What Do They Represent?
Computer Games as Spatial Concepts

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Since the late 1980s a so called 'spatial turn' affected the arts and humanities, foremost cultural studies. Also, computer game studies took a turn towards space, if they were not from the very beginning always about analyzing the spatiality of digital games (Günzel 2010). Nevertheless, this contribution investigates not only spatial theories, but suggests a further possible turn within the spatial turn and look at computer games themselves *as spatial concepts*. This means that in as much as spatial theory can be used in game studies to describe their objects in structure and appearance, games do *enact* spatial concepts.

Henri Lefebvre and the Spatial Turn

To understand this new approach, it nevertheless is crucial to go back to the origin of the current debate about the spatial turn, which can be traced back to 1974, when Henri Lefebvre published his book *La production de l'espace*. Yet in the 1970s the relevance for a spatial account of culture has not been recognized yet. It took almost two decades, until – by reason of the English translation of Lefebvre's (1991) book – neo-marxist and postmodern theorists began to discover the relevance of a spatial approach in sociology and urban studies. During the 1980s the focus lay on what Fredric Jameson (1998) called the 'cultural turn', i.e. the critical notion of capitalism incorporating culture for means of profit (Jameson 1984). Spatial thinking was present only implicitly, most prominently in Michel Foucault's (1998 and 1977) research on heterotopology and panopticism.

Lefebvre's thoughts were finally introduced to a broader audience when the geographer Edward Soja (1996, 53-82) published his reading of *The Production of Space*. The monograph was the follow-up to Soja's (1989, 39) publication *Postmodern Geographies*, in which the term "spatial turn" was coined for the first time (diagnosing a turn of Western Marxism towards spatial aspects of culture). As the title of the following book, *Thirdspace*, suggests, with Lefebvre, Soja calls for an understanding of a society as a synthesis of first space and second space.

In line with modern philosophical approaches by Charles Sanders Peirce, Gottlob Frege, and Karl Popper the difference between first and second space in Lefebvre could be understood as the material or present space in opposite to the logic or a conceptual space: Peirce (1984, 56) called it the 'indexical' as opposed to the 'iconic' sign, Frege (1960) called it 'reference' in contrast to 'imagination' and Popper divided the 'physical' from the 'psychological' world. In addition all three of them claimed that there is another realm or a third 'world' that has to be taken into consideration: Peirce named it the 'symbolic' sign, which gains its meaning only from interpretation, and Frege (1956) termed it 'thought' (*Gedanke*), which is very close to Popper (1980, 144), who described the third sphere as "the products of the human mind", to which "languages; tales and stories and religious myths; scientific conjectures or theories, and mathematical constructions; songs and symphonies; paintings and sculptures" belong.

The reason why Lefebvre also insists on a third realm or 'space' is not only because he, like Popper, thinks of the symbolic space as being a human product, but – following Karl Marx (Elden 2004) – claims that production takes place at any of the three stages (fig. 1): Physical space to Lefebvre is as much produced as imaginations are: landscapes are reworked nature and social or architectural utopias are manmade ideas. Both are in a dialectical relation and the outcome of their concurrence is the social space. Therefore, Soja subsequently addresses cultures as 'thirdspaces' – a term originally coined in postcolonial studies (Bhabha 1990, 211) – spaces that are 'real-and-imagined places' alike.

Fig. 1: Triad of Space according to Lefebvre and Soja

Spaces	Forms	Modalities	Equivalents
1st	**Spatial practice** [*pratique spatiale*]	**perceived** [*espace perçu*]	subjective │ real everyday live/nature
2nd	**Representations of space** [*représentations de l'espace*]	**conceived** [*espace conçu*]	objective │ imaginary urbanism/cartography
3rd	**Representational spaces** [*espaces de représentation*]	**lived** [*espace vécu*]	collective │ symbolic lifeworld/culture

Going even beyond Lefebvre's idea of a dialectical production of space, Soja speaks of a 'trialectics of spatiality', and this for at least two reasons: One is that the results of the imaginary (re-)production of physical space as culture again feeds back into the first (as well as the second) space by which the first space is already affected by the third (and second); the other reason is that Lefebvre describes each of the spaces as two-fold, hence as dialectical in themselves. ('Dialectics' – based on the Greek word *logos* for 'spirit', 'speech' or 'meaning' – does not literally des-

ignate a movement between only 'two', since the prefix is derived from *dia-*, for 'through' and, and not from *di-*; '*tri*-alectics,' as Soja names the process, therefore is almost a nonsensical term.)

Production of space on the first level takes place as an everyday spatial practice, in which space is at the same time not only acted out or performed, but also individually perceived: it is the aspect of a *phenomenology* of space. Production of space on the second level takes place due to the representation of (perceived) space in architecture, geography, urbanism and so forth, but is also objectively conceived: it is the aspect of an *epistemology* of space. Production on the third level takes place as the constitution of 'representational spaces' (as Lefebvre calls them) or 'spaces of representation' (as Soja calls them), i.e. *culturally significant places* which are significant due to the collective production as an interpretation or a collective reproduction as preservation of certain traditions; both of which are called the 'lived space' by Lefebvre.

