

The Spectacular Space

Rules and Guiding Principles of Irrational Spaces in Games¹

René Bauer and Hiloko Kato

“And then again, from another aspect, the solution of an intellectual problem comes about in a way not very different from what happens when a dog carrying a stick in its mouth tries to get through a narrow door: it will go on turning its head left and right until the stick slips through. We do pretty much the same, only with the difference that we do not go at it quite indiscriminately, but from experience know more or less how it should be done.

Robert Musil, Man without Qualities²

INTRODUCTION: “I GUESS THE GAME WANTS ME TO GO HERE”

01 PEW: is that a cock (-) oh: !GOD! i hate cockroaches;
02 door opens quietly with a creaking sound
03 does it have a fAce in its BUTT?

1 This article was originally published in German with the title “Der spektakuläre Raum. Regeln und Leitsysteme irrationaler Computerspielräume” In: Hennig, Martin/Krah, Hans (eds): Spielzeichen II — Raumspiele / Spielräume. Boizenburg: Werner Hülsbusch Verlag, 2018, pp. 104-132. We are grateful for permission to reproduce it here with minor changes.

2 Musil (1953: 128).

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04      what the hell is over THERE;
05      (9.0)
06      AH:-
07      ^OK,
08      i guess the game wants me to (-) GO hEre huh,
09      (5.0)
10      WOW.
11      the graphics looks a!MA!zing;
((...))
12      !WHAT!?
13      isn't this the (--) <<h> it !IS!> the same corRIDOR!
14      what Is THIS;
15      am i stUck in a LOOP,=
16      =am i stUck in a LOOP,=
17      =am i stUck in a LOOP,=
18      =am i stUck in a LOOP,=
19      =am i stUck in a LOOP,=
20      =am i SORry ts ((laughs))

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Spectacular is an apt description for the spaces in computer games, for a number of reasons. In its most prominent usage, the adjective captures the notion of a near-perfect simulation of a world. The focus in this simulated world is on graphics, atmosphere or the aesthetic experience of the game – whether in thoroughly researched and detailed sections of the real world (for instance, in the *Assassin's Creed* series (Ubisoft, 2007-2016, cf. chapter 3) or in fictitious environments (the most recent example being *Last Guardian* [Sony Interactive Entertainment, 2016]). We propose the use of the term *hyperreal* for this kind of spectacular space in computer games. Even the spaces in *P.T.* (Konami, 2014)³ can be regarded in this sense as hyperreal, which is supported by the player PewDiePie's comment in the transcript (PewDiePie 2014, the transcript starts at 00:32): “Wow, the graphics looks amazing!” (L10 and L11).⁴ Similar to a picture puzzle, players, who find themselves in an L-shaped corridor, are encouraged to look a little longer and more closely at the numerous details, rendered with minute graphical precision; otherwise, they will fail early on in their endeavors to assemble the solution.

3 P.T. stands for “playable teaser” of the game *Silent Hills* (which has been cancelled in the interim).

4 The transcript has been created on the basis of the transcription system *Gesprächsanalytisches Transkriptionssystem 2 (GAT2)*, cf. Selting et al. (2009). For the transcription conventions of this system or the meaning of individual symbols please refer to the key at the end of this article. The letter “L” is used to refer to specific lines.

The space in *P.T.* is accurately described as spectacular not least because it is an impossible, irrational space. At the end of the L-shaped corridor, the player climbs down some steps in order to open a door which in turn leads to the same corridor. Being trapped in a loop, a situation which PewDiePie tries to give a humorous spin by willfully repeating the same sentence five times (L15-L19), seems to intensify the scary setting of the horror genre to the point of madness. It is the horror of being caught up in cybernetic circuits or, to put it in a more game-theoretical way: becoming stuck in the system of rules.⁵

In this article we want to examine this second type of spectacular space. Non-Euclidian, impossible or other irrational spaces in computer games create a challenge for players and game designers alike, because the rules of space need to be defined or learned anew. Particularly when the computer game's space does not depict a real space, the question becomes relevant as to whether players will be able to get their bearings, with their motivation and acceptance more or less intact.

All our observations are based on the assumption that a computer game must establish its playability. This can be done inelegantly – as a break with the perfectly staged “anything-goes, make-believe world” – and rather obviously, such as in *P.T.* before the player enters the loop: as if the staging of the entrance door – solid, polished, illuminated – was not enough, it also opens with a quiet creaking sound (L02), in an obvious invitation to enter right here, and nowhere else. PewDiePie uses it as an opportunity to sum up the situation: “I guess, the game wants me to go there, huh?” (L08). It is a balancing act for game design: on the one hand, everything in a game is predetermined, but on the other, it is important that players do not feel patronized. With the present-day focus on hyperreal simulation as the ultimate goal, players are increasingly spared the additional learning effort regarding the game's own guiding principles (cf. Kato/Bauer “Hansel and Gretel” in this volume). Separate tutorials are therefore avoided, and instead, there are short, embedded learning sequences.

In order to identify what players must do to comprehend or master the space in a game, we will initially examine some early games and introduce different approaches to understanding space in computer games and its appropriation (comparison between the analog world and the digital game world, trial-and-error method, space appropriation model). Afterwards we will take a closer look at three more recent games, which are characterized by different forms of irra-

5 And the question arises if hyperreal graphics and rules (cf. Salen/Zimmermann 2006: 9) of a game might stand in a possessive – and at the same time charming – opposition to each other.

tional space and appropriation of space. *Let's Plays* will form part of our analysis, as they enable us to observe how events unfold from the player's perspective.

SPACE AS THE RESULT OF A PROCESS: RULES OF SPACE IN COMPUTER GAMES

The most significant rule of space in relation to games has been proposed by Johan Huizinga: the “magic circle” of the game opens up a space with its own rules. (Huizinga 2008[1938]: 18f.)⁶ These are comprehensive and must cover all aspects of the game, from elements such as the game's world, its layout, its look, its behavior, to the possibilities of interaction for the user, and the rules-based mechanics of the game: everything is subject to rules.⁷

In analog (= Euclidian, real) games, street games or board games – which are often the first thing aspiring game designers study as part of their training –⁸ rules are already very comprehensive. They need to be translated and made applicable in interaction, when the game is played for the first time.⁹ It is a widely observable and fascinating fact that the rules of the classic analog space (the Euclidian space), or those of its construction, form the basis of these games, albeit mostly in a very rudimentary way and only as a designated section of the real world. Board games predominately revolve around two-dimensional actions; in street games such as *Himmel und Hölle* (literally “Heaven and Hell”, known as hopscotch in English-speaking countries) the transformation from the vertical to the horizontal becomes particularly evident in the Swiss version of the game, in

6 Our main focus here is on the rules underlying computer games, and we are not primarily concerned with the question of transferring the magic circle from general games to computer games, nor with the relationship between reality and fiction. We will therefore not deal with the discussion around the concept of the magic circle for the purposes of this article. (cf. Günzel 2012: 95-99).

