A theory of spatial simulation in video games: Selective realism and the production of virtual territory

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ABSTRACT
Video games have become one of the dominant media through which space is experienced, imagined, and learned, yet no general framework accounts for how they simulate territory as an operational system rather than merely as an image. The aim of this article is to explain a recurring pattern: video games distribute geographical fidelity unevenly, enhancing features that support visual clarity, emotional engagement, and playability, while compressing or omitting dynamic processes, systemic interdependencies, and socio-spatial complexity. To this end, a geographical theory of virtual territory production is proposed, structured around four analytical dimensions and six recurring design operations. The guiding concept is selective realism. Originally used in game studies to describe experiential filtering (Pötzsch 2017), the term is redirected here toward territorial analysis to capture this uneven distribution of geographical fidelity across the different layers of simulated environment. Drawing on a comparative synthesis of empirical analyses across open-world, coastal, and urban simulation games, the article develops four analytical dimensions of spatial simulation (morphological, functional, semantic, and political) and identifies six recurring operations through which selective realism is materialised. The resulting virtual territories are aesthetically compelling and functionally coherent, but their patterns of simplification carry epistemological and ideological consequences that warrant critical geographical attention.

KEYWORDS
spatial simulation; selective realism; video game geography; virtual territory; critical geography

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1. Introduction

Video games have become arguably the most pervasive spatial medium of the twenty-first century. The global industry generated around US$187 billion in revenue in 2023 (Burgess et al. 2025), and video games occupy a substantial share of the leisure time of children and adolescents (Donati et al. 2021). Yet despite this scale, and despite two decades of productive geographical scholarship on virtual worlds, the discipline has not yet developed a unified theoretical account of how video games produce space as operational systems. There are productive accounts of what they represent, of the affects they generate, of the ideologies they encode, and of their pedagogical potential, but the underlying logic that connects these dimensions remains comparatively undertheorised. This article proposes such an account.

The need is not merely academic. If video games are, as this article argues, not simply representations of space but operational spatial systems (environments that regulate movement, distribute resources, impose frictions, structure visibility and organise risk) then understanding the principles that govern their construction is necessary for assessing what geographical knowledge they produce, what they distort, and what they make impossible to see. The geographical stakes are considerable: a generation that learns mountain topography through *Skyrim*, urban governance through *Cities: Skylines*, and colonial territoriality through *Anno 1800* is learning from spatial simulations whose logic of simplification has received limited systematic theoretical attention.

Existing scholarship has approached video game geographies from three directions, each productive but partial. Game studies has developed sophisticated typologies of game space – Nitsche's (2008) five-layer model, Aarseth's (2001) distinction between allegorical and traversable space, Bogost's (2007) procedural rhetoric, that illuminate how virtual environments are structured and how they communicate through rules, but without building a geographical theory of what kind of territory these environments produce. More recently, phenomenological approaches to game space have gained traction: Wang et al. (2024) proposed a framework for meaningful place design in open-world games drawing on Tuan and Relph, while Bunting (2026) applied critical cartography to the rhetorics of game maps. Cultural geography has examined video games as landscapes of affect and ideology (Shaw and Warf 2009; Ash 2009, 2012; Ash and Gallacher 2011; Dyer-Witheford and de Peuter 2009), demonstrating their legitimacy as objects of geographical inquiry, but primarily in terms of what they *mean* rather than how they *function* as spatial systems. And simulation studies has examined the validity and fidelity of digital simulations (Klabbers 2003; Kriz and Hense 2006; van Haaften et al. 2024), but without a geographical framework for interpreting the patterns of simplification it identifies.

Recent empirical work has begun to bridge these perspectives. Fraile-Jurado (2024) demonstrated that open-world game geographies exhibit systematic distortions: compression of horizontal distances, exaggeration of slopes, idealisation of climate, simplification of vegetation, that are not random but patterned across titles and genres. Fraile-Jurado et al. (2025) extended this analysis to coastal environments, showing that beaches, cliffs and tidal marshes are represented with striking visual plausibility but without the dynamic processes (tidal rhythms, sediment transport, wave refraction) that make them function as geographical systems. And Fraile-Jurado and Llovet-Ferrer (2026) analysed urban simulation games as ideological productions, revealing how city-building titles consistently represent urban development as a depoliticised, technocratic process managed by omniscient authority, erasing conflict, informality and social inequality from the simulated city. Together, these studies reveal a common pattern: games distribute fidelity unevenly across the layers of the environments they simulate, investing heavily in visual coherence and narrative functionality while systematically suppressing dynamic processes, systemic complexity and political friction.

The aim of this article is to explain a recurring tendency. Video games consistently simplify certain features of the territories they simulate, whilst enhancing others. The argument advanced here is that this pattern is not incidental but structural. It reflects a coherent logic of spatial production, one which can be theorised and named. The article's principal contribution consists of supplying the theoretical language for this pattern, namely a geographical framework comprising four analytical dimensions and six operations. Selective realism here acquires a territorial meaning: it refers to the unequal distribution of geographical fidelity across the strata of a simulated world, shaped by the interplay of gameplay demands, technical limitations and cultural assumptions. Pötzsch (2017) had already used the term for the experiential filtering of war in shooters; this article moves it from the realm of represented experience to that of territorial system, and anchors it in a framework (set out below) that extends this line of work toward the fidelity of physical process, a register that existing accounts have left largely unaddressed. The article focuses specifically on games that organise space as traversable, governable or explorable territory, genres in which the spatial environment functions as an operational field rather than as a backdrop or interface element. Within this scope, the central question is: *how do video games simulate space, and what general principles govern the selective production of virtual territories?* The article does not claim that all video games simulate space in the same way, but that across these genres a recurrent logic of uneven fidelity can be identified and theorised.