Lefebvre's (or Soja's) triad of space has become very popular in the recent discussions and been used for describing the various modes of cultural production. However, confusions occurred about the model. This is not only due to the latter term of the 'lived space', which is hard to separate from the 'spatial practice' of the first level (indeed, the confusion was Lefebvre's intention as he wanted space not to be conceptualized as static, but as a process). The confusion was also because the second and third space are both attributed as 'representations.' It is especially this duplication or bifurcation that can be used to have a different look at the medium in question: computer games.
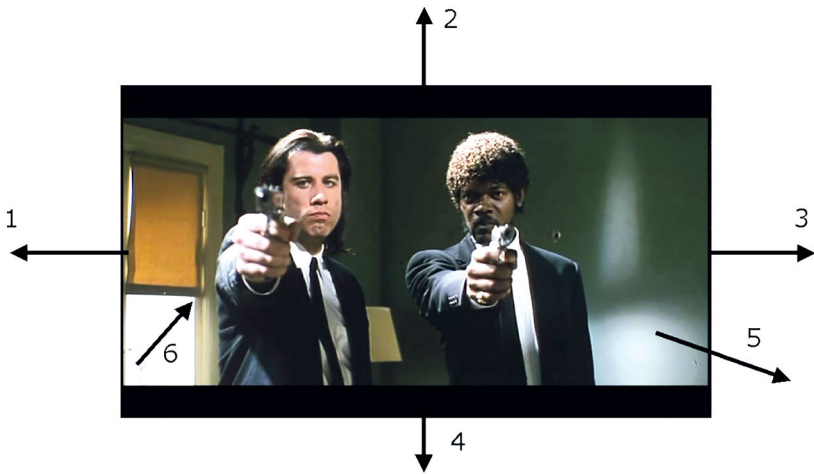
Lefebvre and Space in Game Studies

In computer games studies, Lefebvre's approach has just been used shortly after Soja's reading in 1996: In a paper entitled *Allegories of Space*, which initially was published online, the Norwegian hypertext-theorist Espen Aarseth (1998) referred to Henri Lefebvre, which makes him first to mention the theory of spatial production regarding games. However, Aarseth's paper is not the first one to discuss games in terms of space: Just the year before, in 1997, the US-American film theorist Mark J.P. Wolf published an article on *Inventing Space*. This paper, four years later also published as a revised version, can be seen as the origin of the understanding of computer games in their spatiality, even though Wolf does not mention Lefebvre at all.

Inspired by formalistic film analysis – in the tradition of the so called Wisconsin School (Bordwell 1985) – Wolf (2001) refers to the opposition of space 'on screen' and space 'off screen', invented by Noël Burch (1981) in the 1960s: He in turn is following an idea introduced shortly before by André Bazin (1967, 166), who

claimed that the "frame" of a painting "is centripetal, the screen centrifugal." Thus, Burch defined moving images not only by what is present to a spectator in the frame (*cadre*), but also to what is absent and lies outside the frame, by which its function turns into that of a cover (*cache*). The off screen-space(s) (fig. 2) is/are not identical with the space off stage in theater (the backstage and auditorium), but still belong(s) to the narrative or 'diegetic space' (Souriau 1951).

Fig. 2: Six 'off-screens'-spaces adjacent to the space on screen

However, in applying the dynamics of space 'on screen' and space 'off screen' to computer games, Wolf faces two problems, of which the second also is to be found in Aarseth's Lefebvrian approach. The first problem in Wolf's approach is the *difference between visibility and interactivity*: Computer games are not only 'representations' on the screen, but can be actively manipulated by the user. Due to the progress of computer graphics real-time rendering, it is hardly obvious nowadays that the possible manipulation of onscreen-representations matches the interactive space completely: Parts of the visible game-world might be interactive, but not everything that is digitally generated is a direct object of manipulation on the side of the user. This is more obvious in early games, like *Pong* (Atari 1972), in which the interactive onscreen-space is only a vertical line for each player, in which the representation of the ping-pong paddle on screen can only be moved up and down, but not sideways. (With the most popular phenomenon amongst this visual-interactive dissonance being the "invisible wall" [Juul 2005, 165].)

The other and for the debate at stake here more severe problem is Wolf's (1997, 11) use of the term 'representation,' in that he considers the "content" of games to be "largely representational." In line with most film-scholars anything happen-

ing on the screen is conceived of a repetition of something that has been present elsewhere (in physical space). When this understanding is applied to computer games, it leads to the almost instant conclusion that these representations lack a 'real' correspondent. Similar to films, in which the representation might have an actual basis – the actors, the stage etc. – but the fictional world itself does not exist other than in the film.

In this regard, a contradictive part in Wolf's is the passage, in which he identifies maps as a distinct spatial modality of computer games and does call them 'representations', too (ibid., 21). Thus, implicitly Wolf deals with two understandings of representation: a *first order representation* and a *second order representation*: The image on the screen and the map-mode within the game, representing the first one as an offscreen-depiction 'on screen'. Obviously both kinds of representations differ from each other different in an almost ontological way: The latter is a representation of the imaginary world, which itself would be a 'null'-representation.

Even though Wolf does not explicitly reflect on the deviating meanings of 'representation,' they hint at the two usages of the term 'representation' in Lefebvre's dialectics of space. Wolf's denomination of in-game maps as representations correlates with what Lefebvre calls 'representations of space' (on the imaginary level of production). A map (as second space) can represent a space of practice (as first space) and either help humans to orient themselves in the world or let them 'get a picture' of the space around them. On the contrary, what Wolf called 'representations' in the first place is exactly the space to which maps (in games) refer to: the first space of practice. This space rests upon the third or 'representational' space, but is not identical with it.

As opposed to Wolf, whose parallel to Lefebvre is not intentional, Espen Aarseth (2001a) in his text (published in print not until three years after its online-appearance) as well as in the simultaneous German translation (Aarseth 2001b), and as a later shortened version (Aarseth 2007), explicitly refers to Lefebvre, following the popular reading of the three spaces as firstly the physical, secondly the abstract and thirdly the social space. Aarseth hereby claims that the spatial practice in games – i.e. the first space as (simulated) *physical space* – derives from a relational space of navigation – i.e. the second space as (imaginary) *abstract space* – as well as from what Aarseth calls an 'aesthetic space' – i.e. the third space as (conventional) *symbolic space*.

At this point Aarseth's approach opens the possibility to also link the theory of computer games space with Ernst Cassirer's (1969) triad of 'mythic,' 'aesthetic' and 'theoretical space,' as the practical, the symbolic and the relational aspect of games (just as Lefebvre's original triad matches Jacques Lacan's [1978] psychoanalytic differentiation of 'real', 'imaginary', and 'symbolic'). Thus, according to Aarseth, games are allegorical representations of space; in other words: They are metaphors of space, and not space itself. 'Representation' hereby again (just like

in Wolf) means an incomplete copy or an ontologically deviant 'image' of the real world. It is 'only' a representation; and games can never depict space as it is perceived fully as it exists 'in real life.'