7 In this matter we follow Juul's understanding of computer games (2011).

8 Game development often takes place over different stages of iteration and, in the best case, becomes increasingly more concrete: it begins with technology-free paper prototyping, followed by a first stage of technical box prototyping, and finally the application of increasingly concrete settings.

9 It is always a challenge to play an unfamiliar board game only by its instructions (and therefore by its rules). A good example is *RoboRally*, a programming board game for multiple players (cf. Wikipedia 2017).

which the bottom field (“earth”) is replaced with “hell”. These games are additionally augmented by symbolic worlds (such as in *Ludo* or *Monopoly*), which are in the foreground when players learn the rules of the respective games, thereby moving the rudimentarily applied rules of space into the background. Yet, this process does not only involve a simplification in terms of board or street games, but also a considerable effort of abstraction which should not be underestimated by players and designers.

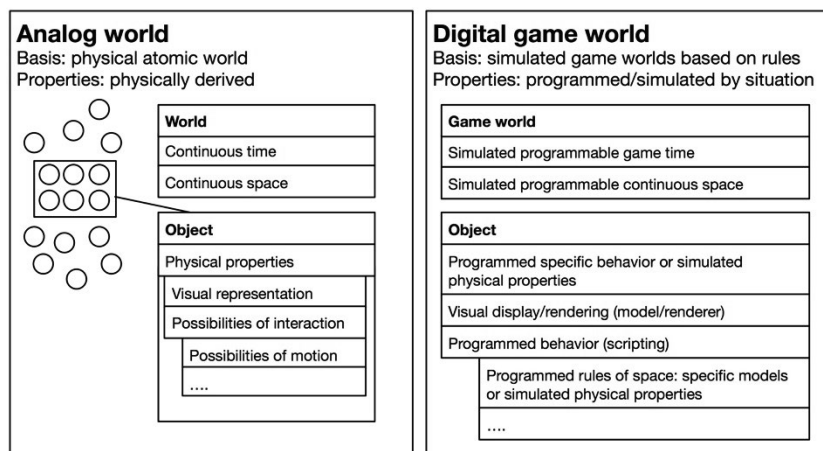
Analog and Digital World – the Analog as Simulation

Computer games radically change spatial relations. The computer-generated digital game space is no longer based on real materials and their inseparable connection with visual or physical atomic properties. Cyberspace can be programmed at will. “The [computational] image became a picture field, its pixels became variables able to be altered at any time.” (Weibel 2003: 594) Whether the material is wood or stone, everything is a direct application of rules: the game world and its objects all need to be created, managed and represented. This also means that the space can be changed completely, at any time. Even when an analog space is created in cyberspace, it is still a simulated analog space. It behaves like the real, analog world only because it follows the same or very similar rules. The fully programmable layer behind it is often assembled as a “holistic” world only at the very end, or that notion is suggested by means of different specialized engines (e.g. physics, rendering, scripting engines, Figure 1).¹⁰

Despite these almost endless possibilities, in most cases the simulated analog space continues to be used, seemingly unquestioned, as the basic model in cyberspace. Primarily, this is because the transfer effort required of players can be kept to a minimum, which means they can attend to other tasks. Against this surprisingly conventional background, the – much more complex – spatial behavior of some of the earliest games appears strikingly modern:

10 The direct, unchangeable and complex laws of the analog world, which is based on atoms and their visual or auditive and physical properties, are replaced in cyberspace by a simulation of the individual and separate functions: the (visual) display of objects (“rendering”), the representation of physical properties (logic, programming, physical simulation, subsumed under the label of “colliders”), and the behavior of objects (“scripting”), which are all also simulated in this way by game engines (e.g. game engines such as “Unity3D” or “Unreal”).

Figure 1: Analog world (physical atomic properties) vs. digital game world (generated by different rules).



Source: Bauer and Kato

In *Tennis for Two* (William Higinbotham, 1958), for instance, several analog rules applying to tennis games are suspended: the omnipotent, invisible player can play the ball from anywhere on their own side of the court, and in any direction. In *Spacewar!* (Steve Russell, 1962) and *Asteroids* (Atari, 1979) it is possible to fly beyond the edge of one side, and, as if by magic, reappear on the opposite side. Spaces are radically transformed and special rules are applied to make these games less predictable and more exciting. Of course these discontinued game spaces could simply be accepted as a given rule of space – and part of the magic circle – of the game. Yet attempts to explain the spatial behavior (*Asteroids*, for instance, could be set on a sphere) seem to prove how difficult it is to accept such impossible spatial relations. In some cases, however, these constructions do not translate to the analog world, with *Frogger* (Sega, 1981) probably being the best example. Here, the traffic on the streets can alternate (!) between moving to the left and to the right, and, even more spectacularly, the river simultaneously flows in different directions. In cases such as this, we simply have to accept what the digital game gives us.

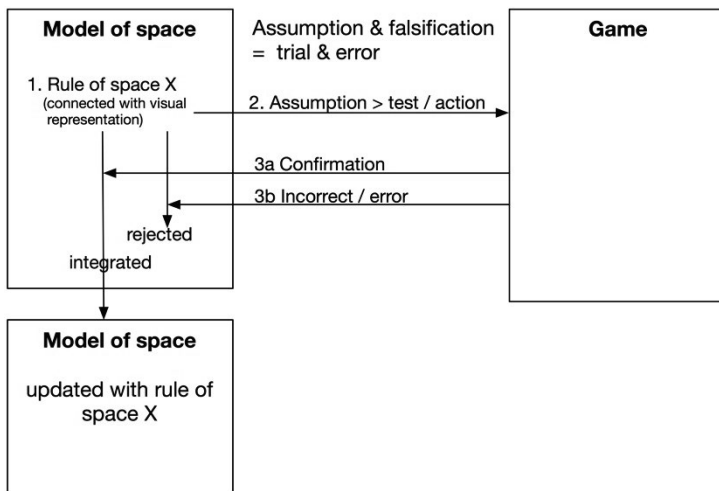
Mastering Space in Digital Game Worlds

In order to find their way around a game, players must learn to master the game space. For economic reasons, this happens systematically by learning to interpret the game's rules of space, usually by evoking equivalents to the analog space. In

cases of irrational spatial behavior, however, players reach for explanations of the specific rules which apply to the game, or these rules are simply taken for granted as part of the magic circle. Forming analogies to similar games is another strategy; the respective rules or principles are mostly genre-specific and become more ingrained with increasing game experience (cf. chapter 3.3). Further explicit help is given by tutorials at the beginning of a game. In addition to self-contained units which enable players to acquaint themselves with the rules before they move on to the actual game (cf. chapter 3.1), in many games there are also discreetly embedded tutorial sequences towards the beginning of the game. These are used conspicuously often and provide an implicit introduction for instance to the rules of space (cf. chapter 3.2).