This is a conceptual article. It develops a theoretical framework through synthesis of existing empirical findings and theoretical literature, rather than reporting new empirical analysis. For this reason, it does not include a separate Data and Methods section. The four analytical dimensions and six operations set out in Sections 3 and 5 were derived inductively. Their derivation drew on recurrent patterns reported in empirical analyses of open-world, coastal and urban simulation games (Fraile-Jurado 2024; Fraile-Jurado et al. 2025; Fraile-Jurado and Llovet-Ferrer 2026). This body of work was complemented by empirical studies on the perceived realism of game landscapes (Hut et al. 2019), the effects of simplification in gaming simulations (van Haaften et al. 2024), and the ecological representation of game environments (Marín-Rubio et al. 2026). These studies were selected because they address the geographical fidelity of simulated environments directly, rather than their narrative or representational content. Their findings were then read against the theoretical literatures on landscape, simulation and game space reviewed in Section 2. The game examples used in Sections 3 to 6 illustrate how the framework applies across genres and settings. They do not constitute a new sample, and the framework is not tested or validated against them in any systematic empirical sense. Validating it through purpose-built empirical analysis is left to future work.

2. Beyond representation: the case for a theory of spatial simulation

2.1 What existing approaches offer and what they miss

Geography's engagement with video games has been shaped by its established tradition of analysing landscapes as visual-cultural mediations. Cosgrove's (1984) argument that landscape is a "way of seeing", a culturally and ideologically situated mode of apprehending and representing the world, provided the conceptual licence for treating video game environments as legitimate objects of geographical inquiry alongside painting, photography and cinema. Shaw and Warf (2009) drew on this tradition to argue that game worlds constitute "worlds of affect" that generate spatial imaginaries, emotional attachments and cultural geographies of territory. Ash (2009, 2012) developed the analysis further through non-representational theory, demonstrating how gameplay reconfigures embodied spatial awareness through the interaction of body, screen and interface. These contributions are substantial and have successfully established video games within geography's expanding remit.

What they leave underdeveloped, however, is the question of how video games produce space as an operational system rather than as an image or an experience. The landscape tradition in geography, as Wylie (2007) notes, has always carried a tension between landscape as visual surface and landscape as material process, between how the world looks and how it works. Video games sharpen this tension acutely, because their spatial environments are both images and operational systems simultaneously: they can be visually surveyed and affectively inhabited, but they also regulate what players can do, where they can go, how fast they can move, and what consequences their actions have. It is this operational dimension, the space as a system of action, constraint and consequence, that existing geographical approaches have addressed only partially.

Game studies has addressed the operational dimension more directly. Bogost's (2007) concept of procedural rhetoric (the capacity of rule-based systems to make arguments about the world through the mechanics of interaction) captures how game systems encode cultural and political assumptions in ways that exceed visual representation. Nitsche's (2008) typology of game spaces identifies rule-based space as the primary layer through which interaction is structured. Aarseth's (2001) distinction between allegorical space (space as image and symbol) and traversable space (space as navigational field) points toward the operational dimension without fully developing it. What remains comparatively underdeveloped across these accounts is a specifically geographical framework for understanding what kind of *territory* a game simulation produces: how it configures morphology, function, meaning and power in relation to each other, and according to what logic it distributes fidelity and simplification across these dimensions.

Simulation studies has contributed a methodological foundation for assessing fidelity and simplification (Klabbers 2003; Kriz and Hense, 2006; van Haaften et al. 2024), but its framework is oriented toward evaluating how well a simulation achieves its representational goals, rather than toward understanding the spatial logic that governs what gets represented and what does not. The distinction between Design-in-the-Large and Design-in-the-Small (Klabbers, 2003) (between broad structural decisions about what to model and detailed decisions about how to model it) provides a useful starting point, but does not itself constitute a theory of spatial production.

Selective realism did not originate in this article. Pötzsch (2017) coined it to analyse how shooters filter the experience of armed conflict, identifying specific design and narrative mechanisms that suppress unpleasant but significant aspects of warfare – such as graphic violence, long-term psychological costs and political repercussions – while preserving an aura of realism. In that formulation, the concept operates within the experiential and representational register reviewed in the preceding section: it asks what is shown or hidden from the player. The framework proposed here moves to a different register, one that

is territorial and systemic: it examines the uneven distribution of fidelity across the constitutive dimensions of a spatial environment, understood not as experiential content but as operational territory. Read through the lens developed in Section 5.4, Pötzsch's filtering of war becomes a single operation (filtering) applied to a single content domain (violence) within one dimension (the semantic). The present framework generalises this underlying logic to the production of territory, extending it across four dimensions and six operations.

2.2 Representation versus simulation

The foundational analytical distinction of this article is between *representing* space and *simulating* space. This distinction is not merely terminological: it marks a qualitative difference in how spatial environments are produced and what they do. It should be understood as an analytical emphasis rather than an ontological partition; in practice, representation and simulation coexist in variable proportions within any given game, and the boundary between them is often mediated by interface, narrative and player practice. The distinction is nevertheless productive because it directs attention toward the operational dimension of game space that existing analyses have tended to subordinate to the visual and experiential.

Representing space is producing a spatial image: a recognisable configuration of visual elements that refer to a place, a landscape, a territory. The backgrounds of early platformers, the painted landscapes of adventure games, the panoramic environments of walking simulators, all these represent space in the sense that they depict it, make it visually present, invite recognition and response. The tradition of cultural geography as visual analysis is well equipped to address this dimension: its tools of landscape reading, iconographic analysis and discourse analysis are directly applicable to the spatial imagery of games.

Simulating space is something different and more demanding. It is producing a spatial system: an environment that not only looks like a territory but *functions* as one, in the sense that it regulates the actions available to agents within it, distributes resources and risks across its extent, imposes frictions and constraints on movement, structures visibility and legibility, and organises the consequences of decisions. A simulated space is not merely an image to be looked at but an operational field to be navigated, exploited, governed or survived. Its relevant properties are not only visual but functional: not what it looks like but what it allows, what it blocks, what it costs, what it reveals and conceals.

This shift from image to operation resonates with Galloway's (2006) argument that gaming is algorithmic culture, where play consists in enacting a process rather than contemplating an image. Galloway states this as a general property of gamic action; the present framework gives it a spatial specification. The simulated territory is not an image to be interpreted, but a process to be performed. And it is precisely this spatial dimension of action, not action in general, that the four dimensions of Section 3 are intended to address.

