Game space topology revisited: A review of labyrinthine terminology

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ABSTRACT
This paper addresses the concept of game space topology – the arrangement of space in games – with regard to the established literature's dependence on spatial metaphors such as *labyrinths* or *mazes*. I argue that despite their prevalence in humanistic game studies, these metaphors widely conflate space topologies with aspects of *representation*, *perspective*, *teleology*, and *sequentiality*. One can rarely tell what specific aspects of the game are addressed by research on this subject. Indeed, labyrinths are ambiguous and highly connotative words, and as such they are unproductive for the classification of game space topology. This paper intends to facilitate more rigorous research on the subject, starting by building on clearly delineated elements of the game world.

Keywords
spatiality, topology, metaphors, representation, perspective, teleology, sequentiality

INTRODUCTION
The question of spatiality resides firmly within the heart of game studies (Aarseth 2001; Aarseth et al. 2019; Murray 1997). Games are regularly conceived of as spatial objects (Günzel 2008), as is evident in well-cited studies such as Jenkins' "Game Design as Narrative Architecture" (2004), where the question of spatiality has effectively assimilated that of narrative. Even the conception of games as ergodic objects has arguably been assimilated in this subject. In fact, Aarseth's concept of the ergodic (as derived from the Greek words *ergon* and *hodos* – "work" and "path," respectively; 1997, 1) is not contingent on visual signifiers, or digital screens for that matter, but on a topological structure in the material object. Games are full of spatial decisions that may have you traverse one place or the other. This spatiality, it follows, is not merely metaphoric – it is structural and as such navigable by a player.

This paper addresses the concept of game space topology with regard to the established literature's dependence on spatial metaphors such as *labyrinths* or *mazes*. I argue that despite their prevalence in humanistic game studies, these metaphors widely conflate space topologies with aspects of *representation*, *perspective*, *teleology*, and *sequentiality*. Indeed, one can rarely tell what specific aspects of the game are addressed in the literature, even if it is no surprise, given that labyrinths are widely conceived of as ambiguous, connotative, and dualistic phenomena – e.g., as *objective pattern* and *subjective process* (Doob 1990). Some are unicursal and some are multicursal, that is, some comprise a single path and some comprise multiple paths in a structural sense. Yet these aspects are rarely disentangled, and the present classifications of game space topology seemingly depend on terminology that is largely unqualified. This critique easily extends beyond labyrinths to notions such as *open worlds*, but for the sake of this paper's scope, labyrinths were chosen for their unrivalled and metaphorical prevalence.

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A few examples are in order. As to *representation*, what appears like mountain paths and open skies may more readily be associated with open worlds, while what appears like dark caves may be associated with multicursal labyrinths, even if either game spaces feature the same bifurcated structure. Either space, in other words, are equally restricted and labyrinthine irrespective of the skies' perceived infinitude (equal in so far as they both meet the fundamental condition of multiple paths).[1] *Perspective* is conflated similarly, as what is viewed and navigated from above is regularly classified as multicursal labyrinths, while what is viewed and navigated from a first-person perspective is regularly classified as open worlds. *Teleology*, then, is concerned with goals that are regularly presented as essential features of spatial structures, as one space is "to be solved," another "to be explored," and a third "to be fought around." Yet most game space labyrinths are not solvable, unless "solvable" is taken to mean "winnable." Who ever got lost in the corridors of *Pac-Man* (Namco 1980), despite the labyrinthine structure of that game space? Is it even labyrinthine, if one is hardly disorientated by one's experience? Finally, *sequentiality* is concerned with labyrinthine space as a sort of tree structure – as bifurcated and mostly irreversible continuations of a spatial sequence – in a sense that relates to the segmented and bifurcated links of hypertextual structures.

One may look for correlations between these aspects, but they should never be taken for granted if we are to understand the intricacies of game spatiality. The labyrinth, we may say, is a concept highly loaded with connotative meaning of complexity and disorientation (among so many other meanings). It has been a motive of literature since the epic poems of ancient Greece, in which the Cretan labyrinth was signified by virtue of linear linguistics. By comparison, the labyrinth of the game space is of structural or rather virtual existence – it demands a highly clarified account if the concept is to be applied as a particular category of game space topologies, with no reliance on vague connotations.

This critique represents the main contribution of the paper. A critical survey of all applications of labyrinthine terminology in game studies is of course utopian and far beyond this paper's scope. But a concise study of the commonalities between established and well-cited literature on (and around) the subject is not. This study begins with Doob's excellent account of the labyrinth as design and experience (1990). Then follows the critique of game studies' application of the terminology, before I present the assumptions that ought to inform future research into this subject.