However, even these tutorials do not save players from having to try out whatever they are presented with, using the method of trial and error (cf. Figure 2). Players make assumptions, which they then apply. The game responds and shows whether the assumption was correct. This increasingly complex process of assumption and falsification eventually produces the set of rules pertaining to space for the specific game. Of course this mechanism does not only come into effect at the beginning of a game but in any situation in which the existing model with its sets of rules is not sufficient or in which the space responds differently. At this point, an update of the model becomes necessary.

Figure 2: Modified models of space generated by the trial-and-error method



Source: Bauer and Kato

This process of space appropriation is found in its most radical form – as part of the game’s concept – in the maze game *Trailblazer* (Gremlin Graphics/Fairchild Semiconductor, 1977).¹¹ In this multiplayer game, the player who first leaves the maze wins. The problem is that there is neither a back- nor a foreground – the entire game is plain green. At first it is impossible to visually deduce what the effect of an action or of moving the avatar might be. Only when it is moved (i.e. tested) does it become clear whether the surroundings are actually a wall or a corridor; these are colored white afterwards. In other words: there is no color-coding which would help players to arrive at a rule, and the rule is visualized only after the event. When the field turns white, then it was and is a corridor. Players therefore have to derive the accessible playfield from facts (which correspond to a single local rule) without being able to use this knowledge to generate visually deducible rules. This means that spatial rules do exist, but there is no corresponding visual, no interpretability beyond the specific situation, and consequently players are not able to arrive at any universal conclusions. *Trailblazer* is certainly a radical example but it shows that rules of space do not necessarily require corresponding visuals. Normally there must be a clearly discernible and established connection between a function and its visual analogy before it can be used effectively and economically. Practically all games therefore assign visual codes to their rules of space. A rule can then be read as an interactive sign.

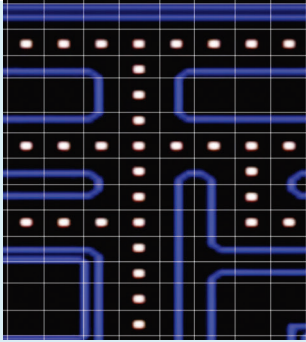
Rules of Space in Tile-based Models of Space

Current games are characterized by allowing “free movement” within their worlds, and as a result, players hardly ever think about what it means to master the rules of space (see also chapter 3). To gain a better understanding of the sub-conscious mechanisms which are in action when we learn these rules of space, we want to examine *Pac-Man* (Namco, 1980). Here, we have a tile-based model of space whose specific rules are learned by means of the trial-and-error method. In tile-based models of space such as *PacMan* or *Sokoban* (Thinking Rabbit, 1982), playfields and backgrounds are assembled from recurring objects and arranged in a grid. This requires fewer resources (storage, administration) and enables a faster level design. For this reason, most consoles of the first generations, from Atari 2600 to NES and PCEngine, support tile-based playfields. The findings are transferable to models of space without grids, in which objects can be

11 Playable in the emulation at https://archive.org/details/Maze_and_Jailbreak_and_Blind-Mans_Bluff_and_Trailblazer_1977_Fairchild.

placed in any position. The different rules, which are learned in this way, are described in the following table.

Visual-functional rule of space: tile-based setup

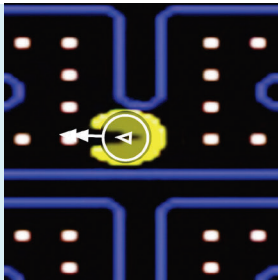


Players initially make a visual observation: the playfield consists of different recurring parts.

Assumption: The playfield is made up of right-angle fields which serve as points of reference for the game's principle, as in other games of the era.

Initial hypothesis: The moveable objects move at a right-angle along the grids consisting of adjacent fields (later confirmed by the movements of the ghosts).

Avatar rule of space: automatic movement

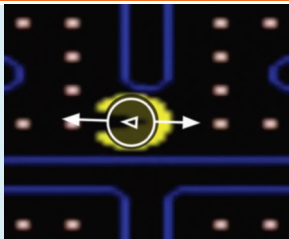


The avatar moves forward automatically (most likely players will test whether they can stop the avatar). Players have no control.

Rule: The avatar moves forward irrespective of the input.

This rule may be interpreted, based on analog knowledge, as a person moving continually forward, a vehicle gone out of control, a car (the unofficial precursor to the game, *Hand On* [1979], used cars) or specifically as a Pac-Man within the game setting.

Avatar rule of space: interactive rule of movement, forward and backward

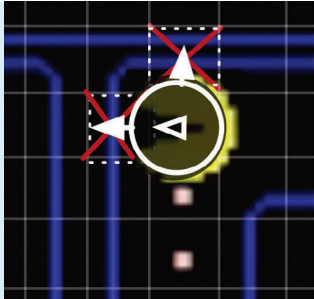


The avatar can be controlled by the input, i.e. a change of direction can be forced.

Rule: Variable movement is possible in the forward direction, as well as in the opposite direction.

Analog interpretation: normal movement.

Avatar rule of space: rule of movement; wall



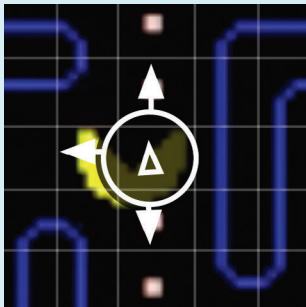
When the avatar comes across a blue field, the “interactive rule of movement” is no longer valid: it is not possible to move in the direction of the blue field, and the game does not respond (no sound). Blue fields seem to be obstacles which limit freedom of movement.

Rule: The avatar is prevented from changing direction, when it is directed towards a blue-edged field.

Analog interpretation: The blue fields are walls.

