

Logic and Structure of the Computer Game

This paper comprises four parts. Firstly, an overview of the mathematics of decision logic in relation to games and of the construction of narration and characters is given. This includes specific limits of the use of decision logic pertaining to games in general and to storytelling in particular. Secondly, the rule system as the medial unconsciousness is focused on. Thirdly, remarks are made on the debate between ludology and narratology, which had to fail as it missed the crucial point: the computer game as a medium. Finally, gaming in general, as well as its relationship to chance, coincidence, emergence, and event is discussed.

Decision-Logic and Gaming

The approach taken in this text is based on a rather unusual point of view. It is a fruitful method for choosing unfamiliar perspectives or ones that don't immediately seem to be relevant to computer games in order to gain fresh ideas and insights. The unusual starting point in this case is psychoanalysis, or to be more precise: Jacques Lacan. In a famous lecture on psychoanalysis and cybernetics from 1964, he mentioned his specific interest in *doors*. What does "a door" mean, Lacan (1988, 307) asks: "[it] opens on to fields, but we don't say that it closes on to the sheepfold, nor on to the paddock". – Thus, the door closes something, it draws lines, it deals with entrances and exits, with inside and outside and also with openness and closure.

In summary, there is not only a door and its obvious connotations for binary systems; there is also a threshold, and sometimes an indetermination or non-accurateness between inside and outside. The relation between entrance or access and closed doors or non-access might not be clear. Being on a threshold is different from having a choice. Sometimes it might be the most convenient location be-

cause you are neither inside nor outside, you are 'in-between', which means you always have a choice. However, it also means feeling unable to choose.

Hence there is more at stake with a simple door than just the binary alternative between *open* and *closed*. Even if the door is reduced to this binary code, some mistakes may still happen. In *Modern Times* (USA 1936) for instance, Charlie Chaplin acts as a waiter in a restaurant with swinging doors which allow exchanges between the restaurant and the kitchen. Through these, the waiters enter the restaurant with their heavy loads of food by just kicking the door or, the other way around, they enter the kitchen with a similar heavy load of used dishes and glasses by also kicking the door. In Chaplin's movie, the restaurant architects obviously made a serious mistake, because the door is marked "in" both inside and outside the kitchen. Obviously two waiters – and of course one of them is poor Charlie – will crash into each other. Sometimes decisions are not clear, especially if you have doors which are, as in this case, a bit confusing in respect to the clear difference of what is "in" and what is "out". But isn't this a typical situation in life? This was exactly the point of Lacan: A door, by its nature, belongs to the symbolic order. Nevertheless, there exists a dissymmetry between openness and closure, as he puts it, because a door seems to be responsible for rules of access: to allow some in and to forbid others. The door itself is a symbol for a rule, and indeed a very strict, binary rule, however there is no rule to rule the rule.

A door also serves as a perfect model for decision logic, or, in other words, it serves as a spatial paradigm for the binary code. There are similar spatial metaphors such as bridges (about which Martin Heidegger wrote important remarks in his essay from 1935/36 on *The Origin of the Work of Art*) or corridors and their ramifications (Trübby 2008). These different kinds of thresholds are all related to space. Doors, bridges, corridors and ramifications structure spatial orders, in the words of Gilles Deleuze and Felix Guattari (1987:508-510) they

(re)territorialize, space using decision logic, they produce a binary 'marked space' (Spencer Brown 1969). It is therefore no surprise that they also play an important role in computer games. Even more than that, structuring spaces through the use of doors, corridors, bridges, ramifications and so forth leads to mazes, labyrinths, pathways and the like (Wolf 2010). This structure is quite obvious in games such as *MASS EFFECT* (2007) and *HALF-LIFE* (1998): the player seems to have a choice, but actually has no choice at all. The pathway towards the goal of the game allows for some detours, but in the long run is predetermined. A different, but in its nature similar effect is found in *PAC MAN* (1980): You are always escaping the ghosts, but you are always on the verge of being caught and forever trapped in a maze. In classical adventure games such as *THE SECRET OF MONKEY ISLAND* (1990), the sole purpose of player interaction is to find the correct order of things, events and spaces. The action space is directly linked to the narrative of the game – the labyrinth-structure of the story goes hand in hand with the spatial pathway used by the player. In other words, it is no coincidence that the spatial order of computer games is mostly based on a labyrinthine structure.