Since Aarseth's article on game space, Lefebvre's triad of space has been used quite a lot in game studies, notably without following Aarseth's interpretation: The first case is a paper on *Virtual Real(i)ties* that was presented for the first time on a conference in 2001 by Shawn Miklaucic (2006), who discusses *SimCity* (Maxis Software 1989) in quite a negative way as an example for a second space, i.e. as an abstract space or the representation of space. In his view the representation dominates the first as well as the third space likewise: To him there is no 'lived' (or perceived) space in *SimCity* to be found, but only its (cartographic) representation. Miklaucic hereby faces a similar problem that Wolf does when talking about 'representations' and uses the term for in-game representations and the reference of the image alike. Furthermore, Miklaucic does not seem to be aware of the fact that in *SimCity* the first space is not a map at all, even though the game world is visible in a top-down view. A map does occur in the game, too, but only as a miniature that represents the frame or cover of the first space, that is: the border between on- and offscreen space. On the contrary, the primary view is the first space of the game – the lived space of *SimCity*.

A second example is Axel Stockburger's Dissertation (2006) on *The Rendered Arena*, in which the three modalities of space are used to differentiate between the first space of the physical medium of the game device(s), the second space as the narrative as well as rule-based representations of space on the computer-screen, and the third space as the realm, constituted by the players' kinesthetic actions. An aspect that is affirmed more and more by recent approaches due to the success of alternative motion control devices, e.g. Kinect, and consoles, e.g. Wii (Juul 2009).

Another author using Lefebvre's schema in a similar way is Michael Nitsche in his book on *Video Game Spaces* from 2008: Just like to Stockburger two years before him the representation of space to Nitsche is the visible space on screen as second space. However, Nitsche separates the rule-based space – which Stockburger includes in the second space – and identifies it with the first space as the set of rules underlying secondary visual space. 'Representation' thus is understood as the visualization of otherwise invisible space. Like Aarseth, Nitsche takes into consideration the dialectic of aesthetics and knowledge (symbolic space and relational space in Aarseth), or fiction and rules (in Juul), from which the spatial constitution of a particular game arises. And like Stockburger, Nitsche (2008, 16) also incorporates the aspect of the social as a third space and claims that the 'thirdspace' is the "combination of fictional, play, and social spaces".

As can be seen from these examples Lefebvre's triad of space is a very stimulating heuristic model for a rich description of computer games (not to speak of

the possibility to easily apply Lefebvre to his original subject-matter: the urban space which now is pervaded by the virtual game space). Nevertheless, the following tries to offer another reading of Lefebvre in regard to computer game spaces, which is quite different to the ones mentioned above: *games as spatial concepts*.

Representation as Denotation and Representation as Exemplification

To do so, a closer look at what a 'representation' is (or could) be, must be taken: Besides its *ideological* meaning, in which a representation is always suppressive and dogmatic, and also besides the *ontological* understanding of representation as something that lacks reality or materiality, representation has a *semiotic* dimension. Indeed, Lefebvre himself, as indicated earlier, seems to have all three dimensions in mind, when he does not only refer to a *phenomenological dialectics* (in respect to the ontologies of space: perceived, conceived, and lived) and an *ideological dialectics* (in respect to the ways of social reproduction: biology, knowledge, and culture), but also to a *semiotic dialectics*: with respect to the first space where the lived, cultural space feeds back into the individual perceived space, Lefebvre refers to it as the realm of 'performance', i.e. where meaning is acted out. This idea originally invented by John L. Austin (1975), who insisted on differentiating between 'performatives' and 'constatives', or the *how* something is said and *what* is being said (as the content of an utterance).

Thus, the relation between the first and second space in respect to semiotics could be understood as Nitsche does: as the dialectics between the (rule-based) performance and the (onscreen) representation. Still, the question remains, what then is the difference between a representation in the second space and a representation in the third space if not understood ideologically or ontologically? Semiotically one could argue for two ways of representation. A whole book has been devoted to the problem of representation by Nelson Goodman, who in *Languages of Art* from 1968 tried to outline a semiotic approach that avoids any ontological understanding of sings. By this, images as 'mere representations' are no longer considered to 'lack reality'.

Goodman (1976, 52-57) distinguishes between representation as 'denotation' and representation as 'exemplification', being the two ways of using a sign in specific contexts: When *denotating* something, what is used to refer to an object or the 'content' of the sign, has not to be like what is referred to in respect to its appearance. For example, most words humans use to designate have nothing in common with the referred object. There are some onomatopoetic words which might resemble an object or an aspect of it: like sounds of animals used as common nouns for the species in question. But those examples are rare; most words

are symbolic in the sense that they have nothing in common with the object and thus are also not lacking its ontological status.

Another way of representation, i.e. to represent something is *exemplification*. In the act of exemplification something is used to refer to something that shares the same properties; or some of them that are relevant for the context of the act of reference. For example, when going to a hardware store, because running out of nails, one might ask for a certain type by naming them properly, this would still be an act of denotation; but if one has forgotten about the name or type, one could just show a remaining nail and ask the salesperson to hand out a(nother) package 'of those.'

Speaking in terms of diagrammatic topology, the nail presented as a sign for other nails belongs to set of objects that share properties like size or hardness, whereas they might vary in other respect from each other, concerning color or brand. Thus, a denotation is an *asymmetrical* representation (the signifier does not share the properties of the signified), and an exemplification is a *symmetrical* representation (the signifier does share the properties of the signified).

One could even say that the difference between denotation and exemplification is the pragmatic reformulation of the (ontological) difference between a sign and an image, or the semiotic (and also ontological) difference between an index and an icon: An exemplification is an image or an iconic sign insofar as it is (used) 'auto-referential(ly)' and is presented due to aspects of its appearance; a denotation is a sign or an index insofar it is used to refer to something else than what is. The symbol (as a possible act of representation) according to Goodman then is the set of all 'iconic' images (exemplifications/symmetrical) and 'indexical' signs (denotations/asymmetrical).

