Boards, Outer-Space, and Freedom in Video Games.

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Introduction

This paper introduces in seven paragraphs some findings in the ontological research applied to games, as part of a research in collaboration with the Labont center (laboratory for ontology) of the University of Turin. An ontological model of spatiality deduced from its historical evolution leads to a reflection about the relation among space, place, territory and map in video games. This also involves a formulation of a taxonomy of board types (both in board and in computer games) and a conceptualization of six degree movement and outer-space setting as concrete instantiations of the general freedom goal of games.

1. The centrality of Spatiality

According to many scholars, the core of computer gaming is related to the representation of space. For example Espen Aarseth has stated that "the defining element in computer games is spatiality" [Aarseth 2007: 44]. But why this centrality?

In one hand the large majority of computer games is constituted by video games, and many neurological [Marr 1982] and phenomenological [Husserl 1907] approaches relate the human conception of space mainly with ocular vision. In any case, as the same Husserl points out, the visual perception is necessary but not sufficient to the constitution of our transcendental conception of spatiality. We need also movement, not only that of the perceived things, but also our movement around the perceived objects and ultimately within a set of bodies.

This can elucidate the statements of Aarseth about the interactive spatiality of video games, which according to him is an allegory of physical spatiality. Video games constitute a spatially-oriented medium because they combine the main three elements of our naïve spatiality: visual perception (shared with other visual media such as photography, painting, etc.), movement (shared with other kinematic media such as cinema, ballet, etc.) and the interaction that gives to the player the material possibility of exploring the represented visual movement (shared with games in general, not only computer games).

2. Which ontology for games?

In this essay we will use ontology in order to investigate the relation between computer games (above all video games) and some concepts related to spatiality. But what is an ontology?

According to Zagal "an ontology is different than a game taxonomy in that, rather than organizing games by their characteristics or elements, it is the elements themselves that are organized" [Zagal 2005a: 2]. This aim could seem too ambitious and many authors consider impossible to draw a good ontological model of games: they normally cite Ludwig Wittgenstein, who noticed that there are no objective properties shared by all games [Wittgenstein 1953]. The Wittgenstein's lesson is considered as a checkmate for our research field, but we can capitalize it by using the filter of the logician Saul Kripke [1982]: if there are no objective and shared properties in all the activities that a player can call "games", hence the shared property is constituted by the player herself. Therefore, in order to understand what is a game and what is not a game we have just to ask to the players: so the constitution of a game depends on the intentionality of the players, which varies from context to context. Under this perspective, the most important type of ontology that can investigates games is the ontology that investigates the intersection of what different players call "games": i.e. a social ontology.

Let's see an example of an attempt to draw an ontology of space in computer games. Zagal argues that "we often find games where the point of view describes a space that is different from what the representation suggests" [Zagal 2005a, p. 10]. For example, he continues, "all the characters in the game are rendered in a style that makes them appear as three dimensional objects but they only act in two dimensional ways, as is the case of Super Smash Bros Melee [2001]". This correct observation leads Zagal to distinguish a cardinality of the space of gameworld (that in the case of Super Smash Bros Melee is 2D), a cardinality of the represented space (in this case 3D), and a cardinality of gameplay (in this case in 2D again). According to Zagal, the cardinality of gameplay "is defined by the number of axes that the player can use to move entities around. (X, Y, Z), i.e. side to side, up and down, back and forth. This term only refers to the movements the player can perform [within the Gameworld], independently of other actions or the effects they may have in a different dimension (e.g. shooting)" [Zagal 2005b: 2]. So, for example, Space Invaders [1977] has a 2D gameworld, a 1D gameplay and a 2D representation.