The decision-logical fundament of computer games corresponds to them being mathematical systems. Yet these decision-logical orders are hidden under the surface (or, as Frans Mäyrä (2008:15-21) puts it: the core-gameplay is hidden under the representational shell), as the surface tries to camouflage the basic labyrinths as 'real' spaces which seem to be under the command of the player's gaze and their (first person) perspective; This is especially noticeable in game-series such as *HALF-LIFE* (since 1998), *CALL OF DUTY* (since 2003) and *FAR CRY* (since 2004). In short: The feeling of being in a natural space, outside in an open field or in a mythical forest, able to move and explore the terrain freely, is only an illusion. Instead, a player is conditioned by a labyrinth, which defines their possible movements – they are already inside the closed door, so to speak, locked in a maze which only allows for decision-logical movements.

Although there is still a range of possible selections, the player may only decide within the framework of the logical basis the game offers. In both MASS EFFECT and its sequel MASS EFFECT 2 (2010), for example, the controlled avatar is unable to jump or fall from heights. The range of possible movements is predefined by the characteristics of the avatar as well as the level design. There always is a possible path towards which the player is guided, or, even more radical, there are seemingly many pathways, but only one of them may be chosen. There is no freedom in a true sense: one might call this the *dark side* of the ‘magic circle’, if a magic circle exists in computer games at all (Liebe 2008). The offered possibilities are mere alternatives; there is no escape from this rigid structure, even if the player is not motivated to play at all.

This structure is the core of what is called the ‘medium’ of the computer game, the kernel of its logic. This can also be seen in the characters, the “pawns” of the game – the avatars and their design. Take a typical roleplaying game such as MORROWIND (2002) or GOTHIC (2001), as this genre brings some of the most successful features of character development into computer games. There always is a similar starting point, asking the player to design a character by choosing some features from the menu: be a knight, a thief, an ambassador, be male or female, be rich or poor, or equipped with special abilities, a number of lives, magical powers and so on. Even if there are options to create additional programs or a different series of algorithms that alter the structure of the game, you still operate in the realm of choices – you can only add more possibilities which allow for new alternatives. You are still the puppet on the strings of these alternatives, trained for pushing buttons and choosing elements from a menu.

However, one might object with the famous argument made by Niklas Luhmann (2000) in his book on *Art as a Social System*, where he points out that even an author has to choose when creating a narrative figure. In writing novels you also have to decide if your charac-

ter is male or female, colored or white, old or young, married or single, with blond or black hair, shy or audacious, unemployed or a master of their job and the like. Maybe creating a character has to do with these basic operations, but what you give birth to is not a character. Instead, what makes a figure in literature or film interesting is the development of his or her character. This does not simply mean adding some features. Development is not a feature at all; instead, it depends on personal histories, memories and the growth of experience with a lot of unexpected and surprising aspects you cannot anticipate. In role playing games, the progress of a character is marked by experience points and new levels of power and capabilities.

The features raise values, such as abilities, and have stronger effects on the game-play the more they are based on additive algorithms. In *MORROWIND*, the third game of *THE ELDER SCROLLS* series, it is a common trick to jump all the time while travelling the game world, because every jump gives experience points in the skill “Acrobatics”. Increasing experience in skills leads to the possibility of increasing attributes of the character. When a character increases “Major” or “Minor” skills 10 times, it reaches a new level, allowing the player to distribute increases in attributes, such as “Willpower”, “Intelligence”, or “Strength”. As a consequence, having acrobatics as a major skill lets the jumping player increase the level of his character continuously – also having an effect on features that do not have a direct link with jumping, such as intelligence or willpower. This kind of linear development of characters, or rather this linear evolution of powers, has become a common feature in many of today’s games, ranging from futuristic shooters such as *BORDERLANDS* (2009) to strategy games such as *CIVILIZATION IV* (2005) (military units gain experience, reaching a certain amount lets the player assign additional features and strengths to the unit) (Aarseth et al. 2003; Elverdam/Aarseth 2007). In life, however, there is more at stake than a simple play of alternatives. Being a person – and not a pawn, a char-

acter or an avatar in a game – includes response and responsibility, which are not a matter of decision but rather, as Aristotle already put it, a matter of practical wisdom or *phronesis*.

System of Rules and the Unconsciousness Pertaining to the Medium

Quite like games, decision-logic is based on rules that make meaningful choices possible. To decide something means to choose from a set of possibilities. The notion of choice in itself already is limited: You never take a choice in complete freedom, but in respect to rules, an apparatus or technological means or a set of alternatives. It has often been claimed that games are based on rules – Ludwig Wittgenstein (1953) does so, as do Johan Huizinga (1955), Roger Caillois (2001), and plenty of recent computer game scholars such as Katie Salen and Eric Zimmerman (2004), Jesper Juul (2005) and Ian Bogost (2007). Moreover, it has been stated that you have to play according to given rules in an absolutely strict manner, like a machine, or else you are playing a different game.