Poetics and Iconology of Space

With Goodman it is possible to look at computer games differently and not only conceive of them as allegories of physical space (or 'metaphors' only), which – as asymmetrical representations in the sense of denotations – do lack the 'real-being' of space, but that are symmetrical representations of theories of space, i.e. *the game exemplifying a spatial concept*. And with Lefebvre, this means taking into consideration representations of space as conceived not only as representations of physical space as perceived, but also as representations in relation to 'thirdspaces', i.e. the culturally produced space, that in which symmetrical and asymmetrical representations together constitute the 'symbolic' space, which is lived.

Gaston Bachelard, in *The Poetics of Space* from 1957, had quite a similar project to Lefebvre almost two decades later, only Bachelard starts off with the spaces produced on the cultural level, especially those described by literature (directly or

structurally). To Bachelard it is also due to this poetic spatiality that new spaces are produced at all and different perceptions of space are envisaged actively. According to Bachelard (1994), modern poets are especially aware of this power and produce alternative spaces to those inherited by the tradition. (For instance, he speaks of 'spirals' that Henri Michaux and others oppose to common literary images of rooms as container-spaces.)

Thus, philosophies of space are – in Lefebvre's schema – not only located on the conceptual level, like Geography and Physics as sciences of space, but are already the transition or from second to third space or do define the dialectics in between representations of space and spaces of representation. With Goodman a philosophy of space may exemplify a contemporary conceptualization of space, which the same time denotates (and likewise produces) physical space. Philosophical concepts of space then are not about a 'true' or 'false' *representation of nature*, but are the *expression of culture*.

This is an approach that has also been claimed by iconology, namely by Erwin Panofsky (1955), in the early twentieth century: They only called the difference between denotation and exemplification that of *iconography* (what is shown in a picture) and *iconology* (how it is shown in a picture). If philosophies are understood in the latter way as a structural resemblance of scientific conceptualizations, they offer a much deeper insight into cultural processes than they do on the level of their own argumentation. One of the first to look at philosophies that way was Michel Foucault; he conceived of philosophical concepts as diagrams, as identical in their structure to the cultural space of an epoch (Deleuze 1999). In fact, as another form of the sign, the diagram was already considered by Peirce: Something is a diagram when it is used as an iconic sign, not by resembling the appearance or visible Gestalt, but the structure or internal relation; or in Lefebvre: Something that is (used as) an image on the level of the first space is looked upon in cultural studies of thirdspaces as a diagram.

In the light of a diagrammatic reading René Descartes' (1996) dualistic ontology then is less relevant in respect to what is being said (on the performative level of a described first space) about the ego and the reflections about whether god exists or not, but how the Cartesian ontology resembles or exemplifies (on the structural level of an implied third space) the configuration of the classical era, which is characterized by a separation of reason and madness (Foucault 1965). This spatial separation is the same time present as madhouses, pestilence-colonies, hospital or prisons and structurally as the claimed separation between the *res cogitans* and *res extensa*, with the first being an intelligible non-space and the latter being the realm of pure matter. Following up this diagnosis, to Foucault (1989, 3-18) Diego Velazquez' painting *Las Meninas* then is a representational space *par excellence* as it does not only exemplify a certain ontology of space, but the same time expresses the transition from one cultural space (the classical age of repre-

sentation itself or dualisms in general) to another (the modern age of the human sciences and transcendental structures).

Games as Spatial Concepts

All in all, the proposal now is to look at computer games not necessarily as a critique of our epoch and its understanding of space, which indeed could be done. Understandings of *Tetris* (Pajitnov 1984), like Janet Murray's (1997, 144) reading, which conceive of it as a (critical) resemblance of contemporary capitalism, do work that way. But computer games could be attempted to be understood as exemplifications of spatial concepts, i.e. symmetrical representations of asymmetrical denotations or, in short, as thirdspaces or representational spaces. Computer games then are not conceived of as designating a certain space or place, but as demonstrating how a certain (historically contingent) truth of space can look like. So it is not the *what?* of space or the *where?* of place, but the *how?* of space; or its 'likeness'.

The task for an interpretation of games as representational spaces therefore is to use spatial theory for analyzing games, insofar as they express or enact spatial concepts as well as possibly contradict them. Jon Cogburn and Mark Silcox (2009, 20-21) in their book on *Philosophy through Video Games* included a chapter discussing the success of Nintendo's Wii-console from 2006 in contrast to Microsoft's Xbox 360 and Sony's PlayStation 3. They apply a similar idea to the one presented here, when they argue that very few people predicted the success of the Wii because nearly everybody's view of the human-computer interface presupposed the truth of *phenomenalism*. According to this philosophical theory, people do not directly perceive the actual world, but instead experience a realm that is a function of their own private sensory manifolds. [...] By contrast, *enactivist* theories of perception hold that human beings do directly perceive the world. According to enactivism, this direct perception is a function of the way we physically manipulate ourselves and our environments. Unlike phenomenalism, enactivism provides a compelling explanation of why Wii game-play is more realistic.
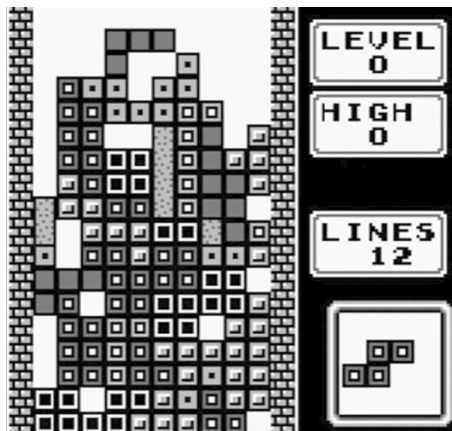
Even though the final claim of 'realism' should be doubted in the long run, Cogburn and Silcox propose the possibility that already on the level of the hardware different exemplifications of philosophical world-views are to be found: rationalistic dualism (in the style of Descartes) and embodiment (as it was brought forth by Phenomenology in the early twentieth century).