Zagal refers to an objective and clear distinction between gameworld and gameplay, but often it relies in a subjective perception: for example in Canabalt [2009], a platform with infinite side-scrolling, the player can feel the gameplay level of spatiality both as 0D, 1D or 2D, depending on the her type of identification. In Canabalt, the avatar automatically runs towards the right side of the screen and the player, simply by clicking on the screen, can choose when the avatar jumps. The cardinality of gameplay can be perceived as 1D (jumping vertically towards the top of the screen), as 2D (jumping vertically towards the top of the screen also changes the horizontal direction towards the right of the screen) and even as 0D (after all, the player does not move the avatar, but he simply click on the screen). The level of the identification of the player (who am I?) changes the level of gameplay cardinality. The same is for any other game where the movement of the avatar does not depend on an analogous movement of the player. For example, in Patapon [2007] the avatars attack the enemy if the player pushes the buttons with the rhythm of the music. Also the sprite of Street Fighter II [1991] combines an analogous movement (if the player moves towards left the stick, then the avatar moves towards left) with a conventional movement: in order to kick the player has just to push a button. Many game features depend on player intentionality, so an ontology of games must also involve a social ontology of games.

3. An interactive magic circle

Re-framing the Kantian definition of play, the philosopher Hans Georg Gadamer [1960] has written that play is an oscillatory and free movement. On the contrary, Huizinga [1938] has defined play as an activity separated from the serious life by the means of a magic circle. Therefore the notably game studies authors Salen and Zimmerman have combined these views defining play as the "free movement within a more rigid structure" [Salen and Zimmerman 2004: 304]. This describes very well the interaction between player (free movement) and game (rigid structure).

The social ontology of games hence defines games as a combination of both interaction and fiction [Mosca 2010]. Indeed the psychology of development [Winnicott 1935, Vygotskij 1933, Piaget 1945] shows that games are microcosms which satisfy a subjective desire of freedom by an objective magic circle that separates them from reality [Bateson 1955]. The fictional frame is important because delimits an alternate place where desires can be satisfied. So the gaming relation with spatiality is primarily fiction-relative (magic circle) and hereinafter interaction-relative (movement) and its general goal is related with freedom.

If we assign a magic circle to a territory, we constitute a playground. Some playgrounds are well defined, as those of sport fields, but other games are focused onto a continuous act of defining the magic circle, such as the *parkour* races and other pervasive games: in these games the magic circle is a sort of horizon that follows the actions of the player instead of determining them. In any case all games, also the pervasive ones, require a magic circle enabling a form of interaction. Some games, such as those involving roles, emphasize the fictional aspect, whereas other games emphasize the concrete possibility offered by the surrounded place, i.e. the interactive movement. Computer games mainly are focused on this second element and in particular with the movement which links a particular place to a more general concept of space. But in order to go deeper in the analysis we need to outline a basic ontology of spatiality.

4. A basic model for spatiality

The nature of the universe is bodies and void
[to pan esti somata kai kenon]

Epicurus, On Nature, 30

Ontology of spatiality has a limitless literature. But even to build a very limited model of it, with the purpose of analysing some particular aspects of video game spatiality, it is necessary to give a look to the main philosophical findings on this topic.

Many concepts of spatiality marked the history of Western thinking. According to the main Pythagorean scholars, such as Archytas, there is a "place for all the bodies", which is a sort of concrete void (κενόν). This is very near to the Atomist conception of Democritus, according to which the universe is made of atoms and the empty space that allows their movement. The real presence of void is a conception shared by Pythagorean scholars and Atomists, but it has been early faced by the most important ancient Greek philosopher of his time, Parmenides. According to him, the world is one being, whole and completely full, so that movement and change are just appearances. This leads to a negation of the existence of an empty space, because it would a nothing, but "only being exists" and "nothing does not exist". This does not mean that for Parmenides there is no space, but just that to him space is not differentiated from concrete things. So for Parmenides also the change and the movement are impossible, because they would involve the presence of nothing between a state and another. Indeed his most important pupil, Zeno, conceived many paradoxes which demonstrated that the empty space among things is not rationally conceivable without a logical contradiction.

The later Greek conceptualization of spatiality tried to combine this views. For Plato, there is an empty space (χώρα) which is not among concrete things, but between the material realm (which is a whole completely full) and the supercelestial realm of abstract ideas. This χώρα is a sort of medium which actualizes the ideas into objects. And also Aristotle solved the Eleatic paradoxes of Zeno by introducing a double nature of spatiality: potential space can be conceived as empty and infinite, whereas actual space is just the collection of bodies, each of them contained in its invisible shell, the place (τόπος). The "where" related to τόπος is one of the main ontological categories and Aristotle accepts the rational possibility of movement as a passage of a body from its place to another place, without really involving a generalised space: "everything remains naturally in its proper place" [Physics, 212b: 34-35]. So for Aristotle the only real spatiality is related to places, which involve the presence, the perception and the interaction of the subject, and not abstract concepts like that of potential space.