This distinction connects with Lefebvre's (1991) tripartite account of space as conceived, perceived and lived. Conceived space (the space of planners, cartographers and designers) corresponds to the representational dimension: space as image and discourse. Lived space (the space of everyday practice, embodied memory and affective experience) corresponds to the experiential dimension that non-representational geography has explored. But Lefebvre's third term, perceived space or *spatial practice*, refers to the material and operational dimension: how space is actually used, traversed, and produced through the routines of daily life. It is this operational dimension, spatial simulation as the production of a field of practice, that a theory of spatial simulation must account for.

The implication is that many existing analyses of video game geographies remain, in Lefebvre's terms, at the level of conceived and lived space while neglecting spatial practice. They address what games image and what players feel, but not how the spatial system works as a territory, and therefore cannot fully explain either the patterns of simplification that empirical research has documented or the geographical knowledge that players develop through sustained engagement with simulated environments.

3. The four dimensions of spatial simulation

A theory of spatial simulation requires analytical dimensions that are sufficiently general to apply across different game genres and settings, sufficiently specific to generate empirically testable claims, and sufficiently connected to established geographical theory to facilitate interdisciplinary dialogue. The four dimensions proposed here are not fixed ontological strata but analytical lenses through which the spatial logic of simulation can be examined. They are not independent; each conditions and is conditioned by the others, but they can be distinguished for purposes of analysis, and the patterns of their interaction (how the semantic shapes the morphological, how the political conditions the functional) are among the most revealing features of specific simulations.

3.1 The morphological dimension

The morphological dimension concerns what territory is materially configured by the simulation: what relief, hydrography, vegetation, soils, climate, and scalar relationships between vertical and horizontal extent are present, and how they relate to each other. This is the dimension most directly addressed by

geomorphological and physical geography, and the dimension along which the empirical analyses of Fraile-Jurado (2024) and Fraile-Jurado et al. (2025) have operated most precisely. Their findings (systematic horizontal compression, vertical exaggeration, absent dynamic processes, static vegetation, climatically incoherent altitudinal gradients) constitute a detailed empirical characterisation of morphological simulation fidelity and its typical distortions.

Two additional process domains reveal the same pattern with particular clarity. Glacial systems depend on the coupling of accumulation, ablation and ice flow; mass balance determines whether a glacier advances or retreats, and this in turn controls meltwater discharge, subglacial sediment transport, and the erosional and depositional landforms (cirques, moraines, outwash plains) that record its history (Benn and Evans 2010). In open-world game environments, by contrast, glaciated terrain is typically decoupled from this logic altogether. Ice appears as a static visual surface that neither advances nor retreats, generates no meltwater or sediment flux, and displays none of the internal structure, such as crevasses, seracs or icefalls, that a moving ice mass would produce. The disjuncture can be stark. Assassin's Creed Valhalla, for instance, sets its western Norwegian territories in a landscape whose real counterpart is defined by active glacial systems and glacially-carved fjord morphology, yet renders it as an ice-free rocky highland, omitting the geomorphological signature of glaciation entirely.

Fluvial systems present a parallel case. River channels are shaped by the continuous interaction of discharge, sediment supply and channel boundary conditions, producing the meanders, braided patterns and floodplain deposits that Charlton (2008) describes as the outcome of a dynamic flow-and-sediment regime rather than a fixed geometry. Open-world rivers, however, typically flow at constant velocity regardless of gradient, carry no visible sediment load, and respond to neither rainfall events nor seasonal variation. They function as navigational boundaries or scenic features rather than as systems whose form is the continuously renegotiated product of discharge and sediment transport. Orographic precipitation and ecological succession, discussed more briefly in Sections 4.3 and 5.4, are subject to the same logic of process exclusion documented here for glacial and fluvial systems, though their specific dynamics are not developed with comparable empirical detail within the scope of this article.

The morphological dimension is not, however, only about accuracy. It is also about what kind of territory is configured: what spatial structure the simulation instantiates as its basic material. A mountain range that functions as a series of navigable slopes without glacial dynamics, erosional processes or altitudinal ecological transitions is a morphologically configured territory, even if it is a highly simplified one. The morphological dimension asks: *what kind of territory is materially simulated, and with what degree of internal coherence?*

3.2 The functional dimension

The functional dimension concerns how the simulated territory operates as a system of action: how it regulates mobility and accessibility, distributes resources and risks, structures the gradients of difficulty and reward, organises visibility and information, and imposes constraints on what agents can do and where they can go. This is the dimension most directly addressed by game design analysis, and the one that most clearly distinguishes simulation from representation: a represented territory shows; a functionally simulated territory acts.

Glacial and fluvial terrain illustrate this functional logic in a different register. For a glacier to serve as traversable terrain, what it needs is simply a walkable surface with adequate friction and visibility; it does not require a mass balance of accumulation and ablation that would cause it to advance, retreat or generate hazards such as crevasses or meltwater floods during the course of play. Similarly, a river that acts as a navigational corridor or defensive boundary only needs a channel of consistent width and a current against which the player can swim or along which they can raft. It has no need for variable discharge that might produce flooding, drying or lateral migration across a floodplain. In both cases, the operational demands of gameplay, a stable and predictable surface over which action can be planned, are met more effectively by a static configuration than by a genuinely dynamic one. This is precisely why these couplings are among the first to be decoupled or filtered out, as discussed in Sections 5.3 and 5.4.

The functional dimension is where gameplay priorities most directly condition geographical fidelity. Mountain terrain that functions primarily as an obstacle will be designed to impose movement constraints (gradient, stamina depletion, surface conditions) regardless of whether those constraints accurately reflect real mountain traversal physics. Coastal terrain that serves primarily as a scenic backdrop will be designed for visual spectacularity rather than hydrological accuracy. Urban space that functions as a governance puzzle will be designed to be legible, controllable and optimisable, regardless of whether real cities possess those properties. The functional dimension asks: *how does the space operate as a system of action, and what spatial behaviour does that system enable, constrain or make impossible?*