'Tetris' as Topic Space

From the Greek classical antique until the middle-ages prevailed a negative concept of space (in the modern sense). Such conceptualizations have been since characterized as resting upon a *horror vacui*, when experimental demonstrations of an empty space as 'vacuum' had been carried out in the seventeenth century by Blaise Pascal or Otto von Guericke (Grant 1981). The dominant spatial concept of antiquity rested upon the idea that the divinity of the cosmos does not allow for space to be empty ('without god'). Even though there were concepts like the Platonic *chora* (which originally designated the acre outside the city-walls), which could be understood as 'open space' or 'absolute space', this basically is a modern projection of Newton's physics onto ancient concepts (Derrida 1997). The dominant interpretation of physics can be found in Aristotle's *Physics*, where he assumes that every object has its own place (*topos*), i.e. the object occupies 'a space'; from which derives the belief, that – as there is no empty space – even air and other natural media are objects or elements (Algra 1995).
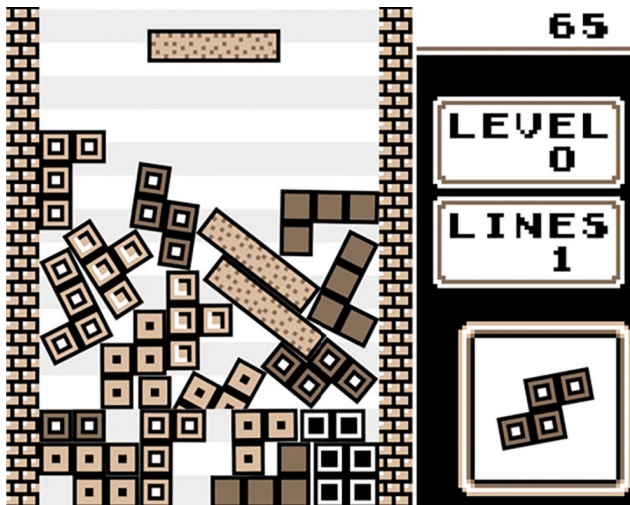
However, those topoi are not part of a greater space as an encompassing *topos* that would be prior to the objects, as Plato suggested, but that all places are 'attached' to things. In this perspective one could conceive of the game *Tetris* as an exemplification of topic space as well as of the related *horror vacui*: Even though there is something like an 'empty' space, in which things seem to move freely, that space is defined only by the shape of the objects themselves that do block out space occupied by 'air'. Each possible location is already defined and there is no way to have the tetraminos 'placed' other than in these *topoi* (fig. 3).

Fig. 3: Aristotelian space in Tetris

Even though it looks like they would fall due the force of gravitation, once they are placed, they do not move anymore, even when they would naturally fall over. In the light of the exemplification of a spatial concept, the variation *Not Tetris* (Staby-ourself 2010) then demonstrates, how *Tetris* would perform when it is an exemplification of Newtonian space (fig. 4): Blocks have no predefined places, but fall over due to gravitation. – Thus, the possible variations of the gameplay of *Tetris* is to try to enforce the modern understanding of space against the ancient.

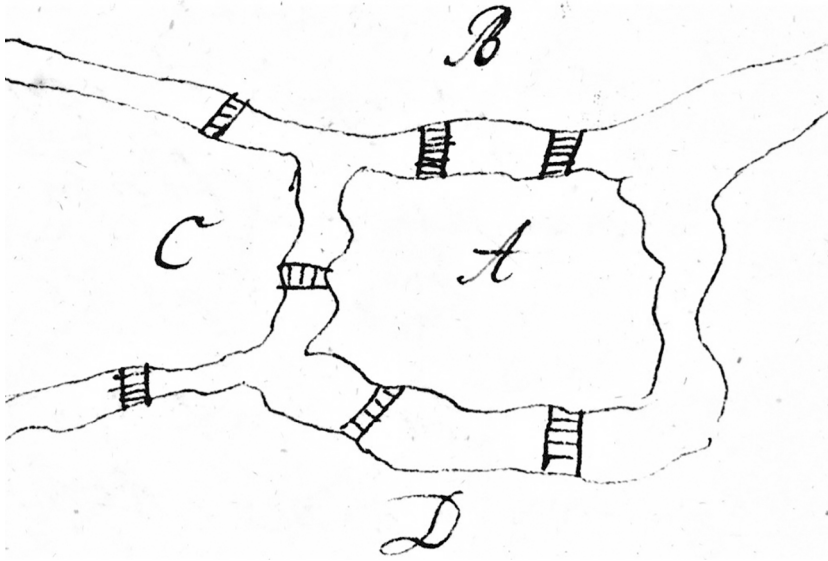*Fig. 4: Newtonian space in* Not Tetris

'Advent' as Relational Space

In difference to the topic space of the antique physics the relational space is a topological concept that stems from graph-theory, which dates to the early eighteenth century, namely the Russian-Swiss mathematician Leonhard Euler, who himself used games like chess to raise mathematical problems. In case of chess: how to calculate the possible moves with the knight and touch every square on the board, but all of them only once. Another game Euler (1995) discussed is 'Seven Bridges of Königsberg', in which the quest was to cross all seven bridges of the capital city of Eastern Prussia over the river Pregel and return to the starting point without using one of them twice, but using *all of them once*. As Euler demonstrated (fig. 5), this is impossible due to the situation of the bridges. He gave a proof for the impossibility by reducing the topography of the city's inner island, the canals and shores to a pure space or relations of points, i.e. a topological net, system or labyrinth. For such a labyrinth to be 'unicursal' always two connections (or edge) are
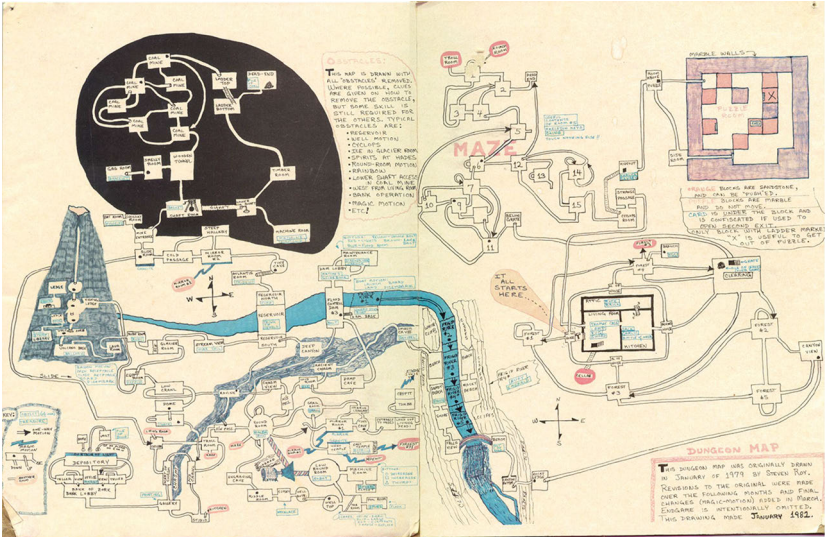
necessary between every knot (or vertex) of the graph to constitute a walk in which a return to the starting point is possible.