The Aristotelian solution has been adopted by physicists until the Renaissance, when Tycho Brae demonstrated that the orbits of celestial bodies cross themselves (so it is probable they move within an empty space). Following the Brae's solution of the problems of Copernicus's system, and combining also the theological geometry of Nicolaus Cusanus, Giordano Bruno theorized space as a pure container, an infinite, empty, uniform and indivisible unicum. On the same direction, Galilei stated that the primary quality of things are the abstract measures of geometry, which senses cannot catch. Also Descartes applied to physics the geometric conception dating back to Euclid, conceiving space as pure extension. According to Euclid, indeed, the geometrical space is a three-dimensional vacuum resulting from an axis rotation of the flat plane. This geometric conception was for Euclid just an abstraction, an infinite unicum, continuous and homogeneous, fictitious but useful for calculus. Almost two thousand years after his theorization, this epistemological tools have been applied as ontological categories. Also inspired by the last of Neoplatonics, Damascius, who, commenting Euclid's Elements, defined space as the measure of the positional relation of the parts of an object or of an object relatively to other objects, Newton based his theory of gravitation on void, the *sensorium deii*, an empty space hosting the matter and its force.

This ontological conception of space was criticized by the English and the Scottish empiricists, who led Leibniz to conceive the absolute space of Newton as a pure abstraction derived from the conceptualization of movement, which instead is simply a change of relation between concrete bodies. This empirical renovation of the epistemological approach encouraged Kant to find a solution to the debate: according to him the absolute and Newtonian space is an *a priori* psychological category that founds our perceptual experience. We can say that Kant has put together the place of Aristotle with the absolute space of Newton into his *a priori* category of spatiality.

According to the historicist Edward Casey "in the era that stretches from Aristotle to Newton, place lost out to space" [Casey 1997: 334]. Also Foucault [1986: 22] noticed that the modern era, which is the age of Gutenberg, Colombo, Morse, Marconi and Berners-Lee, all inventors of new methods for enlarge the human connection and communication, has been "above all the epoch of space", of simultaneity, of juxtaposition of near and far, because of the scientific description and the mass media diffusion.

A first attack to the concept of absolute space has come from physics. Kant could not know the theoretical possibility of non-Euclidean geometries, which can conceive space, e.g., as curved (Gauss). Few decades after the systematic study of curved geometries (Riemann), also physicists theorized a real curved space (Poincaré) that has been included in the Einstein's theory of relativity, that conceives space as dimension not distinguishable from time, both influenced by the presence of concrete matter: "the concept of *empty space* loses its meaning" because "physical objects are not in space, but these objects are spatially extended" [Einstein 1920]. Against the modern concept of space, some intellectuals of 20th century proposed a "revalorization of place", such as Heidegger, with his expansive view of place as dwelling, nearness, and the event of appropriation. According to Heidegger, the Da-Sein (that means being-there) is "the place which Being requires in order to disclose itself" [Heidegger 1959: 205]. The relation between the Da-Sein and the place is tied to the fact that many phenomena which involve the subject (like, for example, *left* and *right*) cannot be explained by the reference to the concept of space, but rather only to the facticity of place.

So in the 20th century, "despite the seduction of endless space […], place is beginning to escape from its entombment in the cultural and philosophical underworld of the modern West" [Casey 1997: 339]. The Husserlian phenomenology and the Heideggerian hermeneutics conceived space as a conceptual absolutisation (Sein) of the experienced place (Da-Sein). In this view, place is then the environment where the subject is inserted, seen from the point of view of the subject and with which the subject interacts. Space, on the contrary, is the abstract representation of all places from the point of "view from nowhere" [Nagel 1986], which we can normally ascribe to a descriptive, sometimes scientific, representation.