Huizinga and Caillois focused on the structuring power of rules, meaning that rules provide meaning to player actions and, by constraining free forms of play, allow for civilized and cultural forms of play. Both scholars also point to the motivational aspects of rules (e.g. defining a winning condition) and the challenges in artificial constraints created by rules. Based on the descriptions and definitions provided by them, as well as Brian Sutton-Smith (1997), Salen/Zimmerman and many others, Juul (2005:36) finally came up with a formalistic definition of games with rules at its core:

A game is a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are negotiable.

The strict separation of the fictional layer of computer games and the rule based underlying structure of games undertaken by almost every game scholar (most prominently in Gonzalo Frasca (2003) and Frans Mäyrä (2008)) finds its roots in this line of discourse. Accordingly, rules bring mere functional aspects to the game while the representation of meaning is based in its fiction. In contrast, Ian Bogost establishes a model of games that proclaims rules to be the basic means for communicating information. This leads to the point that games can communicate with the player through their sets of rules and automated behaviors rather than having to rely on fiction. Most recently, Miguel Sicart (2009) based his theory of ethics in computer games on the consistency of possible behaviors.

Constitutive rules, as John Searle (1969) called them, create the conditions for the possibility of action or interaction: they transcend the practice of gaming. Indeed, games are parts of normative systems which exceed its rule system and which in turn condition their design and usage in the first place. There would be no rules without a common sense of norms, of laws or of commandments. These factors suffuse rules – they govern the establishment of rules. They always precede them. Moreover, rules neither define nor limit possible practices nor do they structure the complete field of things. Instead, they arrange things and possibilities with regard to a specific set of guidelines which normally remain unconscious for the player. In other words: rules furrow a field according to their own conditions. In the context of the ‘navigable space’ (Manovich 2001:244-285) of computer games, they produce grids on a surface. These grids allow the mapping of the surface.

Maps in games like DOOM (1993) or GHOST RECON (2001) both give orientation and define trajectories according to their underlying loco-semiotic system at the same time. In the case of computer games, this system is based on code. It is not the map itself which establishes the code, it is the other way around: it is the code, the basic mathematical system, which substantiates the map. It is not the

map that is the medium, but the code mediates mapping. Yet as the medium it remains hidden: The code remains concealed but at the same time reveals the structure of possible movement or action. The mathematical order functions like an unconsciousness of the game. It is this unconsciousness which pulls the player towards its strange and sometimes perverted directions; e.g. in *FAR CRY*, when a player tries to escape the 'map' of the game or discover its borders and is automatically killed at the edge of the game's space, which presents itself as open and unlimited.

Accordingly, there is more at stake with rules than meets the player's eye. As decision logic forms the basis of computer games, restrictions due to the rule system are implied. This system is nothing more than a mathematical system and its 'unconsciousness' becomes more and more present as the player's actions are reduced to a series of choices, sometimes meaning nothing more than simply: 'press this button now!' Although a lot more complex in performance and aesthetics, music games such as *GUITAR HERO* (2005), *ROCK BAND* (2007), and *VIB RIBBON* (1999) exemplify this very well. Based on a complex codification of the played music, the game causes the player to continuously react to the rhythm of the song.

This aspect is also prominent in other game types, however. To give a short example: you can move through cities, pass corridors, cross bridges, but you cannot stand in complete serenity just watching the birds flying or the monsters passing in order to just contemplate their bizarre beauty: You have to react or else the game is over very quickly (Pinchbeck 2008). Neither is it possible to open a door and meet some strange person heavily loaded with guns and spontaneously start a conversation with him. The player has to react to the threat according to the implemented rules of the game – in this case: shoot before being shot.

Thus, rules are indeed essential to games, but there is more to it. They are not the whole story, there is still something hidden behind the rules that constitutes the unconscious code of the game.

This code not only creates the modalities of each play session, but also constructs the player's intentionality and his so-called freedom. In order to keep the game running, the player becomes an application of decision logic, as they are forced to have one decision after another. This characteristic of computer games is most prominent in moments of frustration and aggression as reflected in game creations like *I WANNA BE THE GUY* (2007), which turns playing into a combat between the player, the designer and the capabilities of the avatar.

