without the use of some traditional methods of level design. Beyond the challenge of narrative structure, open-world games present technical challenges that led to their prevalence after the early 2000s. In short, the game engine must render in real time a screen image of a physically-based reality displaying the synchronous interactions of player and program. These simulated worlds, furthermore, are populated by digital bodies, which must be drawn, shaded and lit for verisimilitude with freedom of movement for the player. While open worlds revolutionized the genre by enabling the remediation of its established conventions, such as a vast and contested frontier setting, these limit the possibilities for western video games by precluding some techniques for optimizing the render and necessitating others that obscure Indigeneity within the frame. Ultimately, subjective rendering contributes a degree of visual bias in building open, living worlds, which in some contexts presents as a settler bias that claims the land as *terra nullius*. In an open-world western, the player consistently navigates between spaces of *civilization* and *wilderness*, a dialectic that maintains the theme and sets requirements for the visual production of the environment.

As a gameplay modality produced at the seam between a subjective viewing frame and the rendering methods used to assemble it, subjective rendering poses critical questions for digital Indigenous bodies and places in open settler worlds. By the time

RDR2 and *This Is My Land* were released, unbiased rendering had opened the possibility of highly complex, photorealistic geometries in open-world settings, and the established algorithmic shortcuts for efficiently generating 3D worlds shifted. An immersive POV further consolidated a set of rendering techniques designed to divert computational resources toward the subjective experience of the player, a framework that includes level of detail/draw distance, mesh simplification (reducing the polygonal complexity of models drawn at differing distance or conditions) and frustum and occlusion culling (not rendering figures and objects that fall outside the player's unobstructed field of view). The expansive, untamed environments of the western genre dispose games to these algorithms for handling geometry and improving the overall look. Even in those games outside the western genre, such computational shortcuts reflect an ideological orientation that privileges player subjectivity and visual fidelity over the Other, a distilled object on surveyed land. They reflect how unspoken settler ideologies may embed themselves in larger technical trends and design goals.

Broadly, *occlusion* refers to a range of phenomena and methods for determining visible figures in a scene, whether according to obstructed view (occlusion culling) or degree of reflected light (ambient occlusion, occlusion mapping). Yet it also serves as a technical metaphor for understanding the structures of settler subjectivity in a game space. This article argues that occlusion, as a collaborative gameplay feature emblematic of a range of algorithmic techniques, organizes gamic vision and therefore player subjectivity. It becomes not only an instrument of efficiency but a principle of open world environment design, shaping how games structure narrative possibility or, more aptly, govern narrative exploration by influencing how players see. This effect only intensifies in games centered on settler expansionism. At the macro level, designers may use occlusion to deliver information to the player in a

controlled way – to insinuate a path or conceal an enemy in a western settlement by arranging buildings, barrels, horses, trees and other objects, for example. At the algorithmic level, things become more abstract. Two rendering methods discussed here, frustum and occlusion culling, preclude broad classes of interaction and actionable space. Draw distance and mesh simplification, while not occlusion/culling methods strictly-speaking, likewise hide complex information from player view and emphasize a settler perspective. Inasmuch as recent western video games have sought to address issues of settler-colonialism, their construction – the way they distill and occlude visual information while generating images from geometric instantiations – operate according to the same principles.

Indigenous approaches introduce interesting claims about the logic of what I have called "settler digitality, which is emergent in the algorithmic grammar of mainstream video games" (Miner 2019, 52). As the subjective camera follows an avatar in an open-world western, the player has a limited sense that the technical conditions of vision organize the frame as a settler gaze. Renderers, after all, are also cultural products. Yet this article moves one step further. Jason Lewis, Noelani Arista, Archer Pechawis and Suzanne Kite (2018, 4) articulate a diverse Indigenous framework "that conceive[s] of our computational creations as kin"; conceptualizing subjective rendering as a shared decision-making process here is an attempt to honor that framework. Occlusion reveals how player and program determine which world will be generated, highlighting the relationship of what is drawn to what is *not* drawn. Native scholars Jodi Byrd (2016) and Elizabeth LaPenseé (2014) have both argued that video games across many genres depend upon actionable gamespace mapped and claimed through settler systems of player advancement. The way game worlds are drawn predicates this process. Beyond genres that explicitly deal in expansionist themes and mechanics (e.g., 4X games like *Civilization*), rendering embeds gamic vision in a cycle

of view–advance–master, as it structures vision hierarchically. Frustum culling, occlusion culling, and even draw distance and mesh simplification maintain settler subjectivity in 3D games with POV tracking cameras, especially those that rely on exploration. This article therefore seeks to establish a model for understanding gamic vision through occlusion.