Supplement to the rule: The avatar stops and waits for an input when it comes across a wall.

Avatar rule of space: rule of movement; 4 directions (free fields)

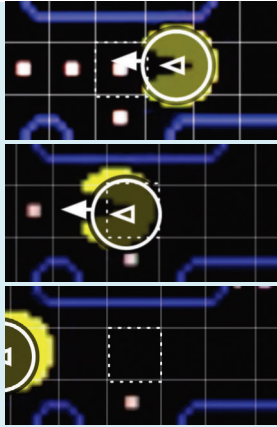


In certain places, the avatar can be directed towards free fields. A free field is either an empty black field or a field containing a (colored) dot. Theoretically, this is possible in all four directions.

Rule: The avatar can be directed in all four directions, assuming there is a free field. Predominantly black fields or sequences of dots seem to indicate possible movement.

Analog interpretation: The path is clear or there are pebbles to follow.

Avatar rule of space: small and large pills

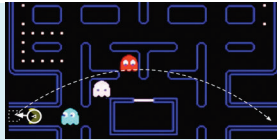


When the avatar is moved into a field with a colored (here: salmon pink) small dot, the dot disappears.¹² When this is tested with a large round dot, no doubts remain: players can temporarily eat ghosts, and the color salmon pink seems to be a positive signal for the avatar.

Rule: Players can move into black fields with or without colored dots. These objects need to be collected in order to win.

Analog interpretation: The colored pills are eaten by Pac-Man (supported by the animation).

Avatar rule of space: teleporter fields



Players notice that they can move into a field at the left edge and a field at the right edge, and then re-appear in the field on the opposite side.

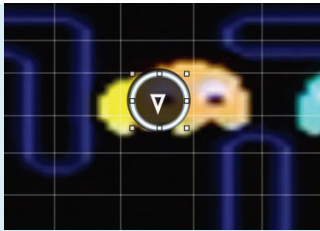
This can be useful for strategic purposes (escaping from enemies, collecting points, eating enemies).

Rule: Players can move to a different side from two special fields.

Analog interpretation: This behavior does not exist in the analog world. It therefore must be a kind of magic teleporter.

¹² In this first arcade version, the dots are salmon pink. In later versions, the color is changed to yellow, which creates a positive connotation: the dots are now the same color as the avatar, Pac-Man.

Avatar-enemy rule of space: in the same field or occupying the same space as an enemy



Players notice that there are other objects traveling through the maze. On first contact, they realize that they get killed by them. These enemies are visually coded: by color or through animation.

Rule: Players have enemies, these also move around in the maze. If they occupy the same spot, the avatar “dies”.

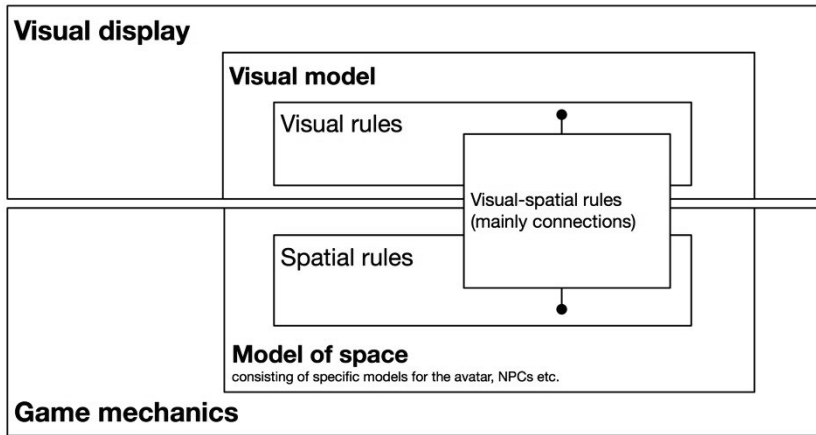
Analog interpretation: This is a type of rival – the game suggests visually, and in terms of the story and game design, that these are deadly ghosts.

Apart from these rules of space for the avatar, there are equally specific rules for the enemy (which, in the case of *Pac-Man*, are very similar): the ghosts move within the same space or maze but they are different in terms of how they are controlled (avatar vs. NPCs). More significantly – and this was an innovation at the time – every ghost behaves individually in a different way. It is not surprising then that the various ghosts have their own visual rules: they each have different, and highly distinctive colors. The enemies give dynamic to the concrete model of space by being dynamic elements of a rigid part (the blue maze). In the best possible scenario, players must offset these two models against each other, while always remaining alert: where are the enemies, where can I find a passage, what is or could become dangerous? At the same time, they need to keep an eye on the actual game: where can I find any more pills, how do I reach them in the safest way, is there a bigger pill, and where and how do I use it? How can the spectacular, non-Euclidian element of the teleporter be made use of?

In the example of *Pac-Man*, the systems of rules are two-dimensional, at all levels of the game. These comparatively simple relationships become much more complicated in three-dimensional games, where the rules of space of the avatar often remain two-dimensional (walking, moving along on the ground), but the enemies can move in three dimensions (e.g. by being able to fly). As a result of the three-dimensional perspective (1st person or 3rd person), both the perception and appropriation of space change fundamentally (e.g. through the lack of an aerial view, i.e. overview). Adding to the complexity, the perspective is interactively dependent on the avatar. Therefore, games and their guiding principles need to be expanded, or the content must become more concrete and more in

correspondence with the analog world. In *Pac-Man*, the set of rules pertaining to space and its visual representation (visual rules in 2D, spatial rules in 2D) are relatively contained and easily understandable. The space appropriation model provides a more detailed examination of this dual relationship between game mechanics and the visual display (cf. Figure 3):

Figure 3: Space appropriation model: spatial rules (e.g. the enemy's behavior) can be connected to visual rules (visuals, depiction) through visual-spatial rules.



Source: Bauer and Kato

The visual display of a game contains a visual model which comprises all the graphical aspects of the game. It has a rules-based structure and includes definitions for the depiction of objects (in *Pac-Man*, for example: “What does a wall look like?”). Game mechanics, on the other hand, contain a model of space consisting of rules of space. This model of space includes (in the same way as the visual model) the definitions for the spatial behavior (e.g. “The wall is an obstacle”). The visual rules and the spatial rules are then connected through visual-spatial rules. The visual wall becomes interactively recognizable as an obstacle, and this information is saved with this connotation for potential future application in the game. Visual-spatial rules are intended by game design as a form of structural connection and encourage an interpretation based on decoding. The same spatial rule for an obstacle could be referenced, for instance, in the case of an extended wall (e.g. made out of wood).