By this short history of the concept of spatiality, we can divide theories in *materialist*, conceiving space as something external that we can directly perceive with our eyes, in *realist*, conceiving space as something external that we can directly perceive with our mind, in *transcendentalist*, conceiving space as a structure of our mind, and in *nominalist*, conceiving space as an abstraction of our physical experiences. But in order to build a model for the study of space in computer games we cannot follow just one of this rigid theories. Our goal is inscribed in a socio-ontological frame: social ontology studies time primarily as calendar and space as it is defined by society: sacred or profane, public or private, real or ludic. So the space of games can be studied from the point of the view of those who constitute it, the players.

In ludic spaces the normal coordinates can vary from game to game, but in regulated games we can find some explicit constraints that bind the behaviour of the interacting players. These constraints define the ludic space by differentiating it from a conception of space that is shared by players in a naïve and common sense as related to reality. This naïve spatiality is well investigated by the *naïve physics* founded by Paolo Bozzi [1990] on the path sketched by the Gestalt phenomenology. According to this commonsensical conception of spatiality, there are two fundamental axis (place and space) and two appendixes (territory and map):

PLACE: it is a subjective portion of the universe. This experienced environment, from the point of view of the subject, is objectively existent and provided of uniqueness.

TERRITORY: it is an objective portion of the universe. According to Varzi and Smith [2000] this conceived environment can be bounded by intrinsic properties (ontological features) or by epistemological tools (socio-ontological features).

MAP: it is the objective representation of a single territory. It is not a simple picture, because it represents a territory taking into account some properties of a territory, such as altitude, relative distance, the presence of houses or roads, etc. with a systematic method. There are many possible maps of a single territory.

SPACE: it is the objective and abstract representation of all territories, grasping their shared properties.

Map and space try to be objective representations of objective territories. The possibility of an objective representation of a single experience or of the collection of all experiences is a matter investigated by phenomenology, which is not our interest here (like the meta-subjective representation of places).

The subject, in our case the player, can make experience only of places, but her conception of territory (a mental map, or even the abstract concept of space) can influence the concrete movement of the player within her lived experience. Indeed not only the use of maps (mental or concrete) is widespread, but probably our native mental model of reality is a sort of map. A clue of this is the naïve representation of children in early drawing: in their sketches the representation of the binaries depicts them as parallel. This is a representation of the mapped model of reality as we conceive it, and not the representations of our concrete perception , which would depict binaries as convergent.

From this basic ontology of spatiality, there are three issues related to computer games which constitute the following paragraphs of this paper. One is related to boards, another to outer-space and the final one is related to a double concept of freedom.

5. The space of place: the boards

The gameplay representations of video games can be defined as places for two reasons: they are coherent and subjective experiences, and moreover they involve the possibility to interact with them, primarily through actions (e.g. jumping) which are completely different from the actions required in order to interact with the real place hosting the player (e.g. pushing a button). In the large majority of video games, the gameplay representation puts the player in a *place* through the medium of an avatar. But the subjective experience of environment is the focus also for games without an avatar: here the player is directly immersed in a new environment, which can reproduce the subjective point of view (in FPS like Doom [1993]) or a totally abstract environment (e.g. Tetris [1986]). But what about games like CMS (e.g. SimCity [1989])?

In order to give an answer we have to investigate what is a game map. We have seen that the assignation of a magic circle to a territory constitutes a playground and that a map is an objective representation of single territory. A game map is then a portion of the playground that represents some parts of the same playground. A game map can also represent the whole playground: it differs from the game space because the latter is not a graphic representation of a territory (like a playground) or of a collection of territories, but a propositional representation of all the possible territories. There are no games which implement this game space for the experience of the player: maybe it is just part of the code of the program.

According to Wolf, maps are "on-screen representation[s] of off-screen space[s]" [Wolf 1997: 21]. but the relation between the representation of the map and the represented territory is not a simple relation between seen and unseen: the seen spaces can represent the unseen spaces (e.g. black voids representing unexplored areas in Sid Meier's Civilization [1991]) without constituting a map. Indeed maps depict portions of playground which in normal gameplay are off-screen.

But there is a particular type of map that does not represent what is off-screen. We know that the division between on-screen and off-screen is primarily due to the segmentation of the playground in different frames of gameplay. Indeed according to Zagal the "discrete segmentation occurs when the screen contains one fragment of the gameworld, which the player navigates; when she reaches the limits of that fragment, the screen refreshes to a different segment of that space. [...] This segmentation may also affect the gameworld, e.g. the player character can move from one segment to another, but the enemies will not follow the character to the next segment" like in Prince of Persia [1989] [Zagal 2005b: 3]. The segmentation described by Zagal is a division of the playground in different places that the player can experiencing. The normal game maps represent a portion of playground without giving direct access to it. On the contrary, there are some maps, named *boards*, that give direct access to the territory they represent.