The 'Ludology vs. Narratology'-Aporia

Although the discussion between so-called ludologists and narratologists was the leading argument during the last six to eight years of game studies, there are some signs that it has lost its harshness. Although the debate was a useful step in the development of a theory of games, it actually failed. It did not come to the realization that it is necessary to discuss computer games as a *medium* (Wolf 2001), one medium among other mass media like film, photography, painting, storytelling etc. All these different media include certain forms, aesthetics and structures that dominate the language through which they can express ideas. The computer game has a lot in common with these media forms, but it also has many differences, or rather divergences.

These divergences can most obviously be found in the rules: Their ambiguity, the whole setting of different meanings and implications, as well as its implicit code system, its dialectic of revealing and concealing information are all related to a theory of play and not to a theory of narration. Yet this does not mean that the ludic approach to games becomes more valuable here than the approach of narratology. There is no doubt that computer games are games, but they raise the question of gaming anew. In order to find out how, the computer game has to be discussed in the context of play, and especially of the question of the 'mediality' of play (Günzel et al. 2009).

Ludology, which tried to face this task, widely referred to classical ideas as they are found for instance in Friedrich Schiller (1967), as well as in Huizinga, Caillois and others. However, ludologists suffer from an approach to gaming that comes from within, mainly focusing on the formal aspects of rules, using a rather rigid concept of the magic circle, as it can most prominently be found in Jesper Juul (2005:164-167). There is no proper understanding of the ludic impact of computer games in ludology, because there is no adequate theory of the 'mediality' of play.

Reading the medial, to take a quote from Wittgenstein (1953:146), often suffers from a "one-sided diet". This is why the forms of new media are often discussed in comparison to those of preceding, old media, such as photography and painting during the early 19th century, or cinema and theatre or literature at the beginning of the 20th century. Such comparisons tend to adopt approaches that seem to fit media with long traditions like painting and theatre, therefore it is no surprise that in early photography or cinema theory there are strong references to painting and theatre or literature. The same is true for computer games. Since the first scholars who approached the new medium came from literature departments, such as Janet Murray (1997), Marie-Laure Ryan (2001) or Henry Jenkins (2004), they adopted textual metaphors like 'fiction', 'figuration' or principles of storytelling. They 'read' computer games in the realm of narration. Others were film-theorists (King/Krzywinska 2006), who adopted the visual aspects and the theory of story-telling in films to computer games. This was useful to a certain degree, but all these comparisons were somewhat misleading.

Indeed, adoption in itself lacks validity. Take photography and painting: from the outside, they seem to have a lot in common with each other. But the essence of photography lies in its indexicality, which does not make any sense to painting. The same holds for cinema: Acting in a movie and on stage seems to have a lot in common, and typical strategies of staging and the *mise en scene* seem to

be quite similar. Accordingly, early film theory stuck to Eisenstein's montages and its possible modes to establish a storyline. Adopting the rhetoric of narration from literature theory therefore seems to be the obvious suggestion to describe films. However, and again, there is more to the medium of film than narration or figures. Film is, in the first place, the art of moving images. It mainly operates in the realm of the visual. Debating cinema in terms of language, text, or narration therefore misses the point; from the very beginning of the history of cinema, there are entirely abstract films without any narration, just moving images with a very playful concentration on shapes, geometrical forms, and colors such as Hans Richter's *Rhythmus 21* (G 1921).

These films without any narration, which simply operate in the visual, take all their impressions from visual playfulness alone. These examples tell us a lot more about the medium than any Hollywood blockbuster movie can. Thus, an exclusive discussion of the medi-ality of film under the notion of narration similarly fails, just as the discussion of computer games under the focus of rules, to establish a proper theory of the medium. This is not an argument to exclude these approaches completely from film theory or game studies, but to make obvious that these approaches are too reductive and do not allow for a full understanding of their objects of analysis.

Discussing film in terms of visual art does not need a debate about narration's relevance to the medium. Accordingly, if one discusses computer games under the notion of decision-logic, the diverging argument between ludology and narratology disappears. Put very briefly: Decision-logic provides the basic system of code formulating the rules that structure the game. Hence, understanding computer games as games shifts the theoretical perspective towards the realm of a theory of play. At first sight, this is a trivial statement; and perhaps not obvious, as it is very easy to use any game, even simple games such as jack-in-the-box or card games, to create a story. Children often do this, and Italo Calvino demonstrated in his 1973 novel *The Castle of Crossed Destinies* how to use Tarot to invent high literature.