3.3 The semantic dimension

The semantic dimension concerns what spatial imaginaries are activated by the simulation: what cultural meanings, symbolic associations and narrative functions specific territorial configurations carry

within the game. This is the dimension most directly addressed by cultural geography and game studies: Shaw and Warf's (2009) account of game worlds as "worlds of affect", Bogost's (2007) procedural rhetoric, the analysis of geopolitical imaginaries in military games (Power 2007), and the study of ideological spatial narratives in urban simulations (Fraile-Jurado and Llovet-Ferrer 2026) all operate primarily at the semantic level. A growing body of ecocritical scholarship has further expanded this dimension, examining how games construct environmental imaginaries and ecological entanglements (Heijmen and Vervoort 2024; Marín-Rubio et al. 2026). The most comprehensive treatment of this ecological register to date is Chang's (2019) Playing Nature, which proposes that games act as mesocosms – constructed environments where players encounter ecological dynamics of interdependence and constraint. Like the ecocritical work reviewed earlier, Chang's focus is predominantly semantic: how games stage relationships between nature and culture, and what forms of ecological sensibility they cultivate. The morphological and functional dimensions developed in this article are complementary, not coextensive. They address physical processes and features (relief, hydrodynamics and glacial dynamics) in terms of geomorphological coupling, a register that has remained largely absent from the ecocritical literature that Chang's book represents.

The semantic dimension is not separable from the morphological and functional: specific morphological configurations carry semantic loading that is historically and culturally produced. Mountains are not semantically neutral terrain. Cosgrove and Della Dora (2009) have shown how high places have been invested across Western cultural history with values of sublimity, spiritual aspiration, scientific knowledge, and existential challenge. Macfarlane (2003) traced the transformation of mountains from objects of fear to objects of fascination in Western culture from the eighteenth century onwards. Debarbieux and Rudaz (2015) demonstrated that mountains are not merely physical features but social and political constructions whose meanings have been shaped by modernity, nationalism and environmental governance. When an open-world game places a dramatic summit at the centre of its map, it is not merely configuring a morphological feature; it is invoking and reproducing a culturally specific imaginary of mountain space that carries these historical meanings. The semantic dimension asks: *what spatial imaginary does the simulation construct, and through what interaction of morphological, visual and narrative elements?*

3.4 The political dimension

The political dimension concerns what relations of territorial power are encoded in the simulation: what assumptions are made about who controls space, how control is exercised and contested, what forms of spatial authority are naturalised, and what actors, practices and voices are rendered invisible. This dimension is included because a geographical framework of territorial simulation would be incomplete without it. Its analytical content intentionally overlaps with an established tradition of ideological critique in game studies and cultural geography (Bogost 2007; Dyer-Witheford and de Peuter 2009; Shaw and Warf 2009). The distinctive geographical contribution of the present framework, developed in detail in Sections 3.1 and 3.2, lies elsewhere: in the fidelity of morphological and functional – that is, physical and process-based – simulation. This is the dimension most directly addressed by critical geography, and a dimension that has received growing but still limited attention in game studies.

Recent analysis of urban simulation games (Fraile-Jurado and Llovet-Ferrer 2026) illustrates this dimension particularly clearly. Across thirteen city-building titles spanning three decades (from *SimCity 2000* to *Frostpunk*, *Tropico 6* and *Workers & Resources: Soviet Republic*) a consistent pattern emerges regardless of the political system ostensibly modelled: the player appears as a sovereign authority with minimal democratic accountability, urban space is treated as a programmable surface rather than a terrain of competing claims, and political friction is either absent or reduced to a technical management problem. As the authors argue, these games naturalise a technocratic vision of urbanism in which governance becomes optimisation and space an instrument of efficiency.

4. Selective realism: the basic logic of spatial simulation

4.1 Realism is distributed, not total

The central theoretical proposition of this article is that video games do not simulate space realistically or unrealistically in any global sense. What they do is *distribute fidelity unevenly* across the four dimensions outlined above, and within each dimension, across different variables and subsystems. The concept proposed to capture this is selective realism: the uneven distribution of geographical fidelity across the different layers of a simulated environment, whereby video games privilege those spatial features that maximise legibility, affective intensity, and gameplay functionality, while simplifying or suppressing those whose complexity would hinder operability or exceed technical and design priorities.

The empirical basis for this concept draws on a series of comparative analyses examining different landscape types and game genres, whose converging findings suggest a recurrent pattern. Fraile-Jurado (2024) demonstrated that across fifteen open-world games, visual morphological features (the

recognisable shapes of landscapes) were consistently more faithfully rendered than process-based and dynamic features. Fraile-Jurado et al. (2025) showed that coastal simulations achieve high scores on static geomorphological variables (beach slope, cliff verticality, dune presence) while scoring near zero on dynamic process variables: no tides, no sediment transport, no wave refraction, no littoral currents. The asymmetry is not random: the coastal features that are represented accurately are precisely those that are visually salient and spatially distinctive; those that are absent are precisely those that would require continuous dynamic simulation. Fraile-Jurado and Llovet-Ferrer (2026) extended this pattern to the political dimension, showing that urban simulations invest in the legible spatial infrastructure of the city (zoning, density, transport networks) while suppressing the political and social dynamics that produce and contest that infrastructure.

The pattern is sufficiently consistent across the landscape types, game genres and development studios examined to suggest a structural tendency rather than an incidental coincidence, though its generality beyond these cases remains an empirical question. It is not that individual games have failed to achieve fidelity in particular dimensions. It is that the distribution of fidelity follows a discernible logic that transcends individual design decisions.

4.2 What gets prioritised

The features that receive disproportionate investment in fidelity across the corpus of studies are those that serve three primary design objectives: visual legibility, affective intensity, and gameplay functionality.

The three objectives proposed here are not drawn from any single framework, but each corresponds to an established vocabulary in the study of designed environments. Visual legibility draws on Lynch's (1960) account of legibility as the ease with which the parts of an environment can be recognised and organised into a coherent pattern. This concept was developed for urban wayfinding but is directly transferable to the navigational demands of traversable game space. Gameplay functionality corresponds to what the MDA framework (Hunicke et al. 2004) terms mechanics and dynamics: the rules and emergent behaviours through which an environment becomes operable for players. Affective intensity aligns with the MDA category of aesthetics, and with what Schell (2008) identifies as the ultimate object of design decisions: the emotional and sensory response the environment is intended to evoke. Rather than borrowing from any one of these traditions, the triad synthesises them. It names the three objectives that recur across the empirical studies examined here, and situates them within existing design and perceptual vocabularies rather than deriving them from any single source.