I believe the first step towards more operational models is to establish consistent methodology, so as to delimit analysis to specific features of the game. My proposal is to approach this subject from the perspective of ontology, in considering spatiality as a property of the game object – as opposed to the experience, seeing as these are questions of another domain entirely. This is not to say that phenomenology is not a highly illuminating perspective on space, or that "space itself" is not a problematic concept; theorists like Augé (1995) and Lefebvre would certainly argue so, the latter explicitly criticising the "speculative" assignment of "ontological status" to a *space itself* (1991, 169; see also Debus 2019, 194-196). But accurate terminology of games' various aspects and elements is crucial if we are to develop this research field. I argue that the classical concept of labyrinths is unsuitable for this purpose, *or* that it needs to be clarified extensively – that is, these metaphorical threads need to be untangled before they are really applicable.

THE DUALITY OF LABYRINTHS

This section aims to lay the foundations of the many apparent connotations with regard to the labyrinth in game studies. Doob's comprehensive study of *The Idea of the Labyrinth from Classical Antiquity through the Middle Ages* (1990) is frequently cited in the established literature, and is in many ways the best source available on the fundamental aspects of labyrinths. In an account of the labyrinth's "double perspective" – of objective pattern and subjective process – Doob explains that

> [labyrinths] presume a double perspective: maze-treaders, whose vision ahead and behind is severely constricted and fragmented, suffer confusion, whereas maze-viewers who see the pattern whole, from above or in a diagram, are dazzled by its complex artistry. (1990, 1)

Here, objective pattern corresponds to *design*, while subjective process corresponds to *experience*. The latter relates to the individual that *treads* and not merely *views* the labyrinth. As metaphor, then, the labyrinth is highly influenced by the individual's perspective; in other words, "[do] we see the maze in its entirety – from outside and above, with its structure neatly mapped as in a diagrammatic drawing," as Doob asks (1990, 65). Such is the case in *Pac-Man*, where the connotations of the labyrinth should change accordingly. That labyrinth is viewed from above and as such hardly connotative of life's mysterious ways, in which one never knows what lies ahead of different paths. But we may ask, is *Pac-Man* played by a treader or a viewer? Is this an experience of objective pattern or subjective process (as well)? Indeed, in this game (as in others), one may *tread* a labyrinth that one simultaneously *views* from above, thus problematising this distinction in the context of game studies. At least, this suggests that the labyrinth of games is fundamentally different from that of media like literature and cinema. Furthermore, that this classical and dualistic notion cannot readily characterise the virtual existence of game space labyrinths. This example of course relates to the aspect of perspective. But there is also an aspect of teleology in this discussion – the labyrinth as simultaneously viewed and treaded from above, such as that of *Pac-Man*'s space, is not solvable (nor particularly explorable), unless the solving consists in finding a metaphorical exit, that otherwise is not there. Doob connects the inextricability and impenetrability of certain labyrinths' subjective process with a *benevolent teleology*, that extends to the metaphoric usage of this concept (1990, 82). This connection is highly illuminating when we turn to the teleological aspects of game space metaphors later in this paper.

As design, the labyrinth is generally separated into unicursal and multicursal labyrinths (Doob 1990; Aarseth 1997), a distinction that is applied throughout almost all discourse on game space topology. The unicursal design features a single path, whereas the multicursal design (sometimes referred to as *the maze*, such as in Eco 1984; Fernández-Vara 2007, 74; Gazzard 2009) features forked paths – and as such spatial choices as well. You could argue that entering the unicursal labyrinth is itself a choice, and perhaps so, but the qualitative difference from multicursal labyrinths remains (as either must be entered; see also Doob 1990, 50-51). One does not get lost in this structure, even if one must show perseverance in order to reach one's goal (regardless of the nature of that goal). For example, one's progress may be hindered by threats, such as the minotaur of Greek mythology, or various monsters or puzzles of the game world, and yet you merely continue to move forward.

