Video games and architecture

An extensive account on video game theory
and the possible application of this theory in architectural design

Graduation thesis - Master in Architecture, Urbanism and Building Sciences - TU Delft

By Simon A. Tiemersma Bsc
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Explorelab, Mentors: Leontien de Wit, Ype Cuperus and Arno Kamphuis

Abstract

This research explores video game design elements that differ from the architectural design elements and could improve upon the latter due to new perspectives and digital possibilities. The research is based on an extensive literature review, a workshop and some interviews. The game design elements in this thesis are subdivided in the themes narrative, gameplay and level design and are selected to their potential relevance to architecture. As part of this thesis, they are compared with similar architectural topics on their relevance and novelty.

The result of this research is a shortlist of methods, divided in several elements and techniques that describe how they could be of positive influence to architectural designs and the architectural design process. The methods are based on the conflicting nature of video game elements, which are either based on precreated experiences which offer some interaction, or based on free structures that provide improvisational play. Another method is based on playtesting, which offers architecture a new way of testing designs.

This thesis offers new approaches to architectural design practices and could be a starting point for more in depth research in game design elements for architecture.

Foreword

Video games are an hobby, but one I have larger aspirations with. That is why I wanted to combine my graduation in Architecture with video game theory. During my Bachelors and Masters at the TU Delft, I recognized many features the disciplines share and I wanted to find out whether the architectural field could benefit from design elements of this digital field. This thesis will elaborate many of those game elements in great detail.

I would like to thank my mentors, Leontien de Wit, Ype Cuperus and Arno Kamphuis for their guidance, Nina Verkerk and Mark Veldboom for improving my thesis, Rémy van den Wijngaart for helping with the workshop and Roderick Trompert, Arne Bezuijen, Joris Dormans, Martin Nerurkar and Igor Mayer for their conversations and ideas.

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Introduction

Opening

This thesis is about video games in relation to architecture. Many people play computer games these days, with demographics showing 58% of people in the USA playing them (ESA, 2013), 9,3 million in the Netherlands (De Hooge, 2009) and over one billion people combined on the whole world (Helder, 2009). Games are a new medium and tied to the rise of computer and information technology at the end of the twentieth century. Physical games existed for much longer naturally, but it was considered only as pastime and toys, not as a field of research. *"Game design started to become a 'field' only recently, with the introduction of computer technologies."* (Salen & Zimmerman, 2004, p. xi)

McGonigal states that the field of games could have positive effects on the whole society:

"We need to build hybrid industries and unconventional partnerships, so that game researchers and game designers and game developers can work with engineers and architects and policy makers and executives of all kinds to harness the power of games." (McGonigal, 2011, p. 14)

This perspective, that games can provide positive change to other disciplines, is a premise for this thesis. In this case, it is focused on the architectural discipline. The comparison of video games with architecture is at place, because of the similar design questions of spatiality, visuality and functionality; all based on a technological system.

"Negotiating the play of (...) spaces requires a delicate balance between design and technology, form and function, the practical and the poetic – all issues that have been at the core of architectural discourses for centuries." (Salen, 2006, p. 37)

Nerurkar even compares Vitruvius' qualities of architecture and found them quite similar to those of game spaces (Nerurkar, 2009). In that light it is not strange that many schooled architects like Nerurkar (see interview appendix B.3), but also others like Michael Licht (Licht, 2003), and Phil Co (Co, 2006), find their place in the games industry. Just as architecture, *"...games create contexts for interaction and are modified by this interaction within the limits of the system."* (Salen, 2006, p. 31)

Games are however a new and much more dynamic design discipline, due to the freedom and limitless options the digital world offers. Because of this freedom, game designers have tried out new approaches and found new answers to general design questions. These new solutions can offer new perspectives to the field of architecture. This is relevant, because contemporary societal context asks for more dynamic design solutions, like how to solve environmental problems that arise due to the crisis and sustainability demand. This research aims to provide new, simple methods that could provide new directions for architectural design questions.

Problem and question

As a result of the rise of games and the research field of games, new opportunities for comparisons with other disciplines arise. The theories by people like McGonigal are large scaled and try to open up people's thinking to this new medium and its possibilities. This thesis explores the most relevant parts of game design and game theories that could be beneficial to architectural design and architectural perspective. The contents of the thesis are spread out wide over the entire game discipline, but will be condensed at the end of parts and at the final conclusion.