When we take a closer look at the rules of space in games such as *Pac-Man*, we realize that the appropriation of space is a process of small, sequential steps. In many of the current games, it is impossible to unravel this process easily. This

is mainly because this kind of cognitive effort becomes obsolete in computer games, as a result of the hyperreal simulation of the analog world with its “normal” or known rules: now, players no longer ask themselves whether a specific space could perhaps be a wall – they can see it and they know it. With the unconscious recognition and learning of graphically coded rules (simple guiding principles) of course comes the advantage of a very economic engagement with the game’s world. The need to understand the rules of space is no longer given: the perfectly simulated wall can be read directly as an orientation cue (“this way”); the actual spatial rule for the wall (“I can’t get through here”) is already implied visually. In most current games it is necessary to recognize the guiding principles, but the underlying rules no longer need to be learned. Paradoxically, space appropriation in these newer games is a much simpler process than in the early, graphically much more unsophisticated games. However, when spaces explicitly do not function according to real-life criteria, the logical assumption is that space appropriation becomes more complex again, albeit under different circumstances (the wall is still immediately recognized as such).

CASES: ECHOCHROME, ANTICHAMBER AND PORTAL 2 CO-OP MODE

Simulations of the real world at the most sophisticated graphical level are now the standard in AAA titles, and no effort is spared in their design. What springs first to mind is the technology of voice and motion capture, with its ability to transfer the characters, their movements, gestures and facial expressions as authentically as possible to the computer game.¹³ But even the game’s space is created with the utmost elaborateness, when, for instance, academic experts from the field of architecture are consulted, in order to design sites as historically accurate as possible, such as in the *Assassin’s Creed* series.¹⁴ In the case of *The*

13 The story-centric approach of many current titles, in which the characters – more recently even played by well-known actors – and their stories are at the center, is probably also a result of voice and motion capture increasingly gaining ground. Or, as predicted by Jay Garnier, the director of Faceware (a software specialist for face animation) in an interview about this technology in 2013: “Gameplay will become more story focused and the ways we as players interact with characters in-game will only get better and more enjoyable.” (Freeman 2013).

14 See also the interview with Maria Elisa Navarro who was a consultant on *Assassin’s Creed II*. (cf. Saga 2015).

Last of Us (Sony Computer Entertainment, 2013), designers tried to outdo each other in creating true works of art, even when the design subject was just a simple wall:

“Everything was art deco! Nothing could just be like a flat wall with stucco painting, you know what I mean? Nothing could just be normal. Artists would be like, I’m going to make this the most awesome fucking wall ever.” (Edge Staff 2013)

“Normal” no longer seems real enough, the space needs to become even more of an experience by added aesthetic value. It is exactly this hyperreal quality of the space that is celebrated in *The Last of Us*, which goes hand in hand, from the player’s point of view, with the promise of a very realistic relationship to the space. Yet, that means any possible actions in relation to the space are limited to those we are familiar with as possibilities in our real world.¹⁵ Identification with the characters certainly becomes easier by being accustomed to the contextual concept of space in these initially unfamiliar, post-apocalyptic worlds. However, that is not to say that this kind of socialization towards the computer game’s space happens automatically: at the beginning players must still learn, for instance, that they are indirectly guided by their companions or that the drawers can be opened.¹⁶ In other words, they cannot avoid this socialization to the game’s world with its own specific rules. Despite all this, this basic mastering of space in hyperreal games should be called by its name: it is anything but spectacular.

Echochrome

The situation is quite different in *Echochrome* (Sony Computer Entertainment, 2008). The levels in this puzzle game consist of architectural constructions – composed of bars, stairs, gaps, and jumping-off points on or holes in the bars – on which an articulated mannequin automatically moves back and forth (cf. Figure 4).

15 With the exception of the protagonist’s phenomenal hearing capacity which can also be used indirectly for space appropriation (“Where is the enemy?”).

16 Cf. our analyses in Kato/Bauer “Hansel and Gretel” (in this volume, pp. 127 ff.) and Kato/Bauer “The Player as Puppet” (in this volume, pp. 222 f.).

Figure 4: Creating impossible objects by changing the spatial perspective: *Echochrome*.



Source: Screenshots Bauer and Kato

The players' task is to now change the perspective of the space¹⁷ in such a way that the mannequin can use the resulting construction of impossible objects in their new, altered perspective to reach a specific goal and, in the higher levels, traverse additional points, so-called "echoes", in the form of semi-transparent shadows. The game's principle is both unique and distinctive, as it requires the manipulation of the spatial perspective, as opposed to the avatar. The impossible objects are reminiscent of the famous images by M.C. Escher, but were created by the "father of the impossible figure", Oscar Reutersvärd. (cf. Reutersvärd 1991) Through its minimalist design, and with its background music of modern-classical strings, this game focuses completely on the experience of space and spatiality. *Monument Valley* (Ustwo, 2014) is also based on the construction of impossible objects, but the two games differ significantly in terms of their graphics and storytelling: While the former is minimalist in these respects, the latter is anything but. *Echochrome* lacks a narrative causality which would encourage players to move from one level to the next. The sole reason for continuing the game is the challenge of ever more complex constructions and their solution through the experience of space. There is an almost esoteric flavor added to this playful concoction by the so-called "five laws", which are introduced at the beginning of the game as part of a tutorial presented by an artificial-sounding female voice.¹⁸ The purpose of this is to help players to reach their goal ("Use the 5 mysterious laws and create the path"). In the example of the construction

17 This raises the question of whether players are more likely to feel that they are turning the objects, rather than changing the space or the perspective of the objects in the space. As far as perception is concerned, that would suggest a neglecting of space in favor of figure-centric actions.

18 Interestingly, this is similar to *Portal 2*, see below.

seen in Figure 4, where the challenge is to overcome a gap, the voice provides the following commentary: “The first mystery is perspective travelling. Yes, in this world, what you see becomes the truth”. As the construction of impossible objects, with all its irrational features and requirements which go against our normal understanding of space, is not a self-explanatory endeavor, a tutorial like this seems necessary. Matching the concentrated experience of space in the game, this tutorial does not rely on conventional instructions in the usual pattern followed by tutorials, such as in *Monument Valley* (where the first instruction is “hold and rotate”). The explanations provided by the artificial voice are more aptly described as very vague paraphrases or strong metaphors for what players *see* in the tutorial, before they can, or have to, do it and attempt it themselves: “travelling“ for the possibility of crossing the gap, or “seeing” for the change of perspective as the solution. The tutorials in *Echochrome* are characterized by a certain vagueness, which elegantly reflects the indeterminate state of the impossible objects and shows that impossible constructions are likely to require some help to be properly understood, and that there is a sympathetic way of achieving this.