Rendering Gamic Vision

As a process of translation by which interactable game environments become images, rendering fundamentally shapes how players engage with space. This set of algorithmic processes synthesizes two-dimensional screen images from complex model geometries, images, animation, and various maps that lend shape, texture and light to a scene – all "so that they can be made visible" (Pharr 2017, xix). For graphically advanced games in the latest generation of consoles, physically based rendering (PBR) methods bring an approach to game worlds that models the physics of matter and light, including specialized algorithms for global illumination (GI) (incl. ambient occlusion and ray tracing), particle effects, volumetrics, and so on, nearing a horizon of full simulation. This becomes more significant for a 3D open-world game, where the simulated environment is coded with a host of additional ambient procedures (e.g. swaying blades of grass or falling leaves) and interactable features, and the player's agency further determines what gets drawn, textured and lit by the renderer. The problem compounds in the motion of gameplay: "[t]he renderer must produce correct results for all possible user input and cannot predict any scenery changes that depend on user interaction" (Bikker 2013, 4). Rendering engines can only move as quickly as the player; sophisticated renderers rely on hierarchized processes for prioritizing algorithms and features that depend less upon player input. Ultimately, some game formats can rely more heavily on static scenery and lighting,

precalculating lighting effects like GI (Bikker 2013, 1). As processing needs differ, so do the ways that the design of the game must configure the player view in order to meet those needs.

Rendering processes structure what the player sees on the basis of their past and potential choices, problematizing Alexander Galloway's (2006, 63) concept of *gamic vision*, which he describes as a way of seeing that "requires fully rendered, actionable space." Rather, in the context of subjective gameplay, player movement generates space itself, piecemeal. The process produces an *illusion* of fully rendered, actionable space by responsively culling elements from the player's view and embedding a few actionable elements in a world of otherwise limited interaction. This is a paradigm of optimization. As a method for synthesizing screen images from 3D geometries, rendering has increasingly functioned as a system of compromises designed to generate the richest, most engaging images on the least computational resources. Optimization for performance allows more resources in the graphics processing unit (GPU) to be allocated to drawing better images. Key techniques include 1) boosting the pixel shader (textures, etc.) through processes like frustum and occlusion culling, 2) prioritizing levels of detail in geometry and texture for objects that are closer than others via draw distance, and 3) establishing simpler approximations of the algorithms that simulate the behavior of light in such an environment. On one hand, these prevailing techniques for improving performance mimic the perceptual capabilities of human beings. Yet in tandem with culturally-inflected narrative, character, and environment design, these mediating processes organize gamic vision through the frustum, shaping the player's experience of settler gameplay dynamics.

The transformational algorithms that produce an intelligible image from model geometry participate equally with the player. This is a core feature of gamic vision. In

order to generate screen images, algorithmic processes must, "[f]or every pixel in an image, [...] find the objects that are visible [to the player's position and perspective] at that pixel and then display their 'appearance' to the user" (Dutré et al. 2006, 15). The renderer assembles the picture plane by drawing rays out from the frustum to the gameworld, displaying the visual information located where they terminate; objects hidden from view are simply passed over, nonexistent. Other visual elements exist only as set design, a mirage of interactable environment. The frustum limits what information is at play in a given set of pixels, presenting a computerized vision that has become ubiquitous in digital media, from production to entertainment (Manovich 2013, 182; Galloway 2006, 63) – yet still dependent on the interaction of light and space. Topography materializes in flexible form: as rendering procedures determine how and which geometry gets drawn and shaded, space shifts in and out of existence according to the subjective participation of the player. Michael Nitsche (2008, 93) describes how the camera then "deliver[s] the cinematic mediation of events as they are instantiated by the interactor in the virtual world." Yet by always synthesizing a shared simulation, as real-time rendering makes gamic vision possible it also delimits the strategies that developers can use to complicate the in-built ways of seeing through the renderer. A designer may set out to produce a game that problematizes settler-colonial ideology, but will run up against algorithms that make the work of ethical representation of Indigenous figures more difficult.