Fig. 5: Euler's topological drawing of the seven bridges of Königsberg across the river Pregel

Even though there is a digital game about *The Seven Bridges of Königsberg* (Grossbart 2015) that reenacts as well as varies the mathematical problem, there have been other ones earlier that already exemplified its specific spatial task: *Adventure* (Crowther/Woods 1976) and the successor *Zork* (Infocom 1980) as well as other 'text-only' adventure games do exemplify a relational space in which the task is not only to find the way to the final knot, but to also find the most efficient walk between the starting point and the ending point (as this is what is counted by the game in order for the users to compete). In fact, Newtonian space is present in *Zork* (fig. 6) as the illusion of a world, too, but mainly on the side of the pre-given descriptions and not on the side of players' actions, who can mainly give topological orders like typing "n" for 'going north'.
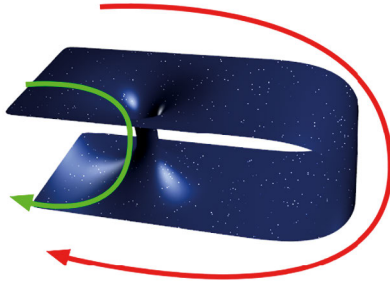
Fig. 6: A fan's drawing of Zork's *topological space*
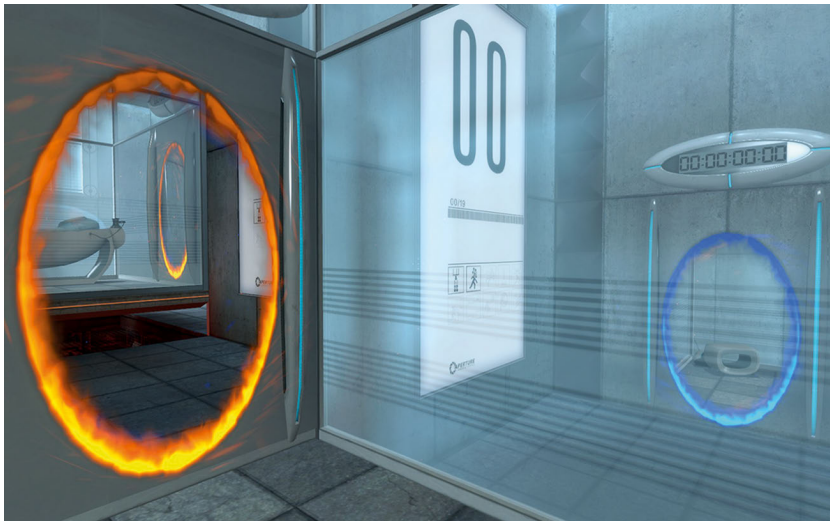

'Portal' as Curved Space

Closely linked to the concept of relational space in mathematics is the physical idea of curvature, which was considered in theories of relativity in the twentieth century and initiated by nineteenth-century Non-Euclidian geometry: As the assumption of parallels in Euclidean space could not be proven, a need for an alternative geometry gave rise to new concepts of space: Whereas for Euclid a plane was defined as the (nonspatial) surface of an object, Carl Friedrich Gauss (2005) defined a plane as a spatial object that could be curved, i.e. be in itself three dimensional (with a 'flat plane' being the special case). Applied to three-dimensional object-space itself, this means that it could be conceived of as curved within the fourth dimension (fig. 7).

Fig. 7: Curved (outer) space with portal or 'wormhole'

But as opposed to the curvature of the plane in three dimensions the curving of space itself cannot be perceived by humans, but becomes an object of speculation (Henderson 2013). Since Edwin A. Abbotts novel *Flatland* from 1882 artists as well as scientists were looking for a demonstration of four-dimensional space – not to be confused with the problem of time being an additional dimension of space, hence spacetime. One way to demonstrate this is to show the consequences of the folding or bending of space and not the curvature as such. This is exactly the situation in *Portal* (Valve Software 2007), where three-dimensional space is (hypothetically) folded back onto itself, without giving the visual impression of a curvature (fig. 8).
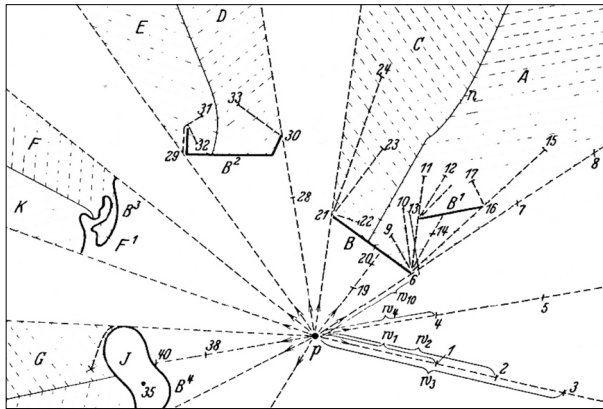
Fig. 8: Portals in Portal

'Mirror's Edge' as Hodological Space

According to the 'topological' approach of the German psychologist Kurt Lewin (1936) Euclidian space hardly ever can be experienced by human beings, since (built) physical space never allows for following a straight line from 'A' to 'B'. Instead the human 'life-space' (*Lebensraum*) is constituted by several paths (gr. *hodos*) through space. Just before seeking exile in the United States, Lewin coined a term that never reappeared in his later English publications: 'hodological space'. To Lewin (1934) it is defined by directions within a given 'field', defining accessible and inaccessible areas (fig. 9).