Antichamber

Antichamber (Demruth, 2013) is another game which contains impossible spaces yet manages without a tutorial. This can be explained by the fact that the mastering of space is not spectacular as in *Echochrome*, but rather more conventional: players wander through simulated passages within a maze-like structure. Of course these do not function in the Euclidean sense or in a way we would recognize from experience: as the run speed changes, the surroundings change as well; things can appear and disappear depending on proximity; going back the same way means ending up in a different location – that last realization is particularly important as it is a prerequisite for solving the very first puzzle in *Antichamber*. As the walkthrough on www.steamcommunity.com recommends, “If the game gives you any advice, take it.” (Asha Man 2013) and indeed there are boards on the walls with cryptic messages designed to help players, which tend to make sense fully only in hindsight. In the *Let’s Play* with Martin and Daniel from the YouTube channel *GameTube*, what makes this game so distinctive becomes particularly clear in the first few moments of their gameplay. (cf. GameTube 2013) After a relatively unproblematic start, the Let’s Players are faced with a choice between going up the blue stairs to the right, or going down the red stairs to the left. The board reads: “A choice may be as simple as going left or going right”. Martin – a novice who has only seen a few screenshots of the game – twice de-

cides to go up (“So I’ll go up again”) and then down. The players then find themselves once again in front of the same set of stairs,¹⁹ but opposite the first board there is now a second one, and Daniel – who already has some experience with the game and acts like an expert – reads out what it says:²⁰

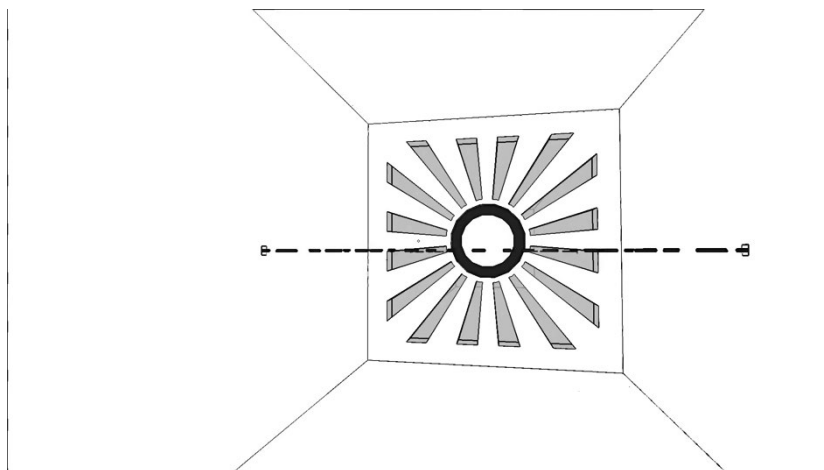
- 01 DAN: the choice doesn_t mAtter if the outcome <<len> is the
SAme>.
- 02 MAR: j[a:]
yes
- 03 DAN: [des] ist wohl egAl wo du lang LÄUFST?
so it doesn’t matter where you’re going
- 04 MAR: ja gAnz kanns ja nicht egal <<len> SEIN>.
well it must make a difference somehow
- 05 ich geh NOCHmal rUnter.
I’ll do down again
- 06 (3.0)
_/
- Goes down the stairs and through corridors, arrives
back in the same old corridor
- 07 was ist denn wenn ich zurückgehe ge=funktioniert DAS,
what happens when I go back does that work,
- 08 Ah kuck (-) vielleicht war DAS des [rätsels lösung;]
ah look (-) maybe that was the solution to the puzzle
- 09 DAN: [brennendes HAus,]
burning house
- 10 MAR: zuRÜCKzugehen.=
to go back
- 11 [=when you] return to where you have BEen things
aren_t always as
- 12 DAN: [when you-]
MAR: reMEMbered.
- 13 DAN: AH wenn man zurückkehrt sind die dinge oft nicht so
wie man sie noch in ner erinnerung hatte,
ah when you go back, things are often not the way you
remembered them
- 14 aber [JETZT,]
but now
- 15 MAR: [kUck] das war des rätsels lösung zuRÜCK<<len>
zugehen.>
look that was the solution to the puzzle to go back
- 16 DAN: die farben ändern sich auch Aja (-) ok.
the colours change as well I see (-) ok

19 Astonishingly, the impossible space is taken for granted without further comment.

Likewise the L-shaped corridor which leads back to the starting point (as in *P.T.*, see above) does not seem to cause any surprise.

20 The transcript begins at 02:43.

The two gametubers conduct the process of reading out, translating and interpreting the text on these boards almost like a ritual. The boards themselves form a system of guiding principles which provide different kinds of cues at a meta level. The text read out by Daniel as an introduction informs the players about the futility of their current actions: it indeed makes no difference which stairs they take, as they would not get them anywhere regardless. Martin initially does not believe this, but on seeing the same corridor, with the same two boards and stairs, his thoughts take a different direction (L07). This principle of reversal is in fact not an easily conceivable or prototypical walking pattern in games, and that is exactly what is exploited by *Antichamber* for its irrational concepts of space: the path walked so far changes when it is walked back. This first, extended challenge reveals itself as an important waymarker in the socialization of the players to the (non-)logic of the game, with the boards functioning as guiding principles. Interestingly, the authority over reading out the text from the boards is now with Martin after he has correctly interpreted the cue, and so he proceeds to read out the next text. The conflict over the right to perform the role of reader (overlapping in L11/12) is resolved in Martin's favor, even though his speech contains closing markers (L08, L10) which would allow Daniel to take over again. Daniel accepts this role change and seamlessly provides a translation (L13). The transcript also suggests that Martin regards the role of reader as a reward for his correct interpretation or action, which manifests itself in his repeated emphasis on "going back" as "the solution to the puzzle" and his emphatic proclamation "look". There are two different types of boards in the game: those providing cues for future or current actions, and others which confirm or comment on the solution. Thus, the first puzzle at the beginning of the game also socializes the players to this dual system of guiding principles.