Gamic vision simulates by displaying the interactions of player and program. This visualized interaction – the reiterating screen image – is ultimately a reflection of shared decision-making, proceduralized through algorithm. Ed Finn (2017) and Safiya Umoja Noble (2018) have asked how these decision-making systems prioritize particular values and perspectives, but the magic of video games is that they invite (and implicate) the player into this decision-making process. The frustum, visual

access to this shared world, configures gameplay in accordance with its production through the renderer, lending the player's view an algorithmic nature. It "does not record the light emitted [...] but rather creates a projection of an imagined viewpoint" according to player action (Nitsche 2008, 90). Galloway (2006, 37) construes gameplay itself as a system of gamic actions that work together as a "subjective algorithm." Rendering processes also function as part of a yet larger subjective algorithm, resulting in collaborative image synthesis as players navigate game worlds through play. Player vision moves along two axes and rotates on two others in the case of FPS games, where the translation of geometry into screen image creates a linked subjectivity. By translating "abstracted versions of [...] externalities" (Finn 2017, 48) that designers use to populate gamespace – everything from assets to material properties – renderers constantly process cultural-computational information within this framework. In the context of real-time rendering, this means that an algorithm is not just a procedure for generating an image but a logic and an ideology for how images are produced from collaborative data. This logic embeds itself in the player's view, molded by procedural interactivity in a diegetic world. An ideology that privileges one mode of interpreting (and organizing) visual information becomes a proxy for the human eye, lending gamic vision a façade of empiricism just as it bears a façade of full rendering and actionability. Gameplay shaped by particular approaches to environment or human interaction, for example, project these values into the technical conditions of the player view.

It is through these technical conditions that subjective rendering establishes a particular subjectivity for (and with) the player as it relates to gamespace. In light of its mathematical construction, Vivian Sobchak (2000, 152) argues that "[s]uch space both denies and prosthetically transforms the spectator's physical human body [...]." The diegetic space transposes the interactive game environment with those actual

living environments that it simulates in its material properties and physical laws. Rendering algorithms translate between the actual-physical and the virtual-physical to generate an analogical topography. The resulting subjectivity sutured together by this transposition between renderer, screen and player structures player vision differently across video game genres, however. The western genre remains framed by historical land disputes shaped by a rhetoric of *wilderness* and *frontier*. As these play out in a game's visual and mechanical fields, vision relies on mapping contested, historical space—regardless of developers' attempts to fictionalize their narratives. This relationship has significant influence over the player's spatial experience. Aylish Wood (2012, 88) observes how gamespace is continuously "reconfigured [...] as the agencies of [player and program] are coconstituted. This space is recursive, based on feedback between the state of the game (relations between the objects) and the state of the gamer [...]." The western genre therefore dovetails well with both subjective and strategic gameplay, as the renderer constantly negotiates spatial contestations and transforms them into images. Ultimately, "image synthesis paradigms that translate physical space into algorithmic space reify encultured frameworks that influence our interpretations of living bodies" (Miner 2019, 57). So while westerns are well-primed to bring these issues to the fore, all gamic bodies appear and disappear according to culturally-construed sets of technical procedures. Frustum and occlusion culling speed up rendering times by allowing the renderer to pass over environmental elements outside of explicit view of the player, which is itself partly determined by the design of the game. This process is facilitated by bounding boxes or volumes that gather sets of objects together – in coordination with draw distance. This shortcut often leaves distant landscape and objects interrupted by visual artifacts as portions of the environment move awkwardly out of view. Space itself becomes warped,

jagged and temporarily shifted into a space of computation. The subjectivity generated by these glitches reflects the computerized vision through which it is conceptualized and manifested on screen.

Occlusion works as a logic of information flow or obstruction. It is an important narrative tool for designers and used to expand gamespace as well as close off spaces or guide player movement for narrative effect. For the purposes of this article, several different related practices may fall under this umbrella: culling algorithms effectively occlude objects from the view of the player, but ambient occlusion and occlusion maps also work together to hide objects from view. In a technical sense, culling "describes the early rejection of objects of any kind (objects, draw calls, triangles and pixels) that don't contribute to the final image" which may occur "at various stages in the rendering pipeline" – whether in the software or the hardware upon which the game is running (Johnson 2013). CryEngine's rule of thumb reads: "To remove as much processing work as possible, it is better to cull early and to cull more" (Johnson 2013). Frustum culling happens as a rendering process that checks all objects for intersection with the frustum, as it extends from the player camera. A third type, *back-face culling*, rejects backward-facing polygons when occluded by the visible faces of objects the player can see. Though not the only principle that determines how content gets culled, occlusion expresses a unifying metaphor for how this occurs.

