Spaces of Allegory. Non-Euclidean Spatiality as a Ludo-Poetic Device

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ABSTRACT
Studies of digital game spaces have established a solid understanding of the general dissimilarity of game spaces and space in reality, discussing e.g. the particular cardinalities of motion and agency, the significance of projection methods, and the possibility of movement among non-linear paths. This paper applies these theories to a particular phenomenon, the manipulation and defamiliarization of spaces, which has become a rather widespread feature of digital games in recent years. Drawing on post-phenomenology and developmental psychology, the paper argues that games with non-Euclidean spatiality challenge real-life epistemologies of space that are acquired early in life. The paper demonstrates the creative use of this form of defamiliarization in two examples, *Superliminal* and *The Witness*, which turn it into allegories of dreams, agency, and authorship.

Keywords
Defamiliarization, aesthetics, cognitive mapping, multistability, phenomenology, Superliminal, The Witness, authorship

INTRODUCTION
Digital games allow players to experience space in unique ways. Spatiality has therefore been identified as one of the most important topics in the field in a number of early, influential studies. For Janet Murray (1998), spatiality is one of the four distinctive properties of virtual environments, while to Espen Aarseth, spatiality is even the "raison d'être of computer games" (Aarseth 2001). It is therefore not surprising that an impressive body of research has produced typologies (Günzel 2008; Nitsche 2008) and ontologies (Fernández-Vara, Zagal, and Mateas 2007) of virtual environments and dealt with their aesthetics, from their dependency on non-diegetic information (Švelch 2008, 214) to their potential for indexical storytelling (Fernández-Vara 2011), as well as their general (Martin 2011) and particular (Rauscher 2018) metaphoric and expressive potentials.

The perception and experience of space is important for ontological and aesthetic approaches, yet some research has put particular emphasis on the player's physical and psychological relation to virtual environments. Questions of embodiment and immersion of individuals (Taylor 2003) as well as collectives of players (Babic 2007) appear as particularly pertinent, because our experience of virtual environments differs both from that of reality and from traditional depictions of space. A player of digital games "experiences a phenomenon that cannot be experienced in traditional imaginative space, namely the experience of motion as navigation. […] Thus, while movies are characterized by the fact that they present artificial motion, computer games are characterized by the fact that they present artificial navigation" (Günzel 2008, 172).

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This results in a challenge that is at the heart of all studies of virtual environments. They are characterized by "fundamental differences" (Nitsche 2008, 3) from what we encounter in reality. They are not spaces but a representation of space that is not in itself spatial, but symbolic and rule-based, or, in other words, "allegories of space", "a three-dimensional scheme carefully designed to offer a balanced challenge to the player" (Aarseth 2001, 168). Yet despite these essential differences, players cannot but approach them based on their perceived similarities to reality. Games do not reinvent patterns of spatial use but reuse, reapply and restructure basic patterns that occur in reality. The fundamental situations of play correlate with familiar spatial configurations, because any environment is experienced based on what we *do* in it (McGregor 2007). The empirical observation that architectural theory and real-world facilitation of navigation translate well to virtual environments (Totten 2014) is theoretically founded in the "shared fundamental experience of the way our knowledge of space develops both inside and outside of the video game" (Fraser 2011).

In many cases, the question of how exactly this transfer of knowledge from the real to the virtual works remains in the background, as games strive to make the transition effortless. It comes, however, into immediate focus when dealing with virtual environments that depart from the parameters of reality in fundamental ways. The most well-known and well-researched of these departures is the use of portals, warps, or wormholes (Gazzard 2009; Leirfall 2013), i.e. means of traversing space that have been theorized as well as depicted in fiction, yet have no equivalent in reality. Such movement disrupts the sequential fluidity of paths, temporarily takes navigational control from the player, and calls into question the coherence of time, space, and causality (Gazzard 2009, 2). *Portal* (Valve 2007), the prototypical example for these games, makes such motion beyond verisimilitude its central game principle, and accordingly follows static and predictable rules, derived quite faithfully from real-world physics. While the navigation of *Portal* is dissimilar to what we experience in reality, its spaces only change in ways that are compatible with our experience of spaces in reality, and generally do so in plain sight and with the cause of their reconfigurations (pistons, tracks, rails) exposed.

Movement in *Portal* is a prime example for an experience of space in digital environments that is neither characterized by (inherent or accidental) fundamental differences or similarities between real and virtual spaces, but on a deliberate defamiliarization (Pötzsch 2017) of their relationship. Some spaces of digital games confront players with spaces that are cognitively different from spaces encountered in real life and appear featureless, unstable, or impermanent. In doing so, they add to the a defamiliarization of movement produced by portaling a defamiliarization of space itself, in what is often identified as non-Euclidean spatiality.

Euclidean spatial logic postulates the fundamentals of geometry, and with them the idea that space is a neutral, static container within which things happen. While in mathematics, non-Euclidean mostly means that the assumption of flat spaces in the original axioms is confronted with the complications produced by curved surfaces, the idea of non-Euclidean virtual spaces aims at a more tangible deviation from the laws of geometry (Hartshorne 2000). Digital games generally present us rather with projections of spaces than with spaces themselves (Arsenault and Larochelle 2014). This allows them to segment and distribute game spaces to address technical limitations and optimize performance, by e.g. making distant rooms appear connected and teleporting the avatar without the player ever noticing. Games with non-Euclidean spatial aesthetics use the same techniques, yet instead of hiding them to make the game space appear more similar to reality than it actually is, they do the opposite and use them to create distinctly unreal game spaces. These spaces produce a very particular, primordial form of cognitive challenge. They are ontologically different, yet in a way

that is not immediately apparent and which undermines players' ability to use fundamental spatial epistemologies they acquire already as infants. What we encounter in these game environments goes therefore beyond disorientation or even cognitive dissonance.[1] It is a throwback to a stage in child development before the attainment of object permanence.