Figure 5: Red laser as door opener: Antichamber

Source: Screenshot (GameTube 2013)

Immediately afterwards, the gametubers need to go through a closed gate, in front of which there is a red, broken line (cf. Figure 5).²¹

- 15 DAN: jetzt ACHtung,
now watch out
- 16 is ein LAser;
is a laser
- 17 MAR: öh ich kann mich aber nicht DUCken;
eh but I can't duck
- 18 oder ich kann GEhen [und] springen,
or I can go and jump
- 19 DAN: [ja]
yes
- 20 [vielleicht musst du in den laser REINGehen.]
maybe you need to walk into the laser
- 21 MAR: [<p> kann ich irgendwo REINKlicken?>]
can I click anywhere?
- 22 macht man ja eher UNGern ne sieht ja immer so nach
selbstschussanlage und alarmanlage und so aus;
- \ /
- nevertheless, he walks into the laser, the gate opens
not something you'd want to do no, always looks like a
spring gun or an alarm system or something
- 23 DAN: macht in dem fall die TÜR auf (-) auch nicht schlecht-
opens the door in this case, not bad

21 The transcript begins at 03:17.

Daniel interprets the red line as a “laser” and therefore as an indirect orientation marker which needs to be bypassed (L15). His aversion to it is of course based on the gaming experience of these two gametubers; this is reflected by Martin’s comment (“always looks like ...”, L22). The verbal effort made in this passage, which contrasts with Daniel’s plain statement about the solution (L23), very vividly shows how difficult it is to overcome these learned patterns – particularly when they have a negative connotation. In that sense, *Antichamber* pursues a kind of tabula rasa policy regarding the players’ socialization to the usual guiding principles, and keeps the promise implied in its name.

Portal 2 Co-op Mode

In *Portal 2* (Valve/Electronic Arts, 2011), the game’s world consists of a simulation which is close to the analog space and as such quite unspectacular. A “portal gun” fires teleportation portals into flat surfaces and enables an (impossible) mastering of space whose logical complexity makes this game particularly attractive. The players’ progress in this game depends on the ideal positioning of the two portals, and they need to search the space in which they currently find themselves for clues to the right combination. The question then is not “what’s next”, but “where next” in terms of the positioning of the portals.²² This becomes especially evident in the co-op mode of *Portal 2*: the exchange between Peter and Christian in their *Let’s Play* on YouTube channel *Pietsmiet* is peppered with deictic expressions such as “there” and “here” (L01, L04, L05, L06, L07); most of them are given a primary stress which audibly marks them out as central to the information exchange (Pietsmiet 2011b, at 08:38):

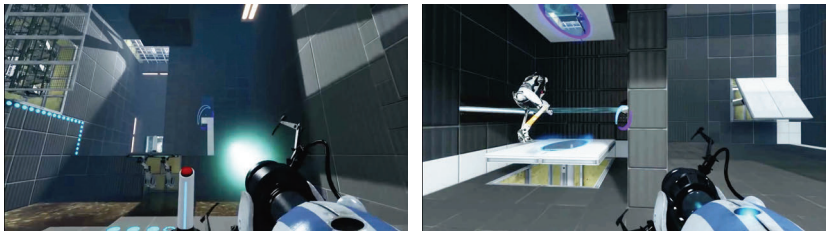
- 01 CH: also von dA wird nachher einer geSCHOSen.
so the launching of one of us later on happens from
over there
- 02 PS: ich weiss aber noch nicht WIE.
but I don’t yet know how
- 03 CH: ^hhh DAS weiss ich ^Auch noch <<len> nich.>
I don’t know that either yet.
- 04 PS: ich kann an diese weisse fläche DA: (-) nichts
schies [sen;]
I can’t fire anything into this white surface there
- 05 CH: [was is]n] HIER wenn
du hier runter fällst ist das portl weg.
what’s here when you fall down here then the portal is
gone.

22 In other words: “what’s next” no longer follows on from “where next”, but “where next” follows on from “where next”.

- 06 PS: achso DA ist noch wAs?
ah ok so there is something else there
 07 CH: aber hier ist das PORTL direkt weg;
but here the portal is gone straightaway

In this sequence the Let's Players are in a position where for the first time they do not immediately find a solution. Christian recognizes early that a tilted surface will be the final jumping-off point for the exit (L01; cf. Figure 6, right), but “how” (L02) to get there remains a puzzle. This is partly because surfaces are falsely interpreted as significant but are in fact insignificant: Peter initially fires, without success, at “this white surface there” (L04; cf. Figure 6, left).

Figure 6: Misleading and useful surfaces: Portal 2 Co-op Mode.



Source: Screenshots (Pietsmiet 2011b)

His trial-and-error strategy contrasts with the knowledge immediately displayed by both players regarding the functionality of the tilted surface. Their choice of words is interesting (ibid, at 09:13): on the one hand, the surface is described vaguely and without stress (“thing” L11, “whatsit” L14), but on the other, it is identified as an important spatial element – it is notably not simply paraphrased as, for instance, a “tilted surface”, similar to the aforementioned “white surface” (L04):

- 10 CH: <<f> doch natÜrlich,>
yes of course
 11 du machst das portal hier UNten und und auf dem ding
 das abgeschossen wird;
you put the portal down here and and on the thing which
is fired
 ((30 seconds omission))
 12 PS: <<f> NE (-) ich WEISS es->
no I know it
 13 ich muss das im richtigen moment ich muss im RIChtigen
 moment das (-) UNtere por!TAL!,
I need to at the right moment I need to at the right
moment the lower portal
 14 (-) ne das Obere por!TAL! auf die=auf die dings tun.

*no the upper portal, I need to put in on the=on the
whatsit*

The two Let's Players recognize the surface as important because of their gaming experience: they (must) have played *Portal* (Valve Software, Electronic Arts, 2007) and the single-player mode of *Portal 2* which includes a narratively embedded tutorial and is also part of the well-known setting of *Portal*.²³ This means they are sufficiently familiar with the specifics of space in this game, and do not explicitly need to discuss most of the actions which are required to find a solution. It is a disadvantage in terms of being able to follow the players' thought processes. However, their sometimes quite elegant and seamless task sharing is proof of their "reading" of the game's space and their internalization of its typical rules of space. The specific fascination of the *Portal* series lies in the dynamic element controlled by the players, i.e. the positioning of the portals, which is similar to the changing of the perspective in *Echochrome*. Even though the available options are preprogrammed and preset by the game design,²⁴ this dynamic element makes the space, and particularly the process of mastering the space, spectacular.