Though these techniques are embedded natively in game engines, some subjective gameplay formats are driven by occlusion. Survival games tend to rely on several methods of making invisible: limiting view with the frame; blocking model geometry with other geometry; and ambient occlusion, or obscuring figures from view through the way models/shapes impact light diffusion. Within this broad format, survival

horror games may use these strategies for suspense, while stealth games like *This Is My Land* involve navigating and mobilizing occlusion to one's own benefit. Whereas most mainstream games use Indigenous people as background scenery that occlusion limits possible interaction with during gameplay, *This Is My Land* makes occlusion a mediating structure for gameplay, always limiting and opening contact between the player and Indigenous NPCs as well as with non-Indigenous NPCs. Finn (2017, 5) argues that algorithms operate "as a prism for a much broader array of cultural, philosophical, mathematical, and imaginative grammars." Real-time rendering, as a co-determined process of image synthesis, facilitates the grammatical elements of stealth, settlement, and other gameplay formats. Occlusion helps establish the subjective grammars of vision, opening a space for suspense but precluding some stories and interactions. Occlusion culling relies on designed patterns of modeled geometry to negotiate gameplay, narrative, and computational resources. These patterns emerge through smart level and environment design, but they are also facilitated by genre. Both *RDR2* and *This Is My Land* operate on a rendering paradigm that tends to shift Indigenous figures and stories into occluded space. *This Is My Land* partly mitigates these technical determinants by focalizing its subjective gameplay through a generic Indigenous individual and by using occlusion as an operable mechanic, not merely as a method for optimizing the gameworld.

Rendering game spaces engaging for the player means structuring decisions about how they receive images of and therefore experience Indigenous bodies and spaces – what is and is not made in/visible. Mediated by algorithm, player experiences frame perspectives on Indigenous and settler culture. We can also explore how some games interrogate and resist the structures of the settler digital platforms in which they are constructed and experienced, including the mathematical processes that produce

particular images of Indigeneity. This will provide a model for exploring other games that constitute algorithmic responses to the logic of settler digitality – articulating Indigenous computational sovereignty as they adapt new digital forms.

Occluding Indigeneity in Open World Westerns

A materialist approach to the analysis of rendering Indigenous bodies and places in open worlds leads us beyond representation to the ways that gamic vision and occlusion structure *how* players see, as collaborators, in games with settler and/or Indigenous themes. This acknowledges the role that technical properties and processes play in generating game images, beyond narrative and visual design – or representation. The history of mainstream representation from a techno-materialist perspective illustrates how designers and renderers work together to occlude Indigenous stories. Indigenous figures have played a prominent antagonist role in mainstream video games that draw on the western genre. The western movie's import into videogames started with ethical problems: early arcade westerns like *Gun Fight* (1975) and home console games like *Wild Gunman* (1985), *Gun.Smoke* (1985) – inspiration for *Red Dead Revolver* – and *The Lone Ranger* (1991) imported an iconography of western images to tell their stories on limited 8- and 16-bit architectures. The remediated grammars of western films flowed into the distilled narratives of early videogames. Along with western cinema, these games formed the basis for a revival of the western video game beginning with *Red Dead Revolver*, followed by horror western *Darkwatch: Curse of the West*, *Gun*, and *Call of Juarez* in 2005-2006. Their advancements in FPS gameplay were often tempered by conventional narrative tropes or, in the case of *Call of Juarez*, poor historical accuracy (McGarvey 2007). Partly in search of better atmospherics and more authenticity, developers became increasingly interested in incorporating open-world environments

and sandbox gameplay. *Red Dead Redemption* (2010), *Assassin's Creed III* (Ubisoft, 2012), *Red Dead Redemption 2* (2018) and *This Is My Land* (2019) all use these elements toward more fully-dimensional gameplay and game worlds, yet even they struggle to escape familiar narratives about either anonymous Native American villains or helpers.