A number of digital games have recently made such spatiality a central feature, either as the source of puzzle challenges – e.g. *Antichamber* (Demruth 2013) – or existential horror – e.g. *P.T.* (7780s Studios [Kojima Productions] 2014) or *Layers of Fear* (Bloober Team 2016).[2] In this paper, however, the focus will be on two indie-games that emphasize aesthetics beyond confusion and fear by treating non-Euclidean spaces as allegories for abstract themes. *The Witness* (Thekla Inc. 2016) uses defamiliarized space as a part of its discourse on authorship, and *Superliminal* (Pillow Castle 2019) as a part of its simulation of dreams. They are existential games (Möring 2013, 294) that concretize a shared metaphor – that things change when seen from a different perspective – into mechanics and representation. Where Aarseth famously stressed that the spaces of digital games are merely allegories of space (Aarseth 2001), the space in these two games are allegories of authorial power.

In the following, I will outline pertinent game studies concepts, particularly uncertainty and agency, before going into more detail with spatial epistemology, showing that there are recurring challenges posed by spatial multistability, as well as universal strategies humans develop early in life to cope with these. I will then turn to the examples to discuss how they undermine said strategies and how this is used to create ludo-aesthetic allegories of otherwise intangible concepts.

SPATIAL EPISTEMOLOGY AND ONTOLOGICAL MULTISTABILITY

The experience of space in digital worlds, just like that of time, is never isomorphic with reality. To this day, it is characterized by great conventionalization and compromise, even in VR. Virtual spaces are abstracted and, in Aarseth's term, allegorical representations of real-life architecture, movement, and social behaviour. The sense of spatial presence they evoke "is best understood as the sense of being physically located in a virtual environment […] or interacting with virtual objects as though they have actual, physical properties" (Tamborini and Bowman 2010, 88). In other words, a virtual space is a combination of the generality of fundamental spatial articulations (figure-ground, solid-void) and the expressive, communicative specificity of a fleshed-out virtual environment (Totten 2014, 104–12). The former organizes and channels gameplay, while the latter creates meaning and atmosphere, effectively turning a space into a place: "A world with a properly defined sense of place is a world that players can learn to use" (Totten 2014, 323). These two articulations of space are epistemologically different: the first we approach in the Euclidian tradition as an absolute, as a container, as "arrangements of bodies, a geometry of things in themselves" (Babic 2007, 2). The details of an environment are, on the other hand, processed as a relational space as described by Lefebvre, in which space does not exist a priori, "*but only through the context given by the relations and interactions of the actors and objects within*" (Babic 2007, 2, emphasis in the original).

The most immediate confrontation with, and thus foregrounding of, space in digital games results from perceiving it as an obstacle or even opponent. This dimension of game spatiality, challenge spaces, are the first of six patterns of spatial use in digital environments identified by McGregor, and with example genres ranging from platformers to adventures and action games, they are unquestionably ubiquitous: "Problems of navigation and environmental obstacles, whether they require a simulated physical response by the player's avatar or an intellectual solution, are configurations of challenge space" (McGregor 2007, 540). Non-Euclidean game spaces present

challenges that amplify those in other games by making them unstable. The uncertainties they thus introduce correspond four of the 11 types of uncertainty in games identified by Costikyan (2013). *Analytic complexity* manifests (which is true for most challenge spaces) in the need to approach spaces as puzzles, in that multiple elements need to be evaluated both individually and in their relation toward each other to arrive at a single, non-obvious combination. Somewhat rarer for challenge spaces is *hidden information*, which to Costikyan in a spatial sense is most commonly achieved through fog-of-war. Navigating such environments is to him an "exploration – but of the parameters of the system rather than of physical space" (Costikyan 2013, 93). What sets the non-Euclidean game spaces apart from traditional uses of fog-of-war is that the player's exploration does not change the presentation of the world. Arriving at an understanding of how to navigate specific passages is traditionally paralleled with rendering this epistemological process palpable in a map or the world itself, which happens in neither of the examples discussed below. Through this, the games add an element of *uncertainty of perception*, "the difficulty of perceiving what's going on in the game space" (Costikyan 2013, 101). And even where things can be perceived in an unobfuscated way, many game elements are characterized by *semiotic contingency*, forcing the player to perform considerable hermeneutic work to interpret the ambiguity of signs. So while in most games, "[m]ultiple paths, open landscapes and convoluted layouts require the player to negotiate and remember spatial configurations" (McGregor 2007, 540), non-Euclidean game spaces complicate and even resist these basic problem-solving strategies.

In fact, even basic navigation is complicated in non-Euclidean game spaces. *Antichamber*, the possibly most well-known example, not only withholds clear environmental markers that would allow for orientation, but additionally imbues otherwise irrelevant parameters with meaning, like when a threshold can be crossed only while walking backwards. This clash of diminished information and additional significance makes these spaces hard to "read", in the sense that "players need accurate information about their state in the game and will make choices based on that information" (Sicart 2013, 87). This feedback loop of receiving (often quite basic) updates about the game state and acting upon it was influentially identified by Janet Murray as the source of agency in virtual environments, "the satisfying power to take meaningful action and see the results of our decisions and choices" (Murray 1998, 126). Game designer Paolo Pedercini has suggested that the lowest level and, at the same time, the precondition of any deeper feeling of agency is control of purposeful movement: "As long as the players feel in control of movements in space, even the most linear narrative and the most constrained level design will provide enough agency. In a way, that's what we've come to expect from mainstream games" (Pedercini in Sicart 2013, 104). Consequentially, the withholding or disturbing of agency has been identified as a powerful aesthetic strategy in digital games (Habel and Kooyman 2013; Wilson 2003), but the cognitive disenfranchisement of non-Euclidean game spaces resembles less the "the human pleasures of lack of agency, of being controlled, of being *acted upon*" (Giddings and Kennedy 2008, 30) than a withholding of the basic means humans rely on in their spatial epistemology.