The function of normal maps is very different from that of gameplay and also their graphic style (on-screen) is very different from the gameplay graphics (on-screen): in 3D games, such as Doom (1993), the difference is clear: the perceived *place* where the avatar is located is visually depicted with a vanishing-point perspective, whereas the map is visually depicted with Euclidean geometries. Wolf expresses this feature of maps saying that they are "not spaces in and of themselves" (what we named *places*).

On the contrary CMS games like SimCity or many geolocalized games as Ingress [2012] make use of maps as the main gameplay view. In this case, the place where the player is immersed is constituted by an interactive map combined with a set of menus, which directly allow the interaction. Here the objective representation of the territory (map) and its subjective experience (place) are coincident. This particular type of place is the board. A board is a game map which not only *represent* the playground, but which *constitutes* it. According to Walz, the board is the playground that abstracts all other physical spaces, but it is still a physical space in itself. So a board is both a place (playground) and a map (representation of territory). In a sense, boards are spatialised places.

Also the spatiality of a game like Pac-Man [1980], the presents an avatar, is totally based on a board. But we have differentiate some types of boards. There are concrete boards and abstract boards. In the games that use concrete boards, such as SimCity (or tabletop board games such as Risk [1957] and Warhammer [1983]), the place of gameplay is a map which represents a territory existing outside its representation. In games using abstract boards, such as Pac-Man and Chessmaster 2000 [1986] (or tabletop board games such as Chess and Go), the place of gameplay is a map which does not represent something external. Abstract boards are still maps not only because they use the stylized graphics normally used in maps (a stylized environment is also that of Tetris), but because they are representations of an objective territory (and simultaneously they provide a place for gameplay). The fact that many boards have a discrete spatiality, sub-divided into a segmentation of squares or hexagons, highlights the difference between spatial representations and spatially useful representations:

unlike card games such as Poker, the board constitutes a place where players have to move (or to... place) pieces with a look to their spatial relation, a place that is bounded and recognizable, and often depicted as an objective and external territory.

The difference between abstract and concrete boards is not the only one. There is an additional difference between video-game boards and board-game boards. Chess are the best example, because of their many computer *and* tabletop versions. In tabletop chess, the players have to obey to some rules, whereas in computer chess, like in almost every computer game, the players have just to interact with some material affordances, without the possibility of cheating [Jørgensen 2003, Mosca 2011, De Leon 2011]. Therefore it is false what Nitsche states about a supposed virtuality of game spatiality: "the fictional space of a video game is an imagined space that lacks the physical and nature-dependent quality of theme parks" [Nitsche 2008: 13]. Indeed this cannot be true: the relation between the actions of the player and a computer chessboard (or the Mario's platforms) is determined by some physical properties, unlike the relation between the actions of the player and a physical chessboard (which instead are determined by some prescriptive rules).

Computer games are then analog environments (like cinema), whereas tabletop games are digital environments (like literature). Therefore, in computer chess the board is a concrete place-to-interact, an environment where the player is inserted. On the contrary, in tabletop chess the board has the main function to represent the mind interaction between the players. Indeed it is possible to play tabletop chess without a tabletop board, simply communicating moves with a propositional language (mail chess, spoken chess, etc.). So we can say that the board of tabletop chess is a pure mind-place and its physical counterpart is just a representation of this mind-board, a sort of play prop [Walton 1990]. On the contrary, it is not possible to play to a computer chess via propositional language: we have to interact with a physical board that implement some objective spatiality. It is more than a prop, it is a concrete affordance.

This leads to an apparent paradox. Because of its mind-dependency, the board of tabletop chess is a *digital* board (a place constituted by a map which interaction is governed just by the discrete states of the propositional mind). On the contrary, the board of computer chess is an *analog* board (a place constituted by a map which interaction is governed by its material affordances).