Though open worlds ostensibly manifest spaces of possibility, open-world western adventures present a unique problem for real-time rendering due to the computational resources required to maintain a vivid and responsive environment. They rely heavily on occlusion techniques that designers use to balance resources with graphics and interactability. Their designs must account for how rendering can reinforce settler narrative's tendency to lean away from Indigenous perspectives. By nature, the resources required to render the natural expanses of an open-world western are massive. Open expanses need points of narrative interest to draw the player in and thus need far more space and assets for immersion. Sandbox games set in western-themed worlds grow the space necessary to foster exploration and also structure the ways that "character changes and narrative progress are often driven by combat, spatial exploration, and object acquisition" (Harrell 2010, 4). Rendering carries implications for how procedures of interaction and western narratives are experienced through gameplay.

Red Dead Redemption 2 and *This Is My Land* demonstrate this relationship. Each guides the player to explore and unlock territory, fulfilling objectives to lay claim to that growing space. Checkpoints, territorial boundaries and other design features of adventure and strategy games articulate the settler logic of progress but are left to the renderer to synthesize. Algorithms operate, according Safiya Umoja Noble (2018, 2), as "digital sense-making processes [that] have [become] fundamental to the

classification and organization of information." Effectively, rendering engines operate as algorithmic semantic systems, abstracting and concretizing physical information while synthesizing a screen image. *Red Dead Redemption* and *Red Dead Redemption 2* use the Rockstar Advanced Game Engine (RAGE), released on 2006 but retooled in 2012 to include ambient occlusion. The international indie developer Game-Labs designed *This Is My Land* using the Unity platform. These engines advanced over time to handle geometry and light in ever more sophisticated ways. Both games strove for a fictionalized western world, a vague simulation of the historical period, unlike the colonial-era *Assassin's Creed III* (2012) that sets its stealth survival gameplay in the social and natural environment of the American Revolution, with more historically-rooted Mohawk narratives and communities.

Improving upon its predecessor, *Red Dead Redemption 2* (2018) involves a few significant Native characters and a major narrative involving the fictional *Wapiti* people, though focalized through a white protagonist's story. The game owes this relative invisibility to longstanding assumptions about the historical period: set in 1899, after the popularly-known *Indian Wars*, Natives were understood to be nearing extinction. *RDR2* was accused of redfacing for some of its stereotypical Native characters, despite the involvement of Native voice actors like Graham Greene (Oneida) and Jeremiah Bitsui (Navajo/Omaha) (Lacina 2018). Unlike *Assassin's Creed*, *RDR2* attempted to sidestep historical accuracy by writing a generic conglomerate of Native U.S. cultures into the fictional Wapiti tribe. The game's setting involves a fictionalized mashup of the western and southern U.S. states around this time period, too, and follows outlaw Arthur Morgan through a changing social world. Among his many enemies, government forces, rival gangs and an oil tycoon present serious danger. The Native-specific storyline sees Arthur entangled in a conflict with the Wapiti people, as Rains Fall (Greene) and his son Eagle Flies (Bitsui) ask the

protagonist to help them deal with prospectors who have surveyed the land for oil on behalf of tycoon Leviticus Cornwall. Ultimately, Cornwall dispossesses the Wapiti, claiming their land via broken treaty, after which the Wapiti people flee to Canada.

Figure 1. The Wapiti Reservation, *Red Dead Redemption 2* © Courtesy of Rockstar Games.[iii]

Occlusion, however, both guides the player to and conceals the fictional Wapiti Indian Reservation and its community, who have limited interactivity outside the storyline (fig. 1). When the player finally rides into the area, the small communities are obscured, hidden from view in a way that expands the game space but is also intended to reflect the living world. It illustrates that seam Indigenous futurist Jason Lewis (2014, 67) observes in the digital landscape, "a terrain stretching from the spirit to the human to the machine worlds." Occlusion triggers cutscenes for the player on the Wapiti Reservation (fig. 2), reducing potential moments of interaction to cinema, since the sandbox elements found in many places on *RDR2*'s map are not present there.

Figure 2. Rains Fall Cutscene, Wapiti Reservation, *RDR2* © Courtesy of Rockstar Games.