In one of the few dedicated studies of the epistemology of space in digital games, Fraser posits that "the epistemological mode of video games is the epistemological mode of reality" (Fraser 2011, 95). Fraser argues for an understanding of spatial epistemology in digital game environments as a form of *mētis* – the Ancient Greek concept of embodied, tacit knowledge of practices that are only learned through experience, not study. Fraser goes so far as to declare "there is the shared fundamental experience of the way our knowledge of space develops both inside and outside of the video game. […] the method through which we form knowledge of video game space is in fact the

very method through which we form knowledge of 'real world' urban spaces" (Fraser 2011, 102–3).

Where Fraser foregrounds the similarities between our epistemologies of real and virtual spaces, Liboriussen suggests that phenomenologically, the non-real character of virtual images is never lost on us, so that the landscapes of games are experienced simultaneously as environments and images (Liboriussen 2008). He draws on Piaget to distinguish between three phenomenologically distinct levels of spatiality: On the most basic level, termed topological space, an environment is perceived; if perception alone is insufficient, perception is augmented with imagination in a projective space that creates an idea of a place; on a yet higher level of abstraction, the metric space of a landscape is created purely through (in Piaget's terms) imagination or (Liboriussen's conceptual update) cognitive mapping (Liboriussen 2008, 152). Liboriussen thus draws an important connection between the mental processes involved in navigating real-world space and virtual ones. Even though the understanding of cognitive mapping still poses a significant challenge to science – neurological observations of the relevant brain areas can only be conducted in the immobility of an MRI, limiting the experimental possibilities significantly (Epstein et al. 2017) – it appears that we resort to the same cognitive processes in all acts of navigation.

This position is supported by postphenomenological theory. Being able to process the spaces of digital games in analogy to those of reality explains how "my sense of embodiment can become distributed across both sides of the glass" (Keogh 2018, 4–5) to form an "amalgam embodiment in and as a part of the videogame performance" (Keogh 2018, 28). Embodiment in a gameworld, particularly from the first-person perspective found in both examples to be discussed in the next chapter, "might be called 'whole body activity.' This is to say that we humans are multidimensioned perceptually; that kinesthetic-sensory actions are primary and implied in all our activities; and that this is the basis for what we take to be our opening or relation to any 'real' environment" (Ihde 2012, 134). For postphenomenologist Don Ihde, "perceptual isomorphism" (Ihde 2012, 136) is the key to successful simulation environments in e.g. flight simulators. Ihde suggests that we switch our attention involuntarily back and forth between the virtual and the real embodiment in a quite classical form of bistability. The non-Euclidean spaces of the two examples, though, defamiliarize this well-established ability to see the same things differently thoroughly.

The following analysis of two examples will demonstrate just how much they undermine a Euclidean conception of space as a stable, static, inert container within which things happen, a non-entity easily abstracted from our higher cognitive processes. In theoretical terms, this is the result of an unusual degree and extent of multistability that affects the way players perceive, process, and navigate environments. Normally, players 'read' the environment for directional and behavioral clues, in which the aesthetic dimension of elements often is what makes positions and paths memorable, and where different types of environmental (Jenkins 2006) or indexical (Fernández-Vara 2011) storytelling convey information that can illuminate simultaneously a fictional as well as the factual past of a gameworld and give the player valuable strategic clues. Both strategies are more closely related to aesthetic multistabilities than to the functional ones Ihde focuses on. Cognitive science indicates that both visual and semantic ambiguity are resolved through oscillation of focus (Yevin 2006, 79). In the arts and literature, ambiguity stems from diverging – often even opposing – meanings that are produced by the same sign configuration, yet "according to the common law of perception of ambiguous patterns, an oscillation of our attention takes place, and we see in turn either the actor or his role" (Yevin 2006, 81). The visual and semantic multistability of traditional aesthetics is therefore one of perceiving a static object in different, objectively co-present and therefore equally

legitimate ways. In the bistability of alternating incorporation in the real and virtual body, both the player's body and the configuration of their relationship to the virtual world are generally static and reliable.

This 'traditional', cognitive multistability is at the heart of navigating game spaces, particularly the often pronouncedly vertical land- and cityscapes of open-world games (Bonner 2015). However, Non-Euclidean spaces in digital games exhibit additional spatial multistability: in them, navigational paths are not isomorphic with the perceived environment, and the objects change when interacted with or even just looked at. The result of this combination of featurelessness and constant change is a form of multistability that differs fundamentally from the visual and semantic forms, which rely on the perception of a static object in different, equally meaningful ways. The profoundly unsettling effect of these environments results from an ambiguity that cannot be resolved with familiar methods because the multistability of the object is ontological.

Differently put, the objects encountered in non-Euclidean game spaces lack permanence, and thus subvert one of the first principles humans rely on in their "striving to preserve order and coherence in the world" (Moore and Meltzoff 1999, 641). Object permanence is generally assumed to be acquired by humans in their second year of life,[3] at which point infants begin to "parse multiple appearances as manifestations of a single underlying individual […] Both classifying groups of entities and tracing the identity of individuals over time and space are effective in isolating invariants and reducing apparent multiplicity" (Moore and Meltzoff 1999, 641). The cognitive processes of parsing the world for variants and invariants are so complex that they lay the groundwork for many advanced cognitive processes we only learn much later: "Infants do not at first understand that material objects, qua objects, are permanent, but rather discover that certain transformations are ones that preserve permanence" (Moore and Meltzoff 1999, 642). Among the connected cognitive developments are an understanding of cause and effect as well as of the agency of others (Piaget 2013, 378). As I will show in the following, these basic cognitive constants are impaired by non-Euclidean game spaces.