Fig. 9: Structure of a hodological space according to Kurt Lewin

Without referring to Lewin, Espen Aarseth (1997, 1) in his book on *Cybertext* fosters a similar understanding in order to substitute the notion of digital games and similar phenomena, usually addressed as a given 'text' with the notion of dynamic literature:

During the cybertextual process, the user will have effectuated a semiotic sequence, and this selective movement is a work of physical construction that the various concepts of 'reading' do not account for. This phenomenon I call ergodic, using a term appropriated from physics that derives from the Greek words *ergon* and *hodos*, meaning 'work' and 'path.' In ergodic literature, nontrivial effort is required to allow the reader to traverse the text.

Just like Aarseth, Lewin is interested in the actual engagement with space, yet he wants to focus on the spatial result itself as the constitution of an 'environmental psyche', less on the concrete, single and more or less random path, taken within a game. Lewin's (and Aarseth's) understanding of space seems relevant to almost all – at least action based – games, yet, there are games that do make use of the

'hodos' in particular. In difference to strictly topological game-spaces (like in text-based adventure games) the way as a certain kind of space 'in use' can be found in games that deliberately refer to the spatial practice of Parkour or Freerunning. One of the first and the most prominent example is *Mirror's Edge* (DICE 2008).

Fig. 10: Following the marked path in Mirror's Edge

In this game the path literally is 'the goal' since the foremost task of the game is to master the untypical control of the avatar, running up walls of jumping over cliffs between skyscrapers in the city's space (fig. 10). Therefore, within the game the path is marked red to show the user the ideal course. At this point, Lewin's original idea is even turned upside down, since it can be considered an approach to Euclidian space, constituted by the shortest line between starting- and endpoint. But this is not a contradiction at all: Euclidian space is the special case of hodological space, in which the straight line becomes the actual path. In his respect, it can be argued that *Mirror's Edge* is a decent simulation of actual Parkour (invented by the French soldier Raymond Belle and his son David in the 1980s), since its spatial practice also aims at using the shortest way possible between two given locations. – In the terms of Michael de Certeau's (1988, 100 and 117) seminal study on *The Practice of Everyday Life* freerunning(-simulations) can be considered the spatial practice *par excellence*:

There is a rhetoric of walking. The art of 'turning' phrases finds an equivalent in an art of composing a path (*tourner un parcours*). Like ordinary language; this art implies and combines styles and uses. [...] In short, *space is a practiced place*. Thus the street geometrically defined by urban planning is transformed into a space by walkers. In the same way, an act of reading is the space produced by the practice of a particular place [...].

'Assassins' Creed' as Horizontal Space

Before Lewin introduced his idea of hodology he in 1917 wrote a piece during his time at a military hospital, where he stayed due to an injury from a battle in the First World War. The text is titled *The Landscape of War* and is a quite irritating piece of phenomenological reflection on space. The disturbing aspect of the text is that Lewin (2009) does not address any of the cruelties happening in war, but tires to bring forth a 'neutral' understanding of spatial modalities. In particular, he differentiates between the spatial experience of a landscape in times of peace and in times of war. When in combat, space appears to have certain 'directions.' especially those of the 'front' and the 'back.' The front is, where the enemy is located, the back is where you can seek shelter within friendly troops. Quite commonly this early text is considered to be the earliest conceptualization of hodological space, yet with an interesting difference: Looking at the later concept from this early idea, the hodological structure of space would call for the absence of peace or: using space hodological is like being at war.

A peaceful space to Lewin on the contrary is a space in which all directions are equal, and the spectator is located in the center of the space from which the surroundings are contemplated. Instead of a designated 'front' the landscape at peace appears to have an 'horizon'. Whereas directed spaces can be found in a lot of computer games, most likely in first-person shooter, 'horizonal' spaces are quite uncommon. Nevertheless, there are some instances, in which space is structured a-directional. One example are instances in *Assassin's Creed* (Ubisoft Montreal 2007) when Desmond Miles climbs a tower in the city. When reaching the top, the virtual camera starts rotating around the character (fig. 11).

Fig. 11: Roofing in Assassin's Creed

Even though, *Assassin's Creed* is another example for a freerunning-simulator at this very moment it becomes another game(-space); comparable to the practice of 'roof(topp)ing', which presumably originates in Russia. Other than Parkour this method does not aim at 'practicing place', but – to rephrase de Certeau – at 'practicing space'. Roof(topp)ers do not look for the shortest connection between two given locations in the urban space, but at an experience of space as a totality.

'Doom' as Threshold-Space

As already mentioned, the directed space (of the war landscape) is the structural significance of basically all first-person shooters. But to some games of this genre there is another aspect even more typical: the threshold. As a spatial concept it was described already in 1909 by the French ethnologist Arnold van Gennep in *The Rites of Passage*. In his research van Gennep discovered a kind of constant in all human cultures: the crossing of a passage, accompanied by certain 'rites' (as the title of his book explains). Throughout history the passages become more 'metaphorical' and disconnected from their original location. The most prominent example being the rite to carry the bride over the threshold of the main entrance in the husband's home. The threshold, however, is a marker for a state of being 'in between,' especially between two countries 'on the border.' Such "zones of indiscernibility" (Deleuze/Guattari 1987, 101) used to be extended spaces in themselves, when borders where not yet marked with walls or fences. As van Gennep (1960, 19) puts it: "The neutral zone shrinks progressively till it ceases to exist except as a simple stone, a beam, or a threshold."