Consuming the main Rains Fall–Eagle Files storyline in the game is the only engaging way to interact with its Native characters – by recovering a sacred pipe for Rain Falls, stealing vaccines for the Wapiti and mounting a rescue mission, among other missions – with Charles Lee providing a kind of mediating figure for the player. By not being as interactive or dimensional as other towns, forts, and camps in *RDR2*, the reservation's façades occlude possibility for the player. Narrative collapses into linearity. The player cannot deviate much from the storyline; there is limited gameplay available. Although technically sophisticated, the renderer's culling algorithms, along with mesh simplification and draw distance, serve to limit the player's contact with Indigenous characters. Stealth gameplay does engage with occlusion in *RDR2*, but glitchy line-of-sight mechanics leave the Native characters in the game relatively cinematic, rather than capable of the kind of dynamic interaction required for subjective rendering.

Gameplay is more stripped down in *This Land Is My Land*, an open-world adventure from the perspective of Native communities banding together to defend their lands. The game is distilled into a kind of stealth survival strategy where you "experience the

frontier as a chief of a Native American tribe and resist the onset of the settlers," gathering resources and building alliances to protect your lands (*This Land Is My Land,* 2019). For this reason, it was billed as "[…] basically *Red Dead Redemption* but from a Native perspective" (Sherjan 2018). Despite how the game relies on familiar stereotypes and ways of eliding difference between Native peoples, it inches closer to expressing Indigenous stories, limited by its explicitly generalized perspective. The game's development lead claims that your tribe represents all nations:

> "You represent them all. […] The Chickasaw, Cherokee, Lakota, Cheyenne, Apaches, Navajo, Shawnee, Shoshone, Mohawk, Utes and all other tribes large and small. These last patches of your homeland seem insignificant for the settlers, but for you it is the center of the universe; the heart of everything" (Campbell 2018).

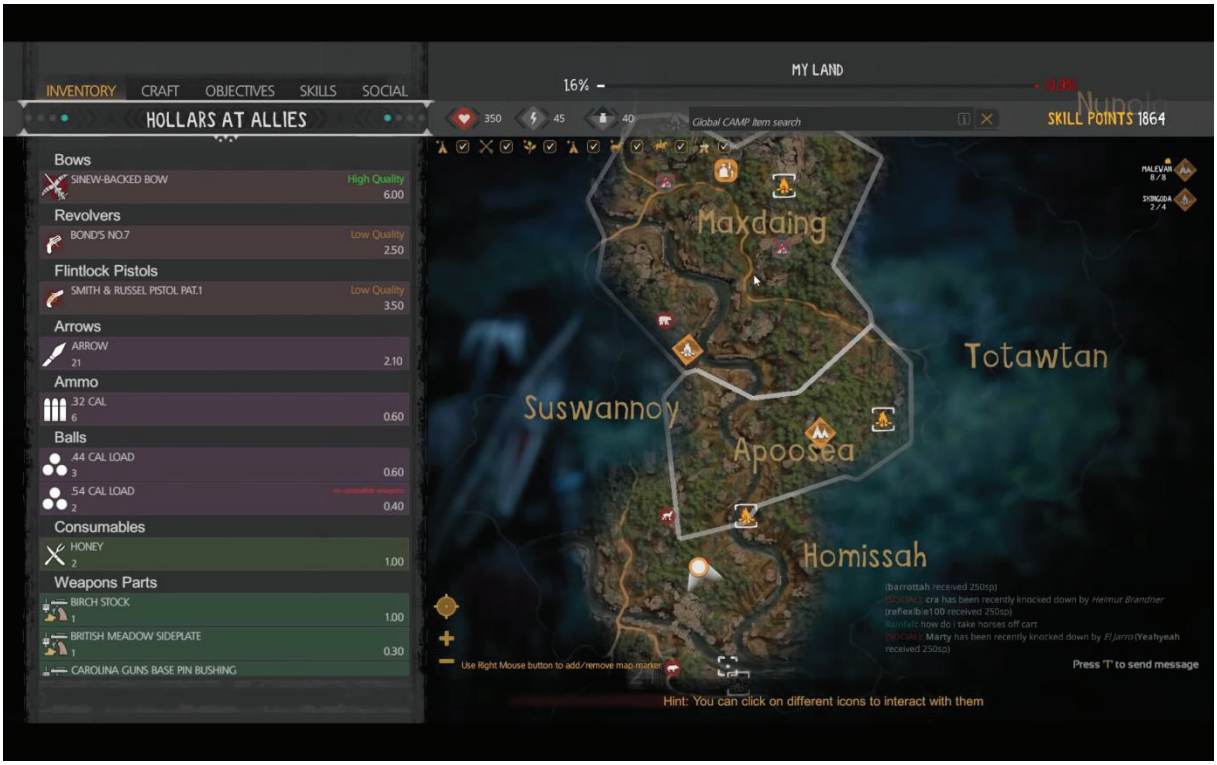

Figure 3. Game map, *This Is My Land* © Courtesy of Game-Labs.