As such, this distinction is not exclusively a property of design, even if mostly so. The multicursal labyrinth features bifurcations and therefore navigational decisions. Perhaps one will come across dead ends, too. Consider the widespread metaphor of life and life's many decisions – this metaphor is of course based on the multicursal labyrinth as experienced (well, in agnostic cases – medieval cathedrals would feature unicursal labyrinths depicted on the floor; follow the single road, and God leads you safe to Eden).[2] This metaphor for a structure of decisions is especially prevalent in game studies that focus less on spatiality and more on the game object as such, where players will necessarily have to make decisions in order to navigate the game. This is different from non-ergodic literature (that is, literature as most know it; a single linear sequence), such as Jorge Luis Borges' short stories, in which the bifurcation of paths – the multicursal principle – is purely signified and as such metaphorical.[3] In other words, these short stories adhere to the classical linear sequence of linguistic signifiers, and the linguistic sequence is not labyrinthine in the sense of, say, hypertextual fiction, where the sequence of the text itself bifurcates and necessitates the reader or user's active decision-making. One may argue that this linearity is

unicursal and that all non-linear media are multicursal, but Aarseth (1997) insists on applying either design to the analysis of ergodic objects such as games, even if most, if not all, game space topologies feature at least a single bifurcation of paths (regardless of one's definitions; not least in terms of sequential and/or narrative structure, Domsch 2013). Most game spaces are vast and full of decisions – the very notion of a unicursal design is problematic if it is to describe spatiality alone. One might ask, at what one point are game spaces multicursal and not merely unicursal? How many bifurcations must they comprise? This question remains vaguely addressed by the highly metaphorical terminology of currently available game space topologies.

It is arguable that the metaphors of the established literature, which are never presented *as* metaphors, are actually synecdoches, a literary figure in which a part signifies a whole or vice versa. One game's space topology is defined as labyrinthine, yet it is only a single or few specific aspects of the labyrinth that is applied in practice. In any case, the labyrinth will always be an attractive metaphor, as Doob writes:

> As later metaphorical uses of "labyrinth" suggest, any complicated building with many chambers and corridors is potentially labyrinthine; any building or mental process difficult to penetrate or escape without a guide is a kind of maze. (2013, 24)

The many conflations with regard to game space topology are not surprising, considering the multidisciplinary nature of this field, and indeed we rarely even agree on what exactly is denoted by terms such as "game." Still, we need better and more specific terminology, and as of now the notion of the labyrinth is applied to highly different aspects and elements of games, a difference that would matter less had the terms more frequently been qualified. I argue that it is the aspect of experience that is typically the signified of metaphoric terminology in game studies. My intention with the following sections, then, is to disentangle these metaphorical connotations. My emphasis is on *design*, but I do not limit design to the labyrinth as viewed from above – in other words, design, in this study, is to comprise the topological side of the game space regardless of perspective and the other aspects discussed throughout these pages. The labyrinths of games are decidedly semiotic, but they are not merely semantic – indeed, and concisely, they are of virtual and objective existence (Aarseth 2001). It is this virtual existence that calls for specialised and accurate terminology. A final note before I move on to game space topologies, then – in the context of game studies, and in order to build formal terminology, I am not going to refer to "the treader," "the wanderer," or similarly, as this would suggest a specific subset of games in terms of gameplay and graphics. This is yet another strategic move towards an abstract terminology of games and similar objects.

GAME SPACE TOPOLOGIES REVIEWED

The present section makes for the main – and as such critical – contribution of the paper. The subject of space topology has not received much attention in the recent decade, and only recently began to re-emerge with anthologies edited by Bonner (2021) along with Aarseth and Günzel (2019), in addition to Debus' formal game ontology that synthesises and builds on concepts from previous literature (2019). Aarseth's two papers on this subject remain widespread and will be discussed extensively (2005; 2012). As will the accounts of Nitsche (2008) and, to a lesser degree, of Fernández-Vara (2007) and Gazzard (2013). From the area of less spatial emphasis, I include Nohr's recent analysis of the labyrinth as an architecture of decisions in games (2021). This whole section is divided into subsections based on the four mentioned aspects of conflation: *representation*, *perspective*, *teleology*, and *sequentiality*. This distinction, like any other, is of course imperfect, in so far as most of the literature feature multiple and variable "levels of conflations," that include

several of these aspects simultaneously. In these cases, one aspect most representative is selected.

Representation

The aspect of representation in this study concerns the ”sign surface” of the game world (see Aarseth et al. 2015). In terms of space specifically, we may refer to this aspect as the topo*graphical* layer contrasted by the topo*logical* layer, that is, as the ” sign-stream” contrasted by the ”actual room-for-movement” – a simple and elegant distinction of Aarseth’s (2019, 130). What appears to be a door in the audiovisual game world may have no mechanics attached to it, nor any non-representational purpose, effectively rendering it a ”wall” in terms of game space topology. This is a classical illusion of game spatiality, to make the game world appear bigger than the navigational space actually afforded (faraway mountains are rarely navigable even in the openest of open worlds).