AESTHETIC STRATEGIES OF THE EXAMPLE GAMES

Superliminal is strongly meta-referential and makes explicit references to similar games such as *Portal* and *The Stanley Parable* (Galactic Café 2013). In *Superliminal*, objects can be manipulated in size through turning 'real' perspective into 'forced' perspective. The tutorial for this mechanic consists of an oversized chess-piece blocking the way through a narrow hallway. Players learn that it is possible to pick up the piece and manipulate its size by moving it closer or farther away from the viewer. In other games, when the object's hitbox gets pushed into that of a wall, it would appear to move closer to the avatar because, emulating the laws of perspective, its perceived size would change. *Superliminal* instead keeps the perceived size of the object static when moving closer to the avatar, meaning that when the chess-piece is dropped, it has shrunk from a height of over a meter to mere centimetres. This first core game mechanic is then used to shrink and enlarge boxes and other objects, thus removing obstacles or creating navigable platforms. The second core mechanic is one in which trompe-l'oeil graphics become objects when viewed from the perfect angle, or the other way around, when objects turn into forced-perspective graphics on the floors and walls once the player moves past a certain threshold.

Figure 1: The table-and-cube trompe-l'oeil in *Superliminal.*

One exemplary transformation that foregrounds the centrality of perspective happens early on in the level "Optical". At the end of a corridor is a step too high for the player to climb. Through a doorway to the right there is a room with a black-and-white painting in the far corner, appearing as a heavily distorted checkered cube with a missing piece in the bottom-right. Even when finding the perfect angle from which the distortion disappears, the cube does not transform into a solid object like objects encountered before. It first needs to be completed with the missing piece, which is accomplished by discovering a second trompe-l'oeil arrangement in the room, to be perceived from a completely different angle, which creates a table with a black-and-white vase on it to complete the cube (see Figure 1).

Once the vase is properly aligned, the cube turns from painting to solid object and can be picked up. It holds another surprise, though, which becomes apparent as soon as the object is moved: it is not a solid cube like the objects encountered prior. The three sides with the checker-pattern facing the player before are the bottom and two sides of an open staircase that the player needs to place and scale with the first core game mechanic to adapt it to a number of different spatial configurations encountered in the next rooms (see Figure 2). This single entity requires the player to identify it as belonging to the class of objects that can be 'summoned' out of trompe-l'oeil paintings and finding the right viewing angle both for this painting as well as a second one, before then reminding the player that a single vantage-point perspective is always limiting and will easily lead them to draw the wrong conclusion, namely that an object with three visible cube-faces is a solid cube.

Figure 2: The *Superliminal* cube revealed as an open staircase.

That all of these uncommon manipulations of perspective and objecthood are allegorical of dreams and their unstable spatial logic is made clear from the very beginning of the game. In a thinly veiled allusion to *Portal*'s narrative about an inhuman series of test chambers, *Superliminal*'s setup is that the player is a participant in a sleep laboratory's experiment into lucid dreaming as a therapy. Just like *The Stanley Parable*, *Superliminal* employs a voice-over-narrator (albeit with an intradiegetic rationale, i.e. the supervising doctor's voice that permeates into the sleeper's dream-state). Like both these precursors, *Superliminal* is self-ironic and self-aware, as well as an exploration of authorship in digital games. Where *Portal* spells out plainly the situation encountered in every game – its obstacles are designed to challenge the player with seemingly insurmountable tasks – and *The Stanley Parable* further concretizes the analogy – inasmuch as it openly references the game designer's struggle to design a carefully calibrated experience for unruly, unpredictable players –, *Superliminal* affirms the value of immersing oneself into the surreal dream-sphere of digital games. Near the end of the game, the narratorial voice of the Dr. Pierce (whose name appears as a pun on his voice piercing through the dream-sphere) solemnly states: "In a few minutes, you'll be back in the real world, and some part of you will say that none of this was real: But – just like the power of perspective itself – it will have been as real as you believed it to be." Just like the painting-objects encountered in the game, the game itself is multi-stable: depending on the perspective, it is 'only a game' or a profound aesthetic experience. In a traditional hermeneutic circle, the immediate paratext of *Superliminal*'s title screen shows how conscious the allusion to multistability. The title of the game appears in a particular logotype where the letters I, M, and I in the middle are formed by a black lower-case M on a white square. This play with ground and figure is a typical bistable image where we can see either two letters I or one letter M, never both, yet are able to process the word as a whole nonetheless.[4]

The second example, *The Witness,* is the brainchild of Jonathan Blow, and like his previous game, *Braid*, it puts a number of core game mechanics through near-exhaustive iterations. While *Braid* is focused on time, *The Witness* is preoccupied with space. The central interaction pattern of the puzzles is the drawing of lines on small square screens following different logics. Initially, many of the screens are (multicursal) mazes through which the player needs to navigate a cursor (see Figure 3, far right). This basic principle quickly undergoes many variations, shifting from pathfinding through labyrinths to

demarcating regions, or drawing specific shapes. The significance of solving puzzles also varies; while most simply unlock progress to the next puzzle, a door, and eventually a key of sorts that grants access to the final challenges, some puzzles create paths for the player to walk on, i.e. they transform the gameworld itself (see Figure 3, background).