Visual legibility refers to the capacity of the spatial environment to be read, navigated and understood at a glance: to present distinctive landmarks, coherent terrain structures, and recognisable territorial configurations that allow players to orient themselves and plan their movements. Mountains in open-world games are consistently represented with dramatic vertical relief, distinctive summit profiles, and visually clear altitudinal transitions precisely because these features serve navigation: they are the spatial anchors around which players construct their cognitive maps of the game world. The morphological exaggerations documented by Fraile-Jurado (2024), slope angles that exceed physical plausibility, horizontal compressions that place ice-capped peaks within minutes of tropical lowlands, serve visual legibility by concentrating spatial drama within perceptually manageable ranges.

Affective intensity refers to the capacity of the spatial environment to generate aesthetic, emotional and kinesthetic responses that motivate engagement and sustain the player's investment in the game world. The Romantic imaginary of mountain sublimity – the panoramic summit view, the dramatic storm, the vertiginous cliff – is reproduced with remarkable consistency across open-world games precisely because it is affectively potent. Cosgrove and Della Dora (2009) showed how high places have been culturally produced as sites of intense aesthetic experience; this cultural production is directly available to game designers as a resource for affective design. What gets simulated with the highest fidelity is not what is geographically most accurate but what is aesthetically most compelling.

Gameplay functionality refers to the capacity of the spatial environment to support the action systems that define the game's core experience: movement, navigation, combat, exploration, resource management, governance. Mountain terrain that functions as an obstacle requires gradient and exposure; it does not require glacial dynamics or ecological zonation. Coastal terrain that functions as a setting for naval combat requires wave simulation adequate for visual drama; it does not require tidal variation or sediment transport. Urban space that functions as a governance puzzle requires legible zoning, infrastructure networks and satisfaction metrics; it does not require informal settlements, social movements or democratic contestation. The functional dimension of spatial simulation is designed around gameplay needs, and this design logic directly conditions which morphological, semantic and political features are faithfully represented.

4.3 What gets simplified

Corresponding to the three priorities that drive fidelity are three categories of feature that are systematically simplified or suppressed.

Dynamic processes are consistently the most under-simulated dimension across all landscape types studied. Tides, sediment transport, wave refraction, glacial dynamics, orographic precipitation, fluvial variability, ecological succession, urban social conflict, all are processes that unfold over time, involve complex interactions between multiple variables, and produce spatial outcomes that are difficult to predict or control. They are also precisely the processes that would make simulated environments behave as geographical systems rather than as static spatial arrangements. The absence of tides from virtually all coastal game environments (Fraile-Jurado et al. 2025), of glacial and fluvial dynamics from mountain and river environments alike (Section 3.1), and of political dynamics from urban simulations regardless of the political system nominally modelled (Fraile-Jurado and Llovet-Ferrer 2026), reflects a consistent design priority: dynamic processes are costly to model, difficult to render consistently, and introduce spatial behaviour that is hard for players to predict, manage or enjoy, being therefore systematically filtered out.

Systemic interdependencies (the feedback loops and coupling relationships between different spatial subsystems that make real environments complex and unpredictable) are similarly absent from most game simulations. In real mountain environments, climate, geomorphology, hydrology and vegetation are tightly coupled: snowfall contributes to snowpack accumulation, snowmelt contributes to river discharge, river discharge shapes valley morphology, and valley morphology influences vegetation distribution. In game mountain environments, each of these dimensions operates independently: weather effects are applied to the surface without driving hydrological change; vegetation is distributed according to aesthetic logic rather than ecological constraint; geomorphology is static and unresponsive to atmospheric or hydrological forcing. Hut et al. (2019) illustrate this decoupling in *The Legend of Zelda: Breath of the Wild*: Hyrule, designed to be roughly the size of Kyoto, nonetheless contains deserts, mountain ranges, swamps and arctic tundra, a combination of environments that no coupled climatic system could produce within such an area.

Socio-spatial friction (the resistance, contestation and uncertainty that characterise the production and inhabitation of real territories) is the category whose suppression is perhaps most directly consequential in political terms. The analysis of urban simulations by Fraile-Jurado and Llovet-Ferrer (2026) demonstrates this with particular clarity: across thirteen titles representing a wide range of political systems, from liberal democracy to authoritarian dictatorship to socialist planning, social protest is either absent or reducible to a technical management failure, political contestation is either absent or reduced to a menu of policy choices, and the multitude of actors that produce real urban space (residents, developers, planners, social movements, investors) is condensed into a single omniscient player-authority. This is not merely a simplification of political complexity; it is the naturalisation of a specific territorial ideology in which space is governable and conflict is manageable.

4.4 Selective realism as a theoretical concept

Selective realism can now be formally defined: it is the structural logic through which video games distribute geographical fidelity unevenly across the morphological, functional, semantic and political dimensions of a simulated environment, prioritising those spatial features that serve visual legibility, affective intensity and gameplay functionality, while systematically suppressing dynamic processes, systemic interdependencies and socio-spatial friction.

This concept integrates and extends three existing analytical frameworks. From Bogost's (2007) procedural rhetoric, it inherits the insight that game mechanics make arguments about the world – but extends this from the level of individual mechanical choices to the structural level of how fidelity is distributed across a whole simulated environment. From Klabbers's (2003) distinction between Design-in-the-Large and Design-in-the-Small, it takes the recognition that different scales of design decision produce different patterns of simplification – but provides a geographical framework for understanding what those patterns mean territorially. From Calleja's (2011) account of player incorporation, it draws the recognition that spatial engagement in games is not passive reception but active inhabitation – a process through which the operational logic of the simulated environment becomes experientially naturalised. And from the empirical programme of geographical analysis of game environments (Fraile-Jurado 2024; Fraile-Jurado et al. 2025; Fraile-Jurado and Llovet-Ferrer 2026), it derives the specific empirical content that grounds the concept in documented patterns rather than theoretical speculation.