Aarseth posits a typology of quest game landscapes in 2005 that is later revised in 2012. Either are good examples of this critique, and either are widely discussed throughout these sub-sections, so a brief summary should suffice. The 2005 typology comprises: *unicursal* or *linear corridors, semi-open often star-shaped hubs* or *multicursal labyrinths*, and *open landscapes*. For now, I am interested in the single addition to Aarseth’s revised typology, the *one-room game* (2012). This is not a labyrinthine structure, but an explicitly topological structure regardless; the qualities with which it is supposedly differentiated from labyrinths is illuminative of the latter, and so the crucial question remains: what are the constitutive criteria with which one-room games and open landscapes are differentiated from labyrinthine space topologies?

With regard to the former pair, Debus (2019, 222) argues there are no formal spatial differences between one-room games and open landscapes (or as re-labelled in the revised typology, open *worlds*). There is no formal measure with which one may differentiate the scale of either game space – and as a consequence, the point at which the one-room’s proportions are transcended is an arbitrary or *representational* one. I realise this is a provocative argument. For the most part, the bedrooms signified in game worlds are experienced as less freely navigable than vast continents with seas and open skies. In other words, there is likely correlation between topography and topology – and yet, the relationship cannot be taken for granted, especially if the sign surface does not resemble our real world. Now, this conundrum is not merely located between open-rooms and open landscapes, as it includes either labyrinthine spaces as well. In terms of topological structure, then – and provided, one cannot navigate in three dimensions – are open worlds any different than multicursal labyrinths? Is there a lower threshold at which the quantity of spatial connections is so enormous that the spatial structure is longer labyrinthine? Or is it rather a question of representational aspects? What differentiates Azeroth of *World of Warcraft* (Blizzard Entertainment 2004) from ”de_dust” of *Counter-Strike* (Valve 2000)? The two *play* very differently, but what *spatial* features make one less labyrinthine than the other? This differentiation remains crucially unanswered in the literature reviewed.

Nitsche’s classification of spatial structures makes for a similar example (2008). It includes *mazes* (i.e., multicursal labyrinths) and *linear* or *unicursal labyrinths*, but the best example of game space topology and representation conflated is once again not the labyrinths themselves. This example, however, is suggestive of the same conundrum, not least because the author reasons consistently across all of these spatial structures. It is particularly interesting how Nitsche is critical of metaphors such as playgrounds, sandboxes, and gardens, seeing as ”they do not refer to the structures […] but focus on their use” (2008, 171-172). More specifically, the author is critical of the playground metaphor due to the way it supposedly has been applied to describe *Grand Theft Auto III* (DMA Design 2001). The playground, Nitsche argues, denotes ”relatively free play” in the game’s ”open architecture,” but the

author claims that the spatial structure is more precisely a ”virtual city” (2008, 171). Now, what ”structure” is denoted by a virtual city? This is merely another metaphor, whose meaning is contingent on cultural and representational aspects. It is not a formal structure that one may compare with different game spatialities, for it is not contingent on a topological structure, but rather the representation of man-made streets and buildings. To the topology of various game environments, the streets of Liberty City in *GTA III* might as well resemble the tracks of the Swamp in *The Witness* (Thekla, Inc. 2016).

Nitsche provides further definitions of *tracks*, *rails*, *linear* or *unicursal labyrinths*, *mazes* (*multicursal labyrinths*), *nets* or *rhizomes*, and *logic mazes* (Nitsche 2008, 172-187). In terms of representation, the differentiation of tracks, rails, and unicursal labyrinths is an interesting one. Tracks and rails are both ”realized as a single axis,” that in practice ”is transformed, twisted, and bent to structure movement along it” (Nitsche 2008, 172+173). The difference between the two is somewhat unclear, but as to unicursal labyrinths, those differ from either because they ”lack outstanding visual cues that can support orientation and instead often feature repetitive rhythms of recurring patterns” (Nitsche 2008, 176). Nitsche elaborates that these unicursal labyrinths ”put [their] restriction on display” (2008, 177). What strikes me is that all three of these definitions are seemingly unicursal labyrinths in terms of space topology. The difference seems rather to be located in those visual cues, which is arguably an aspect of representation – of the sign surface, and not of the space topology.

All of the above examples should demonstrate why representation is not a feasible criterion with regard to game space topology. One may otherwise develop a typology of game space that comprise an almost farcical quantity of game spaces: *cities*, *gardens*, *mountains*, *deserts*, or even *studio apartments* and *mansions*. These are perhaps unfair examples, but the argument stands; studies of game space topology should avoid metaphors such as *cities* (Nitsche 2008), *corridors* (Debus 2019), *landscapes* (Aarseth 2005), and *worlds* and *rooms* (Aarseth 2012) altogether. Many games simply escape these labels, as their thematic surface does not match these connotations.