For completeness, we have to analyse also the case of computer chess that are not video games, because they lack a display. This is the case of Deep Blue [1998], which did not enforced concrete moves, but only suggested the moves that were executed by a human on a physical chessboard. Also this type of chess is propositional and mind-dependent. Anyway the concrete instantiation of place in computer games is not always related to the visual element. According to Zagal "the screen is the basic unit of space in *video*games, since it frames the interface" [Zagal 2005b: 3]. Zagal, like other authors, analyses only *video* games. But there are also audio games (such as Dog and Cat and in a certain measure Zombies, Run! [2012]) and move games (such as Johann Sebastian Joust [2011]) which include a certain type of spatiality.

Move games are played directly into real places, without any form of representation. The audio games which I refer are not based on music or rhythm, but on a territory defined by noises in which players can move. In Zombies, Run! is the real movement of the player to determine his movement onto the board defined by noises. In Dog and Cat instead the relation between the player movement and the (invisible) avatar movement is due to a classic button interface.

6. The place of space: Outer-Space

Termine, sive lapis, sive es defossus in agro
Stipes ab antiquis, sic quoque numen habes.
[...]
Tu populos, urbesque, et regna ingentia finis:
Omnis erit sine te litigiosus ager.
[...]
Gentibus est aliis tellus data limite certo;
Romanae spatium est urbis et orbis idem.

Ovid, *Fasti*, Book II, 639-84

In this passage, Ovid celebrates Terminus, the Latin God of spatial limits. His name comes from the milestone (terminus, in Latin) and Terminus represented the limits of Empire, always trespassed by the Roman expansionism. *Romanae spatium est urbis et orbis idem*: the temple of Terminus was the symbol of the entire space: the space concentrated in a place. We will see in which sense some video games constitute a modern instantiation of Terminus.

In the Western media of 20th century, the representation of the interstellar space (the outer-space) has been often used as the metaphor for the human ability of going beyond the human limits. With its combination of exploration of new frontiers and of absence of constraints for physical movements, outer-space has become the symbol of *freedom* and the synecdoche of the entire *space* (the part for the whole). Outer-space has risen as the main allegory for the concept of the abstract space: this de-localized place embodies the concept of objective realization of the subject's freedom. According to Walz [2010], outer-space "is the location of infinity and its allegory" because it presents six degrees of freedom and it can be universally understood without other visual elements than itself. We could say that outer-space is the place where space can be directly-experienced as *pure movement*.

Gadamer, explaining the concept of play (*Spiel*), refers it properly to the concept of a free and pure movement. Hence it does not surprise that early video games used so often the interstellar setting: the videoludic medium, involving interaction, amplifies the experience of movement inherent to every representation of outer-space. It is perhaps the artistic expression most adherent to the concept of freedom.

The 20th century inherited from the 19th century the positivist conception of infinite progress of humanity. This has led artists to search solutions to represent future: during the past century, the most widespread image of future as been that of spaceships. The outer-space setting has been abandoned by SF literature only when humanity reached the Moon: this event also coincided with the advent in the large market of the computer, that has arisen to be the new symbol of future. Video games have been the first computerized medium to carry on a representational level, so they contributed to the change of paradigm in the symbolization of future, marking the passage from outer-space to computers.

This also marked the evolution of computer graphics, starting from Spacewar! [1961], Galaxy Game [1971] and Computer Space [1971] (which were basically the same game, but during this early years nobody ever thought to change their setting). The videoludic history of the research of free movement passed from the 2D representation of early outer-space video games to the six degree freedom of 3D graphics.