Selective realism is not a normative concept: it does not imply that games *ought* to be more realistic. Games are not geographical information systems, and the simplifications that selective realism produces are often precisely what makes games playable, enjoyable and culturally powerful. The concept is, rather, an analytical tool for understanding how virtual territories are produced, what they teach, and what they make invisible – and therefore for developing the critical geographical literacy that Morawski and Wolff-Seidel (2023) argue is essential for the use of games in geographical education.

If selective realism is a general logic of spatial simulation, several expectations follow. First, fidelity should be distributed unevenly rather than uniformly across the dimensions of a simulated environment. Second, those features that enhance legibility, affective intensity and gameplay operability should tend to receive greater representational investment

than those requiring dynamic or systemic modelling. Third, where games increase fidelity in one dimension, they will often compensate through simplification in others in order to preserve playability and control. Fourth, simulations centred on management and governance should be especially prone to filtering socio-spatial friction, whereas simulations centred on traversal and exploration should be especially prone to compression and exaggeration. These expectations do not function as rigid laws, but as recurrent tendencies whose intensity and combination should vary across genres, design traditions and technical regimes.

Selective realism should not be understood as implying that all games simplify space in the same way, or that all dimensions of simulation are equally reduced across all cases. Its claim is more precise: fidelity is structurally redistributed according to design priorities, technical constraints and cultural conventions, and this redistribution produces recurrent patterns even where individual games depart from them in specific respects. Some titles may intensify dynamic simulation, political conflict or systemic interdependence in particular domains; yet even these cases are likely to remain selectively realist insofar as gains in one dimension are offset by simplifications in others. Dwarf Fortress (2006/2022) exemplifies this intensification more clearly than any other case. Its world generator ties elevation, rainfall, temperature, drainage and mineral distribution into an interdependent procedural model: rainfall is recalculated for rain shadows and orographic effects as terrain elevation is finalised, and biome assignment follows from the resulting climatic parameters, not from a separately authored aesthetic layer. This is precisely the kind of process that Section 5.4 identifies as typically filtered out of mountain simulations for exceeding gameplay relevance. Yet Dwarf Fortress achieves this systemic coupling by sacrificing visual and affective legibility almost entirely: the world appears as a grid of abstract symbols rather than as a navigable, perceptually rich terrain. The trade-off is clear: gains in morphological and functional fidelity are purchased through simplification along the very dimensions – visual clarity and emotional engagement – that most open-world titles place at the centre of their design. The theory therefore concerns not the presence or absence of realism as such, but the patterned allocation of realism within a simulated spatial system.

5. The main operations of selective simplification

The abstract logic of selective realism is materially implemented through a set of recurrent design operations. These operations should be understood not simply as descriptive categories, but as the principal mechanisms through which uneven fidelity is organised within simulated environments across genres and landscape types. Six such operations are identified here, drawing on the empirical studies reviewed above and on the broader game studies literature. They are not exhaustive, and individual games implement them in distinctive combinations; but they constitute the basic repertoire through which selective realism is materialised in specific simulations.

5.1 Compression

Compression refers to the systematic reduction of horizontal distances and spatial scales to make the game world navigable within the time constraints of gameplay sessions. All game environments are compressed relative to the real-world scales they invoke, but the degree and logic of compression vary significantly. Fraile-Jurado (2024) documented horizontal compression as a universal feature of open-world game geographies, with traversal times from one territorial extreme to another measured in minutes rather than hours or days. Hut et al. (2019) noted that in *Breath of the Wild*, the compression of horizontal scale produces geographically impossible altitudinal gradients: ice-capped summits are visible from and accessible within minutes of tropical valleys, a configuration that violates the atmospheric physics that governs real altitudinal zonation.

Geographically, this operation formalises what Aarseth (2019) calls ludoforming, and more specifically ludo-compression: the reduction of actual, historical or fictional topographies to smaller ludic topologies, so that traversal remains viable within the temporal constraints of gameplay. Aarseth treats this compression as a general feature of game spaces derived from existing geographies. The present account draws out its geomorphological implications: horizontal distances are systematically shortened, while vertical relief is either preserved or exaggerated, producing a characteristic topographic distortion.

Compression is not a failure of ambition but a structural necessity: a game world at real-world scale would be unplayable. The geographical consequence, however, is that players develop an intuition of territorial distances that is systematically and dramatically shorter than real-world equivalents, an intuition that may, as Section 6 discusses, have consequences for geographical understanding beyond the game.

5.2 Exaggeration

Exaggeration refers to the amplification of spatial features whose dramatic visual or functional qualities serve affective intensity or gameplay legibility. Vertical relief is the most consistently exaggerated dimension: slope angles in open-world games typically exceed geomorphologically plausible values for the rock types and weathering regimes depicted

(Fraile-Jurado et al. 2025), producing cliff faces and mountain flanks that are more vertical than real equivalents. Landmarks as prominent summits, distinctive rock formations or spectacular waterfalls, are exaggerated in scale and visual impact relative to their surroundings to serve as navigational anchors and affective spectacles simultaneously.

Exaggeration interacts with compression: because horizontal distances are compressed, vertical relief must be exaggerated to preserve the impression of dramatic topography. The result is a scalar distortion that is structurally necessary given the design priorities of open-world games, but that systematically misrepresents the relationship between horizontal and vertical dimensions that is among the most geographically significant properties of real mountain, coastal and fluvial landscapes.

5.3 Decoupling

Decoupling refers to the severance of the coupling relationships between spatial subsystems that make real environments function as geographical systems. In real coastal environments, wave energy determines sediment grain size, which determines beach slope, which determines the profile of the intertidal zone, which determines where vegetation can establish, which in turn affects wave attenuation and coastal evolution. In game coastal environments, each of these variables operates independently: beach texture is applied according to aesthetic criteria, slope follows from computational convenience rather than hydrodynamics, vegetation is placed according to visual logic rather than ecological constraint (Fraile-Jurado et al. 2025).

Decoupling is the operation that produces the characteristic gap between *image territory* and *system territory* that is the central empirical finding of the research programme underlying this article. Simulated environments look like territories because their visual surface is carefully rendered; they do not function like territories because the processes that would couple their dimensions into a coherent system have been decoupled. The result is what might be called a *scenic geography*: spatially legible, aesthetically compelling, experientially rich, but ecologically and geomorphologically inert.