But the game fails to actually represent any of these cultures. Indigenous scholars of digital media recognize how specific and generic assets convey different kinds of information to the player about Native locations, contexts, or themes (LaPensée and Lewis 2014, 112). The game situates contested land and game space as the *center of the universe*, with procedurally-generated maps and generic tribal designations on a strategy-style map populated by settler camps and forts (fig. 3). In contrast to both *RDR2* and *This Is My Land*, *Assassin's Creed III* instead uses tribe-specific cultural images that allow for styles and textures that "have differing levels of recognition to different viewers" (LaPensée and Lewis 2014, 112). These elements reiterate character narratives, genre narratives, and our ingrained cultural narratives, which make the game relatable and intelligible to mainstream, non-Indigenous players. While *This Is My Land* attempts to adopt an Indigenous perspective, it instead loses sight of the culturally-informed assets and environmental features that could have improved it. Yet player subjectivity in each of these games remains restricted by a cinematic frustum that connotes the imperialism of western cinema in its tendency to reduce Indigenous figures to mere scenery.

While critics have found the cultural elements of *This Is My Land* disappointing, its politics make a unique – if simplified – intervention in the genre. The goal of the game is to make useful alliances with neighboring Indigenous communities while engaging in a campaign against any settlers. Its gameplay is both strategic, where the player gathers resources and tasks automated villagers with gathering resources and crafting objects; and first-person stealth action, in which the player must stalk and kill or intimidate settlers. In a sophisticated turn, the most effective way to marshal other Native camps to your cause is to raise your *karma meter* by intimidating settlers instead of slaughtering them, which otherwise makes you seem to potential allies a risky or even bad leader. The tactical use of occlusion offers a powerful contrast to

the colonial violence otherwise ever-present in the genre. Here, culling and occlusion algorithms do less to preclude interaction with Indigenous characters, because the game itself is structured around them – flat as they are. The game encourages the player to exploit occlusion and invisibility in a decolonial reversal of the dynamics of a territorial western, where Indigenous invisibility precedes settler claims to land.

Figure 4. Stalking settlers, *This Is My Land* © Courtesy of Game-Labs.

The game's focus on land brings us to the gameplay that negotiates conflict between the player – with generic Native avatar and villagers – and white settler NPCs. The land itself serves as the mediating element, where occlusion facilitates stealth mechanics and frames friends and potential adversaries in the environment (fig. 4). White camps and forts also serve as occluding assets, settler political claims to the land. The environment is procedurally generated, so each playthrough is different. (The names of settlements are also randomly generated, often leading to terrible caricatures of Native place names.) Occlusion in the landscape is built into the

gameplay design, just as in other stealth games like the *Assassin's Creed* series. Unlike *RDR2* and *Assassin's Creed*, however, the central strategic role that land plays in the game shifts how we understand the function of occlusion. Yet whether focalized through a settler perspective on a historically fictive Indigenous world or through a generic Indigenous perspective on a contested colonial-era landscape, the mainstream paradigm of subjective rendering limits the possibilities for experiencing a gameworld outside of settler vision. In fact, here it reduces the complexity and visibility of not only its Indigenous characters, but its settler characters as well.

Ultimately, gamic vision and the camera frame function differently in *This Is My Land* than in other colonial strategy games. Instead of a top-down informatic view, the game only involves a help map that can be accessed by the player, providing a Eurowestern colonial perspective on the land (a la *Civilization*) and then a ground-level, subjective and occluded one. Both are designed toward the basic settler cycle of view–claim–master, but the relationship they establish with the player and the gameplay they engender are different. The top-down view for the map (but not subjective gameplay) guides the player's focus toward territory, borders, and mapping, but also tactical violence that the player must engage in to succeed. The experience of the Native warrior stealth-attacking white settlements and forts encourages players to map on the basis of subjective gameplay experience. The settler logic of these frames, one informatic and one first-person, show the conflicting frameworks of vision within which *This Is My Land* situates the player.