At the same time, any narration may be transformed into play. This happens by transforming the narrative into factors of action or interaction by reducing the narration to a set of rules and the normative system behind it; every translation of a film into a game undergoes this transformation. The crucial point here is the relationship between rules, or rather decision logical rules, and narration, especially since decision logic only facilitates constricted narratives. There can be no full interaction with the storyline as, ironically, especially acclaimed story driven games such as *HALF-LIFE* or *MASS EFFECT* (2007) demonstrate. There is always a goal to reach, missions to accomplish and characters to meet, but no events that are not already part of the internal structure of the game. Narrations that are created by the use of choices indeed allow for quite a number of stories, but they always also imply serious exclusions for certain not included possibilities. This is a very important aspect of computer games. The range of possibilities is determined.

Gaming in Relation to Chance, Coincidence, Emergence, and Event

Obviously, games in general use rules in action. Games that exist only conceptually and cannot be played are not games. Games only exist through reference to the actual movements of a player, which in turn are primarily dependent on two essential principles: *contingence* and *order*. The difference between these two principles refers to the hidden structures of the computer game, which are overseen by theories that mainly deal with rules and actions.

There is another, almost mostly forgotten approach to game theory originating with Hans-Georg Gadamer. His original paradigm was not ritual (Huizinga and Caillois), or language (Wittgenstein), or the games children play (Buytendijk), but that what was traditionally called *ludi naturae*, the playfulness of nature, especially the “to-and-fro” (Gadamer 1999:105) of movements in nature, waves coming and going at sea, the wind playing with leaves and other similar

examples. For these references to nature, the ball serves as a perfect example in human play. In *Truth and Method* from 1960 he wrote: "Playing is being played with. The attraction of a game, the fascination it exerts consists precisely in the fact that the game masters the players." (Ibid:106) The statement implies that the practice of playing the game as little obeys the sovereignty of the player as it is characterized by the player's virtuosity or strategy. Instead, gameplay is embedded in the logic of happenings or rather something that 'be-falls' (in German: *Widerfahrnis*). Everything that is a game is in the first place an *event*.

Yet games are framed by rules and structures. Games or the practice of playing is endowed with a double *cathexis* or 'occupation': On the one hand, a structure is required within which the game takes place. On the other hand, the act of playing is unforeseeable and undetermined as the rules create situations that are unregulated, undetermined and full of responses that are not anticipated. Games are characterized by alterity, whether it is through a number of opponents whose reactions are unpredictable, or through the unpredictability of the game's object itself, e.g. the ball (This is also the reason why games like football or soccer are so intoxicating). Hence games operate in a field of ambiguity: they are constituted by the *to and fro of structurality and contingency*.

This structural characteristic of games is also included in the differentiation of *tuché* and *automaton* by Lacan (1978) in his *Seminar XI*. *Tuché* is the randomness that cannot be forced or repeated, which is most effective in the realm of passivity. *Automaton* refers to the automatic generation of coincidences by means of algorithms and random samples. In the first case, a frame which margins or locates something that happens is sufficient: an open space of unknown events. In the second case, randomizations, probability functions, the so called Monte Carlo-method or other mathematic simulations of emergence produced by software programs or machines are at play.

Due to its digital nature, the computer game *by definition* uses the latter ones. Rules in computers are not just frameworks, but themselves constituted by internal structures. There is no space that may remain empty, as in the art forms using *tuché*. In his work *Silence*, for example, John Cage (1961) plays with this notion of possible nothingness. The parts with no sound at all constitute the artistic expression. Yet the freedom to not fill the frame is not given when acting with computers. Even the white screen of an empty document file is generated and not empty as such. Additionally, the range of possible outcomes through user input is determined by the input-options defined by the program.

Computer game rules are no different. Instead of establishing their productivity in play through passivity, they function as 'positive rules'. The rules of computer games, as well as the ball in computer games, allow for actions that would not be possible at all if it were not for the lines of code defining them. At the same time, the progress of a match of FIFA 10 (2009) is predetermined by the range of possible actions included into the game. This internal structure stands in contrast to the text production of concrete poetry or compositions such as Cage's *Empty Words* from 1973/74. *Tuché* instead refers to 'negative rules' which simply frame an open space in order to let something happen, "the outcome of which", as Cage (1979) puts it, "cannot be foreseen".

In conclusion, games in general deal with the ambiguity of structure and coincidence. The most interesting and playful ones are the games with an open framework and the possibility for "events"; we love to be confronted with something which disempowers us, something that makes us aware of our non-sovereignty in the world (which may already happen through something simple as a bouncing ball). Computer games simulate this exact situation. However, here we are dealing with an *automaton*, a set of algorithms that create randomizations and emergence in a completely formalized and structured environment. The limits of computer games become especially

obvious when compared to art practices. These limits are seen best from an oblique angle and tell a lot more about the essence and characteristics of computer games than any direct or upfront approach at analyzing them.

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