5.4 Filtering

Filtering refers to the selective exclusion of spatial variables that, while geographically significant, do not contribute to the design objectives of legibility, affect and functionality. Tides are filtered from coastal simulations: they are difficult to model convincingly at the visual scale of open-world games, they would complicate navigation by continuously altering the land-sea boundary, and they do not serve any major gameplay function in action-adventure titles (Fraile-Jurado et al. 2025). Social conflict is filtered from urban simulations: it would introduce unmanageable uncertainty into governance gameplay, undermine the player-authority's sense of control, and require the representation of political dynamics that most game designers and audiences prefer to avoid (Fraile-Jurado and Llovet-Ferrer 2026). Orographic precipitation is filtered from mountain simulations because it would require continuous atmospheric modelling that exceeds both technical capacity and gameplay relevance.

The political consequences of filtering are potentially the most significant of all the simplification operations, because they extend beyond the morphological and functional dimensions into the political. What gets filtered from game simulations is not neutral: the systematic exclusion of social protest, informality, environmental degradation and institutional constraint from most urban simulations, as Fraile-Jurado and Llovet-Ferrer (2026) demonstrate, amounts to an ideological filtering that naturalises specific visions of urban governance and territorial order.

5.5 Iconisation

Iconisation refers to the conversion of complex territorial configurations into sets of visually iconic and culturally recognisable forms that function as spatial signifiers. Mountain peaks become the iconic triangular profile of the Romantic summit; coastal landscapes become the iconic arc of the sandy beach with palm trees; urban space becomes the iconic grid of the modernist city. These iconic forms are not arbitrarily chosen: they draw on accumulated cultural capital – the Romantic tradition of mountain aesthetics analysed by Macfarlane (2003), the colonial imagery of tropical paradise, the modernist utopia of the rational city – that makes them immediately legible and affectively potent to players across diverse cultural backgrounds.

Iconisation is closely related to what in cultural geography has been termed the "landscape as cultural image" (Cosgrove and Daniels 1988): the process through which specific visual conventions come to stand for landscapes in general, naturalising particular ways of seeing and experiencing territory. When games reproduce these conventions, they are not merely depicting landscapes; they are reproducing the historical and ideological work that made those conventions available as spatial common sense.

5.6 Functionalisation

Functionalisation refers to the reorganisation of territorial configurations to serve specific gameplay functions – mission objectives, combat arenas, resource nodes, navigational challenges – regardless of their geographical plausibility. Mountains are placed where they are needed to provide movement obstacles or scenic backdrops for narrative sequences, not where

geology and tectonics would produce them. Rivers run where they are needed to provide natural corridors or defensive lines, not where hydrology and drainage basins would direct them. Urban districts are zoned where they maximise the spatial drama and decision-making interest of governance gameplay, not where land use history, social patterns and market dynamics would locate them.

Functionalisation is the operation that most directly expresses the priority of gameplay over geographical fidelity: the spatial environment is designed as a field of action before it is designed as a territory. Its geographical consequence is to produce simulated landscapes whose spatial logic is primarily narrative and ludic rather than ecological, geomorphological or social – and whose patterns therefore communicate implicit arguments about how space is ordered that bear no necessary relationship to how real environments are structured.

Taken together, these operations explain not only why simulated territories look and function as they do, but also why they generate specific forms of spatial learning, attachment and ideological naturalisation.

6. Spatial simulation, player experience and geographical literacy

6.1 Orientation and spatial learning

The spatial environments produced through selective realism are the environments in which a growing proportion of the global population spends significant amounts of time navigating, dwelling, and orienting. Nitsche (2008) argues that navigating three-dimensional game spaces cultivates spatial awareness and cartographic engagement comparable in some respects to navigating physical terrain. Calleja (2011) demonstrates how players develop spatial involvement – a sense of inhabiting and being oriented within a simulated environment – through sustained engagement that produces genuine spatial memory and navigational competence.

The geographical question is not whether players learn spatial skills from game environments but *which spatial knowledge* they learn, and whether that knowledge transfers in useful or misleading ways to understanding real environments. The scalar distortions documented by Fraile-Jurado (2024) (compressed horizontal distances, exaggerated vertical relief) may produce intuitions of territorial scale that diverge substantially from real-world geography. A player who has navigated the mountains of *Skyrim* for hundreds of hours has developed a highly refined sense of how to move through that specific simulated space, but may have developed geographical intuitions, about the relationship between altitude and distance, about the speed of environmental transitions, about the co-location of climatically incompatible conditions, that may be misleading if transferred uncritically to real mountain geography.

Gibson's (1979) concept of affordances – the action possibilities that environments offer to agents – is useful here. Game environments offer affordances that are calibrated to gameplay rather than to real-world physics and ecology. The affordances of climbing, swimming, or driving in a game are designed to be satisfying and meaningful within the game's action system; they are not designed to simulate the real affordances of real environments. Players who develop their spatial affordance intuitions primarily through game environments may find that those intuitions are poorly calibrated to real-world spatial problem-solving, though the extent and conditions of such transfer remain an open empirical question.

6.2 Affective attachment and digital topophilia

At the same time, the experiential richness of simulated environments generates genuine geographical investments that are not reducible to skill development. Tuan's (1974) concept of topophilia (the affective bond between people and place) applies to digital environments in modified form: players develop real emotional attachments to simulated landscapes, real spatial memories of places that do not exist, and real senses of loss when those environments are no longer accessible. Shaw and Warf (2009) describe game worlds as "worlds of affect" whose imaginative and emotional power is not diminished by their immateriality. Krzywinska et al. (2026) have extended this line of inquiry by analysing how games function as "second homes" through spatial aesthetics of coziness, demonstrating that digital environments generate place attachments that operate through dwelling rather than traversal.

The cultural geography of mountain landscapes provides a useful frame for understanding digital topophilia. Macfarlane (2003) argued that Western fascination with mountains is not a response to their physical properties but to a cultural imaginary that has been produced over centuries and that shapes how mountains are experienced before and during any direct encounter. When players develop affective attachments to simulated mountain environments, they are drawing on and reinforcing this imaginary (the sublime summit, the vertiginous cliff, the remote wilderness) in ways that reproduce its cultural logic regardless of the geomorphological incoherence of the specific simulation.