Figure 3: An intradiegetic puzzle interface in *The Witness* (far right) and its manifestation in the gameworld (background center)

In an extension of this logic, the game does not contain its puzzles to intradiegetic interfaces. Gameworld elements such as the shadows of branches on screens are integrated into challenges and their solutions, as are the surfaces of the intradiegetic interfaces. In one section of the game, the player needs to view screens from a particular angle that shows the wear and tear previous users have caused to the surfaces, and reiterate their movements.[5] Consequently, some puzzles are hidden in the environment itself: when viewed from specific vantage points, elements of the world will form paths akin to the ones found on the puzzle screens distributed throughout the gameworld (see Figure 4). In these moments, the world itself becomes clearly apparent as a part of the interface, adding a new facet to what Kristine Jørgensen (2013) calls the gameworld interface. While Jørgensen stresses the similarity between the avatar's movement through a gameworld to the control of a mouse pointer in a windows-style user-interface, *The Witness* destabilizes the distinction between the gameworld as explorable space and its rendering on a screen that forms shapes through perspectival projection. Several of McGregor's patterns of spatial use in games collapse here: the finding of these vantage points takes place in a three-dimensional challenge space, from where the gameworld appears simultaneously as a codified space – the elements of the environment come together to form additional, symbolic meaning in the shape of an interactable shape –, a backdrop – the shape formed by the environment can be interacted with like the flat surfaces of other intradiegetic user interfaces – and a creation space – the player draws on this 'surface'. These three rivaling perceptions of space only occur after taking a particular position in the gameworld and thus attaining a specific perspective on it. The multistability encountered in these moments is a product of an often conscious act of player agency, similar to the one in *Superliminal.*

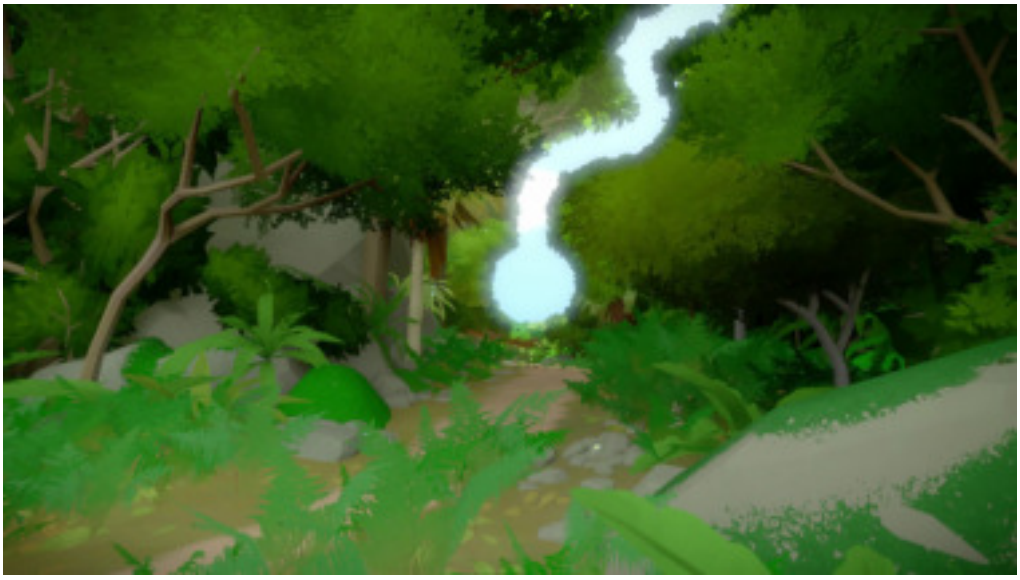

Figure 4: One of *The Witness*'s environmental puzzles.

All types of puzzles are combined in a section entitled 'The Keep', a tower surrounded by hedge mazes and derelict courtyards, and it is here that *The Witness*'s particular approach to multistability and cognitive mapping becomes fully tangible. When crossing the labyrinth initially, the player has to understand that there are additional conceptual walls to the (virtually) physically present ones. The gameworld communicates these invisible barriers as physical in a certain sense, e.g. by altering the sound of the avatar's footsteps to signify that they are stepping on a different surface. Upon repetition, the player understands that this sound acts as an aural signifier for a prohibited path. If we were to frame this in terms of multistability – the changed footstep sounds are perceived initially as incidental or atmospheric, before the player understands that they are actually symbolic; the multistability encountered here is therefore not one of the interpretative outcome, but of interpretative method – it would be a multi-sensorial kind in which the visual, the sonic, and the haptic feedback provided by the gameworld (the latter in the form of hit-boxes of shrubbery impeding the avatar's motion) are added when creating the cognitive map of the environment (see Figure 5).

Figure 5: *The Witness*'s meta-puzzle in the "Keep" region.

After traversing the four 'physical' labyrinths, the player has to solve a panel-based puzzle at the top of the tower overlooking these labyrinths. The grid of the panel needs to reflect the paths taken, yet omits any walls that would help orientation, thus reversing the spatial logic of labyrinths. The player needs to remap the paths walked previously to a two-dimensional grid, rotating them from the non-uniform directions of the 'physical' space to the uniformity of the common grid, with the added difficulty of simultaneously conforming to the puzzle-modifiers omnipresent in *The Witness*. What *The Witness* makes us perform is the creation of a cognitive map from a space with missing or ambiguous signifiers of shapes and limitations, which then needs to be externalized as a shape in its own right, conforming to a logic and aesthetic of pure two-dimensionality. In addition to this 'main quest' challenge necessary for progressing through the game, the player can also solve one of the aforementioned environmental puzzles (see the dotted white lines in Figure 5). This particular one is one of the most easily perceived, most convoluted, and yet easiest to solve specimens of this type of puzzle in the game, suggesting that the co-presence of many simultaneous labyrinths in the same space is meant to be noticed. Put more abstractly, the game asks a fundamental question of countless game spaces: "For what constitutes labyrinthicity? If a 2D drawing or a painted or tiled floor can be a proper labyrinth (and they can, since labyrinths do not come with specific height requirements) then a 3D virtual labyrinth in a computer-simulated world is a real labyrinth, since it can be navigated by the same rules as the one at Hampton Court" (Aarseth 2007, 41). It is the ludic equivalent of concrete poetry, drawing the player's attention to the conceptual linearity and geometric purity of puzzle-solving, just like visual poems highlight the graphical dimension of typography through defamiliarization of letters and words.