The very first instantiation of a graphic representation of space in computer games was that of checkers simulators, which printed out their moves on punched cards, a representation that we could define 0D, because of its propositional form. But there are many other steps that conducted towards the polygonal and stereoscopic 3D of WipEout HD [2008]. But the first real *video* game, is OXO [1952], which uses a 2D representation of a grill where to play Tic-Tac-Toe. The continuous and physical movement has been implemented by Tennis for Two [1958] and cited Space War [1961]. In 1974 Maze War and Spasim (i.e. "space simulation") represented a 3D interactive space, also if the interaction was not in real time: a series of static images gave the feeling of movement. (exactly like in Myst [1993]). The first attempt to represent a 3D space in movement is Interceptor [1975], of the author of Space Invaders, Tomohiro Nishikado, that using the size scaling permitted to increase or to reduce the distance of the object from the point of view of the player. Night Driver [1976] presented an environment which was reactive to the movements of the player. Star Raiders [1979] introduced a free-roaming explorable environment, and Battlezone [1980] used this format with a three-dimensional representation of objects in vector graphics. Space Tactics [1980] introduced scrolling, and SubRoc 3D [1982] introduced the eyeglasses stereoscopy. Flight Simulator [1979] presented a coherent simulation of the three-dimensional space, but not very focused to perception: the point was instead a realistic simulation of causes and effects, without a believable visual output. Its nemesis was Astron Belt [1983], which 2D pre-rendered graphics (and in many cases not-rendered, but filmed directly on celluloid and just transferred on laserdisc) recreated in a detailed manner the believable, but not interactive, perception of a three-dimensional space. Zaxxon [1982] introduced an axonometric (isometric) projection, and Moon Patrol [1982] used parallaxes. Star Force [1984] applied parallax to sprites, and Parallax [1986] applied it both to sprites and background. In Intellivision World Series Baseball [1983] many different points of view of the same place were recreated in order to simulate the television cameras. The first game with polygonal graphics is Hard Drivin' [1988]. In some years, the precise reproduction of space was substituted by the variation of its laws: Super Mario 64 [1996], Super Mario Galaxy [2007], Portal [2007].

The evolution of outer-space graphics evolved also the cardinality of player movement, passing from 1D (Space Invaders) to 2D (both in the vector graphics of Asteroids and in the bitmap-raster graphics of Zaxxon) and to 3D (both in the vector graphics of Star Raiders and Elite or in the polygonal graphics of Star Fox [1993]). Video games abandoned the outer-space as main setting when computer graphics evolution reached the possibility of a fluid free movement in six degree of freedom. Some technical advancements, like the introduction of GPUs able to manage T&L with pixel and vertex shader (which produced a rendered and real time photorealism during interactive game phases) and the spread of graphic engines, led the developers to focus no more on the reproduction of human perspective, but rather on the variation of their space-time coordinates (as in Portal, Braid [2009], Echochrome [2008] and Fez [2012]). The same occurred in painting after the introduction of photography, with the avant-gardes (Gehlen [1960]).

So we can say, finally, that the 3D outer-space video games combine the six-degree experience of freedom with the outer-space setting as a cultural synecdoche for the concept of space. So they could be considered as the final transfiguration of the concept of abstract space into a material experience of place.

7. Freedom: from movement to choice

We have seen that game is often defined as a free movement in a more rigid structure. The video game interaction is concretely instantiated by the dialectics of place (the experienced environment from the point of view of a subject) and space (the objective and abstract representation of all places). Players perceive movement as the friction between the place of the subject (*ground* as point-of-view, player) and the space of the object (*sky* as void, game). In this metaphorical language we could say that the activity of play is the change of the horizon that connects and divides the ground of place and the sky of space. This is recognizable in the movement as experience (subjective place) of freedom (objective space).

In video games the instantiation of movement is mainly material interaction and perceptual illusion of freedom. Indeed the gaming interest for space is not intellectual or scientific, but related to experience: in video games, the abstract space is simulated just to be experienced as a place. This is outlined also by selling comparisons: the concept of space as ontological simulation of reality, e.g. in games like Falcon 3.0 [1991] (100.000 copies), had less success than the epistemological reproduction of human perception, e.g. in games like Rebel Assault [1993] (1.000.000 copies). The market success of believable graphics instead of realistic graphics emphasizes the fact that, as Nitsche puts it, the ludic simulations are not focused on the reproduction of an objective reality (space), but on the subjective perception of what is real (place).

We can say that in Western video games freedom has been the main focus. Because of the visual nature of video games, it has been instantiated primarily as a freedom of movement, well synthesized in the outer-space setting. When graphics advancements gained this material free-roaming, a social freedom has been introduced with the sandbox genre, where freedom is not just related to movement but to choices and games like Ultima [1981], Elite [1984], SimCity [1989], Blade Runner [1997], GTA [1997], Shenmue [1999], The Sims [2000], and Second Life [2003] marked this path.

Games

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