Conclusion

These games present Indigenous-themed stories in an open world, using contemporary rendering processes to increase performance and therefore the quality

of the final screen image. Research in Indigenous studies of the relationship between the settler gaze and the land in westerns has led to a recognition of cinema as a mediating device that "correlates an imperialist gaze with Western settlement" that "link[s] the theatrical work of filming the West with the colonizing work of mapping land…" (Hearne 2012, 45). Framing functions as a similar device in western video games, though the technical methods that construct that frame vary significantly from cinema. Gamic vision instead remains structured by sophisticated culling and occlusion algorithms that establish a structuring frame, through which the subjective rendering between player and game synthesizes the image for/of the player's experience. This structuring frame shapes the player's view of the designed Indigenous bodies and places (i.e. game assets and environments). Open world westerns that prioritize photorealism, especially, suture a longstanding transmedial logic of the settler gaze to the interactive phenomenon of gamic vision.

Red Dead Redemption 2 and *This Is My Land* offer vital examples of this relation. They feature explorable worlds designed to guide the player through western geographic and social terrain. They synthesize a screen image from simulated worlds in real-time, worlds cooperatively generated by the physically-based interactions of player and program. Westerns work well with open world designs because they require a vast *frontier* – though they cannot rely on level design for environmental occlusion culling, more common in FPS and adventure games, to improve graphical quality and general performance. In an open-world western, the player must consistently move between *civilization* and *wilderness*, a settler dialectic that establishes particular requirements for the visual production of the environment. In this context, subjective rendering methods contribute a degree of invisible design bias in building open, populated and narratively operable worlds. Nevertheless, both of these games demonstrate the use

of culling and occlusion to organize vision and player subjectivity, posing critical questions about Indigenous stories, bodies, and places in settler gamic environments marked by colonial violence.

The immersive POV perspective of gameplay helped organize a broader set of rendering practices designed to divert resources toward the subjective experience of the player, a framework that includes draw distance, mesh simplification, frustum culling, and occlusion and back-face culling. As Harrell (2010, 1) explains, "[c]omputational identities are not mediated only by social interaction, but by the particular implementations used to instantiate them." These shortcuts reflect a particular ideological orientation that privileges player subjectivity and visual fidelity over the Other, a settler perspective on the land that configures relationships to both Indigenous land and Indigenous people. They support Linda Tuhiwai Smith's (1999, 23) claim that "[c]olonialism was, in part, an image of imperialism, a particular realization of the imperial imagination." They reflect how unspoken settler ideologies may embed themselves in larger technical trends and design goals, operating as a mode of technical imagination for designers and players alike. Though open-world designs are only now being explored by Indigenous game designers,[iv] I expect we will see more of them in the future.

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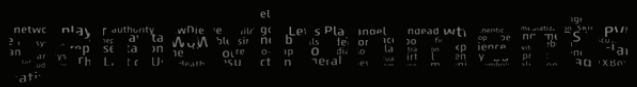

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[i] This revival also saw the release of *Call of Juarez* (2005) and the horror western *Darkwatch: Curse of the* West (2005) as well as the platformer *Brave: The Search for Spirit Dancer* (2005) and its HD Port, action-adventure *Brave: A Warrior's Tale* (2009). Both fantasy games feature a generic *Indian brave* protagonist and borrow heavily from generic Native North American story traditions. Neither of the *Brave* is a western, per se, beyond their inclusion of these elements.

[ii] *Assassin's Creed III* (2012) is perhaps the closest example, as it is an open-world adventure game set in the colonial era with an Indigenous protagonist. Other games, like *Red Dead Revolver* and *Gun,* remain part of the western revival in the game industry but are not open world games.

[iii] Rockstar Games does not endorse the content of this article.

[iv] Two recent Indigenous games have begun to experimental with more fully explorable worlds. The first is *He Au Hou (A New World)*, an experimental Indigenous game created by Indigenous students during a design workshop hosted by the Initiative for Indigenous Futures and Kanaeokana in 2017. The other is *Mulaka* (2018), a successful game that debuted on the Switch about the Tarahumara people in northern Mexico.