In the game's 'hidden ending', a section of the gameworld unlocked after finishing the puzzles that form its equivalent of a main quest, players find a live-action video recording from the first-person perspective of 'the game designer'. The relationship of this video to the rest of the game is too complex to adequately represent here, but some details are particularly relevant for this analysis. The opening of the video seems to show the game designer waking up from a long sleep, suggesting that what came before – our playthrough of the game – has been their dream. In this fashion, the theme of dreams is retroactively introduced into *The Witness*, likening digital games to dream-states in a similar way as *Superliminal*, yet with the key difference that here, it is not the player or their avatar who is the dreamer, but the game designer. We are being dreamt, so to speak, and the perspectives that we take are those of the game designer. It is here that the title of the game makes ironic and double sense: playing the game, we witness the designer's vision, just like the fictional coda makes the designer the witness of our actions in solving their puzzle – one more aesthetic bistability. Regardless of whether we accept a strict proceduralist interpretation that reduces the player to a function in the designer's plan for expressive algorithms or, conversely, see it "more in terms of bodily habituation than a more object-oriented formulation" (Wright 2019, 16), the framing is nonetheless an important statement about authorial intent. As if to hammer home this point, the first-person video of 'the game designer' suggests that we are, in yet another bistable moment, witnessing the perception of a metafictional character – we understand that we were not literally, but metaphorically, part of someone's dream, and that we are not really looking through someone's eyes, but are seeing footage from a mini-camera on someone's forehead – who might very well have been played by Jonathan Blow himself. To return to the textbook-example of aesthetic bistability, "we see in turn either the actor or his role" (Yevin 2006, 81), yet in this particular case of ludic autofiction, we in both cases see Jonathan Blow.

CONCLUSION

In most cases, the spatiality of digital games adheres to illusionistic projections of Euclidean space (Arsenault and Larochelle 2014). The basic hypothesis of this study is

that whenever games deviate from these traditions, they undermine our spatial epistemology, which results in a deeply unsettling effect beyond cognitive dissonance: the perpetual change of environments and/or objects precludes cognitive mapping, yet not simply as a temporary hindrance, but as a fundamental undermining of one of our developmentally first and most important cognitive achievements, object permanence.

Differently put: when game spaces deprive their players of the ability to navigate them reliably and repeatedly based on abstract rules, they not only undermine this particular part of the game – the spatial navigation – but impede players' ability for reasoning. As briefly discussed, *Antichamber*, the prototypical non-Euclidean game, suggests to its players not only that pre-formed behavioural patterns may not be applicable, but that the methods by which we have formed them as children (and which are the basis for all our rational thought) may no longer hold. By shaking our existential confidence that objects stay the same and in the same location when we do not watch them, non-Euclidean games simultaneously undermine and underscore our reliance on object permanence. In stripping us of our ability to trust in object permanence, these games do more than defamiliarize and make playful the navigation of game spaces. They throw us back cognitively to an overcome stage in child development and rob us of some of our most essential, most fundamental, and most relied-upon means of dealing with the world, thus fundamentally undermining our ability to rely on experience and knowledge in overcoming the ludic challenge. We are thus often left with trial and error, the preceding phase in child development, and later on forced to do non-Euclidean cognitive mapping. These game spaces thus throw us back into a childlike state and, from there, force us to transcend our established navigational faculties for a heightened sense of accomplishment.

The two examples discussed centrally in this paper use the same practices of defamiliarization to a different effect. The environmental puzzles of *The Witness* are obviously very similar to the ones in *Superliminal* in that they depend on finding the right position in the gameworld and the correct viewing angle. Where *Superliminal* emphasizes the viewer and the subjective dimension of perspective – seeing things from a different angle makes them appear (or, in this case, be) as something different – *The Witness* suggests a different understanding, one already hinted at in its title.

The games force the player to not only accept, but to creatively deal with the multistability of the virtual environment, giving them agency over aspects things that are unusual in digital games and impossible in reality. This empowerment is counteracted, though, with the disorientation that results from the instability of objects and places in the gameworlds. The game environments are constantly changing, yet not in ways that primarily inhibit navigation (as is the case in *Antichamber*), but in more abstract, categorical terms. Unstable and barren game environments impair our ability to navigate them because they withhold the clues we have learned to rely on early in life after attaining object permanence, and *Superliminal* and *The Witness* transpose this concrete loss of object permanence to a more metaphysical or meta-medial one. They destabilize the relationship between gameworlds and their projections into two-dimensional screen space, thus undermining not as much our real-life object permanence – the confidence to know which object is the same – but our game-specific object permanence, i.e. our ability to distinguish different instances of the same template of virtual object from one another. In *Superliminal*, this is concretely manifest in the many exchanges of projections of objects into tangible objects and vice versa, whereas in *The Witness*, it is expressed primarily in the multistability of environments that are elements of different puzzles in different regards.

Both games force the player into a position of existential insecurity by defamiliarizing space in a fundamental way, yet without evoking the disorientation or horror of

Antichamber or *P.T.* Instead of instilling dread and disorientation in the player, they make their spaces allegorical. *Superliminal* fashions them into a reflection on how perspective can become tangible by going through the motions of actual shifts in perspective that change not only the view of the world, but manifestly its character. Here, the perspective shift becomes an allegory suggesting empowerment, because the perspective shifts are central and powerful means of the player's exertion of agency. *The Witness* takes the same situation and complicates it even further. Where *Superliminal* puts the player in the perspective of the dreamer, *The Witness* makes them the subject of someone else's, the game designer's, dream. As such, the agency felt in both games – as a result of impactfully shifting perspective – is retroactively turned into a calculated, manipulated performance in the service of the designer. In terms of formal analysis, there is no difference between the relationship of player perspectivization and authorial power: in both cases, puzzles need to be solved by consciously (or accidentally) finding the right, i.e. authorially planned, perspective. The discourses of both games about this act of taking a particular perspective are, however, diametrically opposed – one is about the player/interpreter's freedom, the other about authorial power. Making sense of a dreamlike environment by taking a subjective, highly particular perspective is an act of liberation in *Superliminal* and a negotiation of authorial power in *The Witness.* Yet in both cases, the use of non-Euclidean environments is more poetological than functional. As such, non-Euclidean game spaces are as powerful as they are flexible in their aesthetic potential, serving both as a device of sublime horror and an invitation to poetological reflection.