Fig. 12: Doom 3

Doors and other kinds of spatial (dis-)connections are to be found throughout the history of computer games (Wolf 2011). The spatial experience of a threshold, however, is very prominent in computer games that rely on scripted events. Being the embodiment of the whole genre, the *Doom*-series particularly is a paradigmatic exemplification of the threshold-structure of space, with *Doom 3* (id Software 2004) being the first one to include also (scripted) story-elements that were located specifically at passages. In most cases the threshold is marked by a door(step), which to cross is activating the combatants on the other side. In most cases the door then gets blocked and the reverse movement is impossible (fig. 12) (just as it is the case with ritual crossings into the next 'state of being').

'Ghost Recon' as Intentional Space

Speaking of first-person shooters one could argue that already before the emergence of computer games the subjective perspective as the typical European mode of depiction in art since the Renaissance (Kemp 1990) is an exemplification of what towards the end of the 19th century has been called 'intentionality'; namely the directedness toward the object, by which the distortion of pictorial space is in compliance with. The main protagonists of this approach to space as a foremost perceptional being can be found in the Phenomenological movement and its leading figure Edmund Husserl. From his teacher Franz Brentano Husserl (1999) adopted the idea that the way things are perceived differs from the way they are in the physical world. Under the premise of perception being only accessible to the subject, Brentano (1973, 102) names the "*intentional in-existence* [...] a distinguishing characteristic of all mental phenomena", with intentionality being defined as "the reference to something as an object" (ibid.). This means, that to Phenomenology consciousness is structures as an orientation towards a thing immanent to perception. The most famous illustration of that insight was drawn by Ernst Mach (1914, 18-19) shortly after Brentano, alongside a corresponding description:

Fig. 13: Ernst Mach's first person-point of view

My body differs from other human bodies beyond the fact that every intense motor idea is immediately expressed by a movement of it, and that, if it is touched, more striking changes are determined than if other bodies are touched by the circumstance, that it is only seen piecemeal, and, especially, is seen without a head.

Mach's image entails an important hint on a strange doubling that appears in many – if not most – visualization of the first person's point of view: Like in a regular first-person shooter in Mach's drawing it is the central item in the hand of the ego: Mach holding a pencil or the shooter holding a gun. This common, yet disturbing inconsistency lies in the duplication of the object being an object (or 'content') of perception, but at the same time its precondition. In the case of Mach's drawing the right hand is holding a pen that seems to be drawing exactly the image one looks at (being Mach's point of view), but the paper on which the image is drawn is not visible in the image, other than being the background of the drawing itself (by which the pen would need to be between the viewer and the head of Mach).

Fig. 14: Intentionality in Ghost Recon

The same applies to first-person shooters, which usually exemplify depict a hand with a gun, whereby the same time the image itself is the view through the gun or the gun's crosshair (by which the gun itself would not be visible). Henry Jenkins and Kurt Squire (2002, 65) therefore describe the first-person view in shooter games as the "through-the-gunsight perspective". The – almost – consistent depiction of the subjective view being intentionally related to the object in sight (and not to the seeing subject) can be found in the sub-genre of sniper-games or in tactical first-person shooters like *Tom Clancy's Ghost Recon* (Red Storm Entertainment 2001), where the seeing ego itself is not its on (intentional) object of perception (fig. 14); the only, typically (Galloway 2012), contradicting moments being the elements of the interface, like the mini-map and the health-bar.

'Max Payne' as Heautoscopic Space

The contradictions to the interface as well as the paradox of the hand can be subsumed under what in narratology, following Gerard Genette, is called "metalepsis" (Galloway 2006, 34). However, it is not the traditional kind of metalepsis that can be found in novels, theatre or movies, when a protagonist addresses the audience directly by breaking the 'fourth wall' – even though this phenomenon occurs in computer, too, like for example in *Zork*, when the user is addressed directly as 'you,' whereby he or she is telling the avatar the same time to do something as a disjunct person (Neitzel 2008). In computer games as exemplifications of spatial concepts the metalepsis occurs in particular as the disjunction of the point of view,

of the user or the image per se, and the "*point of action*" (Neitzel 2005, 238), of the avatar controlled by the user.

This is the case in most of the so-called 'third-person shooter,' which attribution actually is misleading: The particularity of this genre is not the third-person view as such – something that is the case in platformers, when controlling a character like Mario – but the mix of a first-person experience with a "following camera" (Nitsche 2008, 96). This mix usually is not witnessed as a disjunction, but can occur as a disturbance, when the character is injured or intoxicated and not only the avatar on screen is tainted in blood of moves strangely, but also the screen turns red or becomes blurred. One of the games, where the effect (fig. 15a-b) can be found is *Max Payne 2: The Fall of Max Payne* (Remedy Entertainment 2003).

Fig. 15a-b: Heautoscopis space in Max Payne 2

Without being mentally deranged, users of games here can look at the possibility of a psychopathological experience that Karl Jaspers (1997, 92) addresses as "heautoscopy": in difference to regular autoscopy the patient hereby does not only view him- or her-self from outside (as looking at another person), but still has the bodily sensations of the first person (especially pain). This worst of all out-of-body- or *Doppelgänger*-phenomena is neither caused by this kind of games, nor can it fully be simulated. Nevertheless, it exemplifies the typical – schizoid – spatial structure of this form of perception.

In regards of the history of philosophy it can further on be observed that this kind of splitting of the self is a concept that occurred in the epistemology of the 18th century, namely in Immanuel Kant, who thinks of the subject as a, as Michel Foucault (1989, 347) put it frankly, "empirico-transcendental doublet": Just like the hand of Mach's ego or the gun of the shooter is content and precondition of the spatial representation the same time, the subject here is the (empirical) matter of experience and the same time the (transcendental) precondition of perception as such. Again, this is neither a claim for Kant's concept of the self being true for all human beings or being true only for psychopathologies, it only is claimed that

computer games can exemplify philosophical concepts – maybe more accurate than any other medium.

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