Perspective

As to the aspect of perspective, I return to Aarseth’s aforementioned typologies (2005; 2012), where the types of interest are now *semi-open*, *often star-shaped hubs* (or *multicursal labyrinths*) and *open landscapes*, respectively. According to the author, the difference between these is that ”mountain ranges, oceans or impenetrable forests form natural boundaries” within multicursal labyrinths (Aarseth 2005, 500). *Heroes of Might and Magic III* (New World Computing 1999) is posited as a multicursal labyrinth – which it arguably resembles – whereas *The Elder Scrolls III: Morrowind* (Bethesda Game Studios 2002) is posited as an open landscape (Aarseth 2005, 499-500). But how is space less open in one than the other? Either are seemingly labyrinthine, that is, your avatar navigates ”impenetrable forests” (etc.) in either game space topology. *Elder Scrolls* is played and viewed from a first-person perspective, as subjective process in Doob’s terminology, whereas *Heroes* is played *and* viewed from above, as *both* objective pattern *and* subjective process (Doob 1990). Is it only when viewed from above, then, that this resemblance to a labyrinth is constitutive? Either game space feature mountain ranges, oceans, and forests – which would suggest that open landscapes refer to either a) an undefined lower threshold of available paths,[4] at which point space intuitively feels more open to the player; or b) the cardinality of gameplay, that is, the number of spatial dimensions one may navigate inside; or c) a criterion of perspective. The difference between options b and c is complicated, as a first-person perspective typically entails gameplay in three dimensions (same applies to strategy games played from above, where most games are navigated on a 2-dimensional plane). In other words, *Elder Scrolls* appears to be differentiated on account of either a) an informal or undefined spatial complexity; or

b) on the ”Levitate” spell which allows for occasional movement on the Z-axis; or c) on the first-person perspective. This is further complicated, when years later Aarseth juxtaposes *Far Cry 2* (Ubisoft Montreal 2008) with *Pac-Man* on account of their apparent and ”similar” labyrinthine structure (2019, 129), when these are arguably constitutive of the same difference as the author’s 2005 examples.

The practical solution would be to consider perspective as a self-contained typology, independent from the space topology of a given game; to simply differentiate between first-person, second-person, and third-person, more usually known as the ”god-like” perspective of many strategy games.

Teleology

The following is concerned with the aspect of teleology. It is clear that labyrinths are naturally associated with teleology, not merely in the sense of a physical exit, but also in the metaphorical sense, with regard to the labyrinth as Doob’s subjective process. It is perhaps the most prevalent connotation of labyrinthine terminology with regard to game studies; the labyrinth directs the player towards a goal, sometimes a concrete coordinate (that often advances the narrative), or sometimes, in a metaphorical sense, a certain playstyle in order to achieve success (whatever that would be) in the game. The first conflation – that of the concrete coordinate – is related to the final aspect of sequentiality, and has as such been directed to another sub-section itself. The concept of teleology observed in the following critique, then, is concerned with a gameplay-oriented purpose, more so than a sequential structure.

In ”completely open landscapes,” Aarseth writes, ”the challenge of navigation is mainly a matter of moving safely, and not of maze-solving” (2005, 505). This contrast suggests that multicursal labyrinths are ”to be solved” – which is of course most often the purpose of labyrinths. Yet, it is arguably incompatible with the same author and paper’s aforementioned classification of *Heroes of Might and Magic III*, a game that is played from above and provides a clear view of the game space. What maze is solved in this game? There is decidedly exploration of faraway lands, clouded very literally so that the player does not always know what lies ahead. But the purpose of the game is to beat your opponents; you do not achieve success by solving the maze in a traditional sense, that is, by finding a physical exit, that is not even there in the first place. A similar criterion is observed in the accounts of Nitsche (2008) and Fernández-Vara (2007). Nitsche defines *arenas* as ”mostly open structures” with ”one dominating demarcation line.” Unlike labyrinths, he writes, ”arenas provide relatively free movement in a contained space with high visibility” – in other words, ”the canvas for a performance” (Nitsche 2008, 183). An example is given with *Counter-Strike* where the player’s purpose is fighting as opposed to exploring – or surviving, or getting lost. Fernández-Vara, similarly, argues that in unicursal labyrinths, ”walkers cannot get lost traversing, [though] they are disorientated and delayed” (2007, 74). She considers this an unproductive structure due to ”[t]he absence of a difficult task along with the existence of a unique path” (2007, 74).