This means that the cultural geography of simulated landscapes is real and consequential even where the physical geography is fictitious or distorted. Game environments do not produce neutral geographical knowledge; they produce culturally charged territorial imaginaries that are affectively potent and whose patterns of inclusion and exclusion are, in selective realism's terms, politically significant.

6.3 Naturalisation and ideological learning

One of the most consequential implications of selective realism is what might be termed *ideological naturalisation*: the process through which the simplifications, distortions and suppressions of spatial simulation come to be experienced as self-evident features of how territory is organised. When urban space is consistently simulated as a manageable, optimisable, depoliticised system across dozens of titles played over hundreds of hours, the representation of cities as contested, unequal, politically produced spaces may become less readily available as a cognitive frame. When mountain landscapes are consistently simulated as static, visually spectacular, ecologically inert backgrounds to narrative action, the understanding of mountains as dynamic systems in which climate, geomorphology, hydrology and ecology interact over geological time risks being displaced from players' spatial imagination.

Fraile-Jurado and Llovet-Ferrer (2026) make this point explicitly in the context of urban simulations: the systematic exclusion of social protest, informality and democratic contestation from city-building games does not merely reflect a design choice but reproduces a specific urban ideology, one that aligns with neoliberal and technocratic traditions of urban governance, through repeated ludic enactment. As Bogost (2007) argues, procedural rhetoric operates through the experience of playing rather than through explicit argument; its persuasive power lies precisely in its embeddedness in action rather than discourse.

6.4 Towards critical geographical literacy

The pedagogical implication of the selective realism framework is not that video games are geographically harmful and should be avoided, but that they should be approached with the critical tools that their complexity demands. Morawski and Wolff-Seidel (2023) have argued for a reflexive model of spatial analysis in geography education that treats video games not as transparent educational resources but as objects of critical deconstruction: cultural productions whose patterns of inclusion and omission reveal the design logics, aesthetic conventions and ideological assumptions through which virtual territories are produced.

The selective realism concept provides a specific analytical framework for this critical literacy: it allows students and educators to ask systematically which dimensions of spatial simulation are represented with high fidelity (typically: visual morphology, affective atmosphere, functional navigation), which are simplified or absent (typically: dynamic processes, systemic interdependencies, socio-spatial friction), and why, what design priorities, technical constraints and cultural imaginaries govern the distribution of fidelity in a specific game. This analysis transforms the experience of game play into a form of geographical inquiry, and game environments into sites of productive critical engagement with the cultural production of spatial knowledge.

7. Conclusions

The theory of spatial simulation advanced in this article rests on three core claims. The first is that video games do not simulate territory with uniform fidelity; rather, they allocate realism unevenly across the four dimensions developed in Section 3 (morphological, functional, semantic and political). Features that enhance visual legibility, affective intensity and gameplay operability tend to be privileged, while dynamic processes, systemic interdependencies and socio-spatial friction are simplified or suppressed. This is the pattern that selective realism, in the territorial sense developed here, is designed to name. The term does not function as a synonym for simplification in general; instead, it designates the specific structural logic through which fidelity is redistributed rather than uniformly reduced. What emerges, therefore, is not a series of isolated design shortcomings, but a structural logic of digital spatial simulation that recurs across landscape types, genres and development traditions. Second, this uneven distribution is implemented through a recurrent repertoire of design operations (compression, exaggeration, decoupling, filtering, iconisation and functionalisation) whose interactions produce recognisable patterns across contemporary game cultures.

Third, the territories produced through this logic are not merely simplified versions of reality, but spatial systems with significant epistemological, affective and ideological consequences. The spatial habits, attachments and territorial imaginaries that players develop through sustained engagement with selectively realist environments are real in their effects, even where the environments themselves are fictitious or heavily distorted. Particularly important is the risk of ideological naturalisation: the process through which the omissions and simplifications of spatial simulation come to appear as self-evident features of territory itself. This is especially consequential where game spaces diverge most sharply from geographical reality by rendering dynamic, contested and ecologically complex environments as stable, manageable and largely frictionless systems.

The purpose of this theory is not to measure games against an impossible standard of total realism, nor to suggest that greater realism is always preferable. Its aim is rather to explain how realism is selectively allocated within simulated environments: according to what priorities, through which operations, and with what geographical consequences. Selective realism thus offers more than a vocabulary for describing game spaces; it provides a framework for understanding how virtual territories are produced

as operational worlds. The framework's most distinctive contribution resides in the morphological and functional dimensions, that is, in the fidelity of physical process (illustrated here through coastal, glacial and fluvial systems). In the political and semantic registers, by contrast, its analytical content necessarily overlaps with an already substantial tradition of ideological and cultural critique in game studies and cultural geography. It is in accounting for the selective simulation of physical process that this framework fills a gap that game studies has not yet addressed.

This framework opens several directions for future research. The most immediately promising is a more systematic empirical treatment of physical process fidelity itself. This would involve extending the comparative approach applied here to coastal, glacial and fluvial systems toward other geomorphological and ecological processes, such as orographic precipitation, ecological succession and periglacial dynamics, which this article has only been able to illustrate rather than document exhaustively. Comparative work across genres, including open worlds, city-builders, strategy games and planetary simulators, could also assess how the operations of selective realism vary according to different design traditions and technical regimes. The framework has clear limitations. It has been developed primarily through analysis of open-world, coastal and urban simulation environments, and its applicability to other genres – including abstract strategy, puzzle, rhythm, or narrative-driven games where territory plays a less operational role – remains to be tested. Its claims about player cognition and ideological naturalisation are theoretically grounded but empirically provisional, awaiting systematic study of how spatial knowledge formed in game environments transfers to and interacts with other sources of geographical understanding. These limitations notwithstanding, the theory proposed here is an invitation to take video games seriously as one of the central infrastructures of spatial experience in the twenty-first century. If growing numbers of people learn to navigate, imagine and emotionally inhabit territory through simulated environments, then understanding how those environments distribute fidelity, organise visibility and suppress complexity is central to any critical account of how spatial knowledge and environmental imagination are being formed today.

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