ENDNOTES

[1] At first glance, this could be considered a textbook example of Festinger's definition of cognitive dissonance as the "holding of two or more inconsistent cognitions, […] which is experienced as uncomfortable tension" (Festinger in Cooper 2007, 7): we know that the door our virtual self just stepped through should not lead to where it does, yet we cannot deny that it empirically does. I will argue, however, that the phenomenon at work here is more specific.

[2] I discuss these games and their strategies in a forthcoming paper (Backe 2020), which serves as a companion piece to the theories and analyses presented here.

[3] There is some debate about the average age and the mode of attaining object permanence. Given the inevitable methodological challenges (Krøjgaard 1998) of the topic, "[i]nfant object permanence is still an enigma after four decades of research" (Moore and Meltzoff 1999, 623).

[4] An additional, even subtler hint at the game's aesthetics of not-quite-ness is the design of its menu: Both font and position are identical to that of *The Stanley Parable*, suggesting not only an aesthetic relation, but a technical one, i.e. the use of Valve's *Source* engine. However, the end-credits reveal that *Superliminal* was developed in Unity. The knowledgeable, observant player the game addresses might very well have picked up on the title design and drawn conclusions about *Superliminal* based on the apparently used game engine, so that the reveal of the actually used technology is a final, subtle nudge into a different perspective.

[5] For a more in-depth analysis of the different puzzle types, see Wright 2019.

BIBLIOGRAPHY

7780s Studios [Kojima Productions] 2014. *P.T.* PS4 Game. Konami.

Aarseth, Espen J. 2001. "Allegories of Space." In *Cybertext Yearbook 2000*, edited by Markku Eskelinen and Raine Koskimaa. Jyväskylä: Jyväskylän yliopisto, 152-171.

Aarseth, Espen J. 2007. “Doors and Perception: Fiction Vs Simulation in Games.” Intermédialités (9): 35–44. http://www.escritasmutantes.com/fileManager/file/fiction_Aarseth_jan2006.pdf. Accessed April 01, 2012.

Arsenault, D. and Larochelle, A. 2014. “From Euclidean Space to Albertian Gaze: Traditions of Visual Representation in Games Beyond the Surface.” *Proceedings of the 2013 DiGRA International Conference: DeFragging Game Studies.* http://www.digra.org/digital-library/publications/from-euclidean-space-to-albertian-gaze-traditions-of-visual-representation-in-games-beyond-the-surface/

Babic, Edvin. 2007. “On the Liberation of Space in Computer Games.” *Eludamos. Journal for Computer Game Culture* 1 (1).

Backe, Hans-Joachim. 2020 (forthcoming). “The Aesthetics of Non-Euclidean Game Spaces – Multistability and Object Permanence in Antichamber and P.T.” In *Game | World | Architectonics – Transdisciplinary Approaches on Structures and Mechanics, Levels and Spaces, Aesthetics and Perception,* edited by Marc Bonner.

Bonner, Marc. 2015. “Ambiguous Play Pattern: A Philosophical Approach to the *Prospect-Refuge Theory* in Urban Open World Games by Merging Deleuze/Guattari and de Certeau.” *Proceedings of the Philosophy of Games Conference*, Berlin 2015.

Bloober Team. 2016. *Layers of Fear*. PC Game. Bloober Team.

Cooper, Joel. 2007. *Cognitive Dissonance: Fifty Years of a Classic Theory*. Los Angeles, London, New Delhi, Singapore: SAGE Publications.

Costikyan, Greg. 2013. *Uncertainty in Games*. Cambridge, MA: MIT Press.

Demruth. 2013. *Antichamber*. PC Game. Demruth.

Epstein, Russell A., Eva Zita Patai, Joshua B. Julian, and Hugo J. Spiers. 2017. “The Cognitive Map in Humans: Spatial Navigation and Beyond.” *Nature Neuroscience* 20:1504 EP -. https://doi.org/10.1038/nn.4656.

Fernández-Vara, Clara, José Pablo Zagal, and Michael Mateas. 2007. “Evolution of Spatial Configurations in Videogames.” *Worlds in Play: International Perspectives on Digital Games Research* 21: 159.

Fernández-Vara, Clara. 2011. “Game Spaces Speak Volumes Indexical Storytelling.” *Proceedings of DiGRA 2011 Conference: Think Design Play*. http://www.digra.org/wp-content/uploads/digital-library/Game-Spaces-Speak-Volumes.pdf.

Fraser, Benjamin. 2011. “Why the Spatial Epistemology of the Video Game Matters: Metis, Video Game Space and Interdisciplinary Theory.” *Journal of Gaming & Virtual Worlds* 3 (2): 93–106.

Galactic Café. 2013. *The Stanley Parable*. PC Game. Galactic Café.

Gazzard, Alison. 2009. “Teleporters, Tunnels & Time: Understanding Warp Devices in Videogames.” *Proceedings DiGRA 2009 Breaking New Ground: Innovation in Games, Play, Practice and Theory*, edited by Barry Atkins, Helen Kennedy, and Tanya Krzywinska. London: Brunel University. http://www.digra.org/digital-library/publications/teleporters-tunnels-time-understanding-warp-devices-in-videogames/.

Giddings, Seth, and Helen Kennedy. 2008. “Little Jesuses and Fuck-Off Robots: On Aesthetics, Cybernetics, and Not Being Very Good at Lego Star Wars.” In

Pleasures of Computer Gaming: Essays on Cultural History, Theory, and Aesthetics, edited by Melanie Swalwell and Jason Wilson, 13–32. Jefferson, N.C. McFarland.

Günzel, Stephan, Michael Liebe, and Dieter Mersch, eds. 2008. *Conference Proceedings of the Philosophy of Computer Games 2008.* Potsdam: Potsdam University Press.