These definitions seemingly presuppose teleologies as inherent to a spatial structure – in a games context, anyway. The criterion is widespread in game studies – and for good reasons – although it is also evident that labyrinths are ambiguous, even deceptive names for something extremely complicated – something that demands conceptual clarity in terms of classificatory criteria and methodology, beyond what is currently offered in the established literature. It is already apparent that notions such as labyrinths are not applied synonymously across this literature. The aforementioned definitions are complicated, when we ask, for example, what topological structure is featured in *Pac-Man*? On the surface, this space resembles a multicursal labyrinth – and that much is true, as far as space topology is concerned. Though in terms of teleology, this is not a space ”to be solved,” if labyrinths are to ”[complicate] the reading of the space and [make] navigation […] so difficult” (Nitsche 2008, 182). How hard is it to read a space one can see in its entirety? This is of course an unfair

question, as Nitsche's perspective is derived from phenomenology, which only makes it natural that he accounts for player experience. A similar argument is put forward by Gazzard, who suggests that a game space may comprise "blind paths" – that is, paths that turn in direction, yet remain the same – even if that space is viewed and navigated from above (2013, 50-51). In racing simulation games, players are of course blind to what lies beyond many of these corners – on account of both their speed and the landscape blocking their view. Gazzard claims that *Pac-Man*, too, comprises blind paths, as these stand for sudden changes one must react to in order to achieve success (2013, 50-51). As such, an argument could be made that this is in fact related to the aspect of perspective – or perhaps an unnamed one of the relationship between gameplay and players' reaction times.

This perspective leads me to another argument: the criterion of teleology mostly presupposes arguments on the player's *experience* of space, and not on space as such. Nitsche's arguments on spatial structures are thus problematic, if what he really is concerned with is experience, as experience, we might say, is malleable – more so than a spatial structure anyway (trained philosophers may disagree!). To the players with thousands of game sessions, the space of *League of Legends* (Riot Games 2009) might not constitute the multicursal labyrinth it once resembled and played like. It may constitute a multicursal labyrinth at first, but what does it become after this experience? Of course, this argument also suggests that the same terminology should not readily be applied across methodologies, as the meaning of labyrinths varies significantly.

Some games feature a plentitude of paths to explore; some requires exploratory skills in order to navigate safely. But is the telos to reach a specific destination, to finish the story? And what if there are several game endings in different points of space? The multicursal labyrinth that is "solved," does that feature a single inherent goal, several such goals, or even player-designated goals? These are only a few questions left unanswered by the established literature drawing on these criteria.

Sequentiality

The fourth and last aspect of this "review paper," sequentiality, is concerned with the organisational principle of game space; that is, space as arranged in a sequence, or in other words, in a tree structure. In this regard, it is similar to the sequential logic of ergodic literature or even better "future narratives" (Bode et al. 2013), whose nodes (events) and connections represent the tree structure of so-called future narratives such as games. This logic is also present in Aarseth's conception of ergodic art, to which he specifically applies the labyrinthine terminology (1997). In fact, this may be work from which the terminology first originated and began to disseminate into the muddy semantics of more recent years. These are similar principles, in so far as game space topology by Debus (2019) is conceptualised as strings on a pearl; as segmented sub-spaces between which navigation is most often irreversible, that is, unidirectional. It is important to note that Debus' does not seem to conflate matters in his account, but that I have included a review regardless – it is significantly different from the previously discussed literature, and yet it does not seem to address this relationship. The core of the matter remains; the established literature on the subject of game space topology is seemingly only speaking of the same phenomena *on the surface*, and not really in terms of semantics.

Debus' synthesised classification of game space topologies comprises *single spaces*, *linear corridors*, *multicursal labyrinths*, and *hubshaped spaces* (2019). The linear corridor – whose linearity refers to its unicursal nature – is defined as "the arrangement of single spaces in an order where one space can always only be accessed from the same one or two other spaces" (Debus 2019, 223). This is, as one may observe, the first classification to seemingly involve a nodal structure of segmented spaces, although no argument is made as to how these nodes or "single spaces" are segmented. This approach allows Debus to differentiate single spaces and

linear corridors, seeing as the latter is not merely a structure that has been ”stretched out,” but a string of connected space. What Debus is arguing is that squares should not be differentiated from rectangles in terms of space topology – which is actually more aligned with the mathematical branch from which the concept originates. In the context of humanistic game studies, the study of topology is generally concerned with the arrangement of spatiality. In mathematics, however, it is concerned with geometrical relations unaffected by continuous deformations. The tube map of the London Underground is an excellent example. The proportions do not correspond to those of reality, but all connections are preserved, so as to make the necessary information more readable. The tube map, in essence, is a nodal graph based on the principles of topology. Similarly, Debus suggests that emphasis should be put on the connections and not the proportions of game spatiality, as proportions are more or less unformalisable.[5]