CONCLUSION

This article set out with the assumption that games – and electronic games in particular – follow the concept of the magic circle and consist of a space with its own rules. These rules do not only affect game mechanics but also the way in

23 This is certainly true for Peter, cf. Pietsmiet (2011a). Unfortunately, there are hardly any *Let's Plays* of *Portal* which are worth seeing.

24 This raises the legitimate question of whether there are perhaps "accidental" solutions which do not necessarily correspond with the various solutions suggested by the game design. Based on our understanding of spatial rules and their design-specific constitution (cf. Figure 7), this is, strictly speaking, impossible as every eventuality is already covered by and inscribed into the rules of space. In other words: there is no freedom, unless it has been preprogrammed. In the example of *Portal* the case seems to be different. Here and in similar moments players prioritize the rules of space over the design of the game (to be more precise: over the guiding principles). In analogy, the white, non-playable surface in our example is (mis-)read according to the rules of space. In this context further reflections are necessary about the nature of the relationship between explicit/implicit guiding principles and specific/general rules of space.

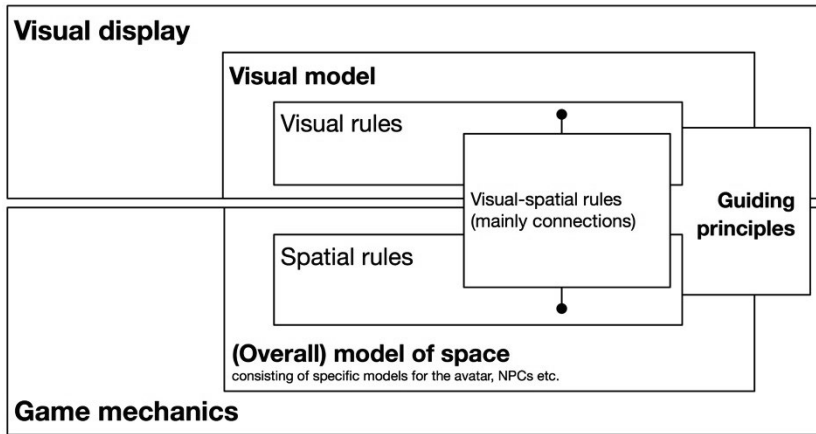
which the game and its space are displayed. The space in a computer game is freed from the analog (atomic) space by means of technology. Computer games make use of computer-generated spaces, both in terms of their display and their game design-specific “management”. Since they are entirely programmable, it would be possible to change the space completely at any time and with any kind of input. Of course most games do not make use of these possibilities, but instead import simpler, analog models for the visual side of the game, and the spatial behavior.

Against this background, it comes as no surprise that there are only very few games which deserve the label “spectacular” as far as their spatial features are concerned. The spaces of hyperreal computer games which impress with their perfect graphics could justifiably be called spectacular, but as our observations have shown, the transfer effort and the cognitive effort are both minimized to such a degree that the actual process of comprehending or mastering the space is in danger of falling below the threshold for detection and perception. In order to be able to draw accurate conclusions about the prototypical process of space appropriation, and about the specific models of space and their visualizations, we have chosen to examine computer games that do not use an analog model of space.

Early games have proven to almost have a modern quality. A detailed analysis of *Pac-Man* provided us with a break-down of space appropriation, which emerged as a gradual process of understanding and mastering the rules of space and their visual representations. For our analysis of modern games, we chose *Echochrome*, *Antichamber* and *Portal 2* which exemplify three different forms of the spectacular. The playfully mastered spaces in *Antichamber* are simulated in an analog fashion, but have a spectacular-irrational quality in terms of how they behave. The spaces in *Portal 2* are analog simulations, however players have the option to use a portal gun and master the spaces in a spectacular way. *Echochrome*’s spaces are spectacular both in the way they are conceived and in the mastering of space.

The following space appropriation model is a result of these findings (cf. Figure 7):

Figure 7: Space appropriation model extended by guiding principles.



Source: Bauer and Kato

The separation between the visual level of the display and the spatial behavior of game mechanics has shown itself to be pivotal especially for the more recent examples: there is a difference between what players see – as a visual rule – (e.g. the tilted surface in *Portal 2* or the red laser in *Antichamber*), and the specific, underlying rules of space (a firing spot or door-opening mechanism). As our examples have shown, the connection between these two levels is mostly due to knowledge acquired through gaming experience. In one case (*Portal 2*), this connection was created through previous incarnations of the game as well as tutorials, enabling players to make fast and correct assumptions about a challenge. In another case (*Antichamber*), the game presented a situation – most certainly deliberately – in which the Let's Players were faced with a dilemma, specifically to demonstrate its different way of functioning and to invite them to give up ingrained mechanisms of space appropriation.

Regarding the notion of guiding principles, our assumptions so far can be extended and integrated into the space appropriation model: guiding principles are cues on the game's surface which are placed by game design and continually assessed by the players so they can successfully continue their gameplay. The guiding principles of space, which can be described as a systemic set of rules resulting from the connection of visual rules with the rules of the model of space, manifest themselves, from the players' point of view, primarily in the form of orientation cues ("where next?"). They are generally interpreted as visual elements whose connected rules are decoded automatically, especially when the spaces are simulated in an analog fashion. The situation is different in spectacu-

lar spaces: here, a learning process is necessary for players to comprehend, by way of the visual level, the underlying rules of space or the rules of game mechanics.

As a general conclusion, and a potential basis for future research, we believe that the concept of appropriation would lend itself well to gaining further related insights, also outside the notion of space – through examinations that probe beyond the visual, and focus on the game-mechanical core of computer games. This would be useful both on the reception and also on the concept side of computer games.

KEY TO GAT2 TRANSCRIPTIONS

(the list below only contains the conventions relevant to this article)

[]	overlaps and speaking simultaneously
[]	
°h	breathing in
(.)	micro pause, estimate, up to approx. 0.2 seconds
(-)	brief pause, estimate, approx. 0.2 to 0.5 seconds
(--)	medium-length pause, estimate, approx. 0.5 to 0.8 seconds
(1.0)	timed pauses
robert_s	words joined together within units
((coughs))	para- and extralinguistic actions and events
<<whispers>>	para- and extralinguistic actions and events accompanying speech
((...))	gap in transcript
=	fast, immediate follow-on contribution by speaker
:	extending, lengthening by approx. 0.2 to 0.5 seconds
acCENT	focal stress, accentuation
accEnt	secondary stress
ac!CENT!	pronounced stress

Fluctuations in pitch at the end of intonational phrases:

?	steep rise
,	medium rise
-	even level
;	medium drop
.	steep drop

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