Günzel, Stephan. 2008. "The Space-Image. Interactivity and Spatiality of Computer Games." In Günzel, Liebe, and Mersch 2008, 170–89.

Habel, Chad, and Ben Kooyman. 2013. "Agency Mechanics: Gameplay Design in Survival Horror Video Games." *Digital Creativity* 25 (1): 1–14. https://doi.org/10.1080/14626268.2013.776971.

Hartshorne, Robin. 2000. *Geometry: Euclid and Beyond*. New York: Springer.

Ihde, Don. 2012. *Experimental Phenomenology: Multistabilities*. 2nd ed. Albany: State University of New York Press.

Jenkins, Henry. 2006. "Game Design as Narrative Architecture." In *First Person: New Media as Story, Performance, and Game,* edited by Noah Wardrip-Fruin and Pat Harrigan. Cambridge, MA: MIT Press, 118-130.

Jørgensen, Kristine. 2013. *Gameworld Interfaces*. Cambridge, MA: MIT Press.

Keogh, Brendan. 2018. *A Play of Bodies. How We Perceive Videogames*. Cambridge, MA: MIT Press.

Krøjgaard, Peter. 1998. "Forskningen Vedrørende Objektpermanens: Et Review Af De Undersøgelser, Der Anvender Velkendte Objekter." *Nordisk Psykologi* 50 (4): 258–79. https://doi.org/10.1080/00291463.1998.11863931.

Leirfall, Anita. 2013. "Computer Game Space as Directional Space. How to Orient Myself in Computer Game Space?" In *Proceedings of the Philosophy of Computer Games* 2013.

Liboriussen, Bjarke. 2008. "The Landscape Aesthetics of Computer Games." In Günzel, Liebe, and Mersch 2008, 144–55.

Martin, Paul. 2011. *Space and Place as Expressive Categories in Videogames.* Doctoral dissertation, School of Arts, Brunel University. Accessed September 17, 2013. http://bura.brunel.ac.uk/bitstream/2438/6406/1/FulltextThesis.pdf.

McGregor, Georgia Leigh. 2007. "Situations of Play: Patterns of Spatial Use in Videogames." In *Situated Play: Proceedings of the Third International Conference of the Digital Games Research Association (DiGRA)*. Vol. 4, edited by Akira Baba, 537–45. Tokyo: JAPAX. http://www.digra.org/digital-library/publications/situations-of-play-patterns-of-spatial-use-in-videogames/.

Moore, M. Keith, and Andrew N. Meltzoff. 1999. "New Findings on Object Permanence: A Developmental Difference Between Two Types of Occlusion." *The British Journal of Developmental Psychology* 17 (4): 623–44. https://doi.org/10.1348/026151099165410.

Möring, Sebastian. 2013. *Games and Metaphor – a Critical Analysis of the Metaphor Discourse in Game Studies*. Doctoral Dissertation, IT University.

Murray, Janet Horowitz. 1998. *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*. Cambridge, Mass: MIT Press.

Nitsche, Michael. 2008. *Video Game Spaces: Image, Play, and Structure in 3D Worlds*. Cambridge: MIT Press.

Number None. 2008. *Braid*. PC Game. Number None.

Piaget, Jean. 2013. *Construction of Reality in the Child*. Taylor & Francis.

Pillow Castle. 2019. *Superliminal*. PC Game. Pillow Castle.

Pötzsch, Holger. 2017. "Playing Games with Shklovsky, Brecht, and Boal: Ostranenie, V-Effect, and Spect-Actors as Analytical Tools for Game Studies." *Game Studies. The International Journal of Computer Game Research* 17 (2). http://gamestudies.org/1702/articles/potzsch.

Rauscher, Andreas. 2018. "Queering Game Spaces: Ein Diskussionspapier." *Navigationen. Zeitschrift für Medien- und Kulturwissenschaften*. 18 (1): 134–44.

Sicart, Miguel. 2013. *Beyond Choices: The Design of Ethical Gameplay*. Cambridge, Mass. MIT Press.

Švelch, Jaroslav. 2008. "What You Can't See Is What You Don't Get." In *Proceedings of the 2008 Conference on Future Play Research, Play, Share - Future Play '08*, edited by Bill Kapralos, Mike Katchabaw, and Jay Rajnovich, 212. New York, New York, USA: ACM Press.

Tamborini, Ron, and Nicholas D. Bowman. 2010. "Presence in Video Games." In *Immersed in Media: Telepresence in Everyday Life*, edited by Cheryl C. Bracken and Paul Skalski, 87–109: Routledge.

Taylor, Laurie N. 2003. "When Seams Fall Apart. Video Game Space and the Player." *Game Studies. The International Journal of Computer Game Research* 3 (2). http://www.gamestudies.org/0302/taylor/.

Thekla Inc. 2016. *The Witness*. PC Game. Thekla Inc.

Totten, Christopher W. 2014. *An Architectural Approach to Level Design*. Boca Raton: Taylor & Francis.

Valve. 2007. *Portal*. PC Game. Valve.

Wilson, Laetitia. 2003. "Interactivity or Interpassivity: A Question of Agency in Digital Play." *MelbourneDAC, the 5th International Digital Arts and Culture Conference*, Melbourne, May 19. http://hypertext.rmit.edu.au/dac/papers/Wilson.pdf.

Wright, Ryan C. 2019. "Beyond Procedurality: Situating *The Witness* in the Proceduralism Debate." *Proceedings of the 2019 DiGRA International Conference: Game, Play and the Emerging Ludo-Mix.* http://www.digra.org/digital-library/publications/beyond-procedurality-situating-the-witness-in-the-proceduralism-debate/

Yevin, Igor. 2006. "Ambiguity in Art." ComPlexUs 3 (1-3): 74–82. https://doi.org/10.1159/000094190.