According to Debus, *Half-Life* (Valve 1998) may ”resemble lines more than rectangles or squares,” but those are not topological features, as what matters, he writes, is ”the arrangement of individual spaces with each other” (Debus 2019, 223). Debus applies the same principle to single spaces, in which Aarseth’s *single rooms* and *open landscapes* are consolidated, and to multicursal labyrinths, with which the linearity of the linear corridor is ”broken up by introducing forking paths” (2019, 223). Had he not applied this *nodal structure* – that, again, is not his words, but a term that describes my interpretation of his ontology – the linear corridor would merely constitute a stretched out space, that appears longer and more ”corridor-like” than the single space. This arguably resembles a more formal approach, one that is not concerned with the experience of space, but space in itself – which Debus also emphasises throughout his dissertation himself (2019, 195-196). Still, the question remains, how are sub-spaces formally ”contained,” in a way they may connect like ” links of a chain” (Debus 2019, 223) – and so that we may demarcate them consistently across games? What is the nature of this perceived discreteness, and how is it inferred from the game object? What differentiates a hubshaped space from a single space, if not these sub-spaces’ apparent discreteness? I should add that Debus does not apply the term ”*sub*-space” himself but it seems to me entirely fair to hierarchise these ”spaces” below the general space of one particular game object. Is this discreteness observed through loading screens, then? Or doors closing behind our avatars?

This is not answered in Debus’ account, which seems to lack the important ”principle of segmentation” – again, a term I propose in this paper. Debus characterises space as sequences with different connections, sometimes multiple. This seemingly nodal, or ” string-like,” structure is dependent on a principle, according to which a sub-space is segmented and not merely part of a greater ”single space.” Loading screens and closed doors are unreliable principles; and the former especially, seeing as loading screens are getting fewer as technologies advance. However, doors that ”close” – or in more formal terms: paths that once were available and later blocked – arguably stand for temporal, more so than spatial, segmentations. The space currently available has changed permanently, and the *past* available sub-spaces are thought of as past links of a chain, or perhaps ”pearls on a string,” from which navigation – indeed, *transgression* – is irreversible (unless one reloads a prior save-game). This is the only principle I could personally imagine to solve this theory, although it will unfortunately have to be explored in another paper.

So Debus’ account of game space topology, even if partly synthesised of the previous literature, evidently differs significantly from said literature. Say, I was to analyse the space of *The Last of Us* (my own example; Naughty Dog 2013) from these different positions. It appears at times like an ”open world,” indeed one level is a vast space one must navigate with a map. That would be the representational aspect. At the same time, the game follows a clearly unicursal trajectory of sub-spaces between which navigation is unidirectional; that is, if the player progresses to a certain point of the

game, the adventure continues from another sub-space entirely, from which one can no longer go back to a previous location. There is no freedom with regard to the order or direction of this string-of-pearls. As is evident, then, this second account of game space topology is contingent on a sequential aspect. Space is arranged with a particular order of access. My argument, then, is that there are no other principles by which these spaces are segmented, and all Debus' example games suggests the same (2019). *Façade* (Prodecural Arts 2005) and *The Elder Scrolls IV: Oblivion* (Bethesda Game Studios 2006) are listed as single spaces, while *Half Life* is listed as a linear corridor, in addition to *Lylat Wars* (Nintendo EAD 1997) which is listed as a multicursal labyrinth – on account of that game's forked progression of levels. As Debus writes, "[to] reach the final level, the players can choose between different paths" among those levels (2019, 223). Finally, *Glover* (Interactive Studios 1998) is listed as a hubshaped space, as "players always return to one space […], the castle space, which makes it the hub" (Debus 2019, 223).

A similar structural logic is observed in Nohr's application of the labyrinth to "the architecture" of decision-making in games (2021, 133). The author describes the labyrinth as, "in its essence," a teleology, that is, "every path and every labyrinth has its *telos*" (Nohr 2021, 136). This would perhaps suggest that I have classified Nohr's research wrongly under the aspect of sequentiality, but it is actually the structural sequence of choices that he is concerned with; not the aspect of teleology in *this* paper. As such, it could be argued that any fixed (and possibly spatial) sequence is in itself also teleological, as there are only a fixed number of points from which one may progress in the game. It should be noted, however, that Nohr's mention of architecture emphasises the fact that his study is concerned with decision-making *in* space, but not *of* space as such (2021, 133). The author presents a definition of the labyrinth with fairly many criteria, one of which is the following: "The paths are organised as a (more or less) binary structure" (Nohr 2021, 136). What I observe here is a sequential concept with a temporal principle of segmentation, similar to the one I pondered in the aforementioned discussion of the nature of Debus' sub-spaces (2019); indeed, the labyrinth is applied as a sort of *after-the-fact* structure to the irreversible choices one player faced. This irreversibility of decisions is in its nature a very consequentialist perspective on the labyrinth. "A more precise description of the cultural technique of decision-making could be summed up like this," Nohr writes, "making a decision always means excluding alternatives" (2021, 139+142). This account of the game "as a permanent labyrinth" (Nohr 2021, 133) is remarkably similar to Aarseth's account of ergodic art (including games), in so far as the labyrinth is treated as *the* prism through which one may approach these objects; the ability to *actually* get lost in the work, and doing so in a nodal structure.

CONCLUSION

In this paper, I have demonstrated a significant inconsistency between the established and well-cited literature on one of the most crucial topics of game studies, that of game space – and space topology specifically. The labyrinth is the classical example of this conflated rhetoric (as is the open world), where different aspects of the game – from *representation* to *perspective*, *teleology*, and *sequentiality* – are seemingly mixed up in rather muddy theories, in terms of both methodology and terminology. To mirror Aarseth's seminal critique of a supposed "narrativism" within game studies at the time (1997), perhaps we may speak of a "labyrinthism" in today's game studies with regard to space topology? Indeed, labyrinthine metaphors have emerged as highly amalgamated concepts contingent not merely on space topology, but entirely different aspects of the game too.

So where do we go from here? A few proposals are in order, but a more thorough sketch for the future is reserved for another paper. Regardless, I believe the following assumptions should allow for new directions in future classifications of game space topology, starting at methodological concerns. It is given that more research is needed in order to develop more sustainable theory within this field. First, I believe clearer

methodology is necessary. One may, like Debus (2019), approach these questions from the perspective of formal ontology, in which only ”underlying” mechanical systems are accounted for, that is, where formal categories are defined *without* ambiguous criteria from other domains. This approach should always be concerned with space not as it ”appears” but as it is organised. This is, of course, one of many humanistic approaches, where perhaps other disciplines may be able to develop more rigorously tested models. Such a method, furthermore, still requires certain considerations, e.g., how do we develop an ontology with no access to the binary code of the video game? Second, I believe clear principles in terms of what exactly constitutes multicursality are necessary as well, e.g., how significant must a bifurcation in the landscape be in order to constitute multi- and not unicursality? How far must paths diverge? Should any stump of a tree constitute a formal bifurcation of connections? One is unlikely to ever observe anything but multicursal labyrinths if that is the case. Or perhaps we need different categories altogether?

As it stands – and if I may be so brisk – the established literature on game space topology follows an unfortunate tendency in game studies, where classifications are seemingly developed with little regard for the underlying criteria. In effect, they read quite like Borges' imaginary and humorous classification of animals, ”The Analytical Language of John Wilkins” (1964), in which one finds arbitrary categories such as ” belonging to the Emperor,” ”drawn with a very fine camelhair brush,” and even ”from a distance look like flies,” all of which are criteria of completely different and non-exclusive domains.

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[1] The very notion of an open world is already debatable, unless a space is *literally* boundless – and by necessity procedurally generated.

[2] As written in one translation of the Bible: "In their hearts humans plan their course, but the Lord establishes their steps" (from Proverbs 16).

[3] To name only a few of Borges' labyrinthine short stories: "The Garden of Forking Paths," "The Two Kings and the Two Labyrinths," or "The House of Asterion."

[4] This is indicative of the same conundrum described at the beginning of the sub-section on *representation* – is there any formal difference between labyrinths and open worlds that would qualify this distinction, if most open worlds feature more or less labyrinthine path structures?

[5] Curiously, Aarseth has once expressed a similar conception of space topology, even though he does not seem to subscribe very strictly to this in his later classifications. An open world, he writes, "may seem like a naturalistic world [but] is in fact a constrictive topology of nodes and connections between them that interferes with unhindered movement" (2001, 161).