Themes like interactivity, interactive storytelling, dynamic worlds, game rules and game systems have not often been part of the architectural debate, but are the core of games. The elements are split in to three parts that are central in the field of games: narrative, gameplay and level design. After each part that is dedicated to these subthemes, they will be compared with architectural writings that already exist. New or enhanced ideas and perspectives are subsequently distilled and elaborated on more practical use and application in architecture. Hence the research question:

How do story-driven, ludic and environmental elements operate in video games and how could those elements be applied in architectural design?

Aims

The goal of this thesis is to formulate a compact list of game elements, which could be used as perspectives, methods and practical models in the architectural design process and as physical elements in the built environment. The research is explorative, identifying and descriptive of existing theories, but also adds a critical note on several topics and in the comparisons. Focus has been applied to elements that have potential for the architectural discipline, but some elaborations are not included in conclusions because they are either introductionary elements or considered as broadening topics.

This research could be a contribution to knowledge, because it combines perspectives of architecture and games. This has been done to a certain degree by architects-turned-game designers like the ones mentioned in the beginning of this paragraph, but not in such a wide extent. Furthermore, trends and new findings on game topics have been analyzed on a larger scope and compared with questions of physical spatiality and use. The final list will define lenses for a different and more contemporary approach to architectural design.

Research methods

The main research method will be an extensive literary review, focusing on general books on game theory, articles of specific researches, opinion article, lectures and some theses. Many books on general game design are very practical and hands-on, describing working methods and examples. These methods have been analyzed on a more overarching methodology and compared to the more theoretical approaches. Because many sources continuously refer to specific game examples, this has also been done in this thesis. This helps in the explanations of some of the theories.

Next to written research, some interviews have been done with game theorists and designers. With different background, but all a history of research on games, Arne Bezuijen (appendix B.1), Joris Dormans (B.2) and Martin Nerurkar (B.3) offered some interesting perspectives that are further elaborated in the thesis and in the conclusions.

Lastly, a workshop (appendix A) has been organized, in which participants listened to some game design theory and needed to design a tower based on that knowledge. The effectiveness of the workshop is debatable, because of the short time length and differing design question, but nonetheless offered some practical examples of games that are embedded in existing architecture.

Structure of thesis

The thesis is split in the three parts mentioned in the research question: narrative, gameplay and level design. These topics are chosen, because game theory is best split up in these themes. Each part contains three chapters, the first being the main body of research in the field of games. In this chapter, the main video game principles that are relevant to architecture are explained. The second is a shorter chapter that gives insight in similar principles, but originates from architectural research field. The third chapter will summarize the findings of the previous chapters, compare these with each other and conclude in a list of more practical approaches that could be beneficial for architectural design.

Narrative

The first part will start with the issues that prewritten stories face when dealing with the free nature of games. The topics, make-believe, magic circle, interactive story structures, environmental storytelling and emergent storytelling[1] will be included here.

Gameplay

The second part is focused on the actual mechanics of play and games, like rules. A general view is taken on in the topic of gamification, which describes the effects games can have outside the digital realm. Next to that, a psychological approach about games and why people play them is elaborated in the paragraphs about patterns, motivation and flow. After that, emergence[1] is reviewed with gameplay systems as the main theme.

Level design

Designing virtual worlds is the theme of the last part. It is divided in the definition of digital spatial structures, the process of designing a level or game world, modularity and procedural level design, wayfinding and navigation and again, emergence[1].

1. Emergence is a recurring theme and is included in each part, because it affects the topics in a different way.

Many other elements explained in the parts of this thesis are not specifically bound to the theme of that part; they are interchangeable. The concept of flow for example related very closely to gameplay and level design, but is described in full in the part on gameplay, because flow is an important part of play in general. They are implemented in the sections in this way, because they fit best with the overarching theme and with the other subthemes. Many subthemes will however concern comparable elements with those from other parts. Duplication of writings has been prevented when possible, and all overlapping topics will be merged in the overall conclusion.

Narrative

In this part the relation between narrative and games is thoroughly explained in chapter 1. Chapter 2 will explain the relation between the same narrative themes as in chapter 1, but then with architecture. Chapter 3 will ultimately be a synthesis of chapters 1 and 2 by providing a summary, a comparison and a list of possibilities for architectural design.

1. Narrative and Games

1.1 Intro

Games are not stories. However, many games incorporate stories or elements from them. Chess is an example of a game that contains simple story elements. You could play with unnamed pieces, but by giving them names such as tower and king, some story element is applied. Seen from the other side, stories have been interactive since men could tell them. People change their tellings by the reaction of the public and sometimes ask the listeners where the story should go. The experience of a told story such as theatre is always the story itself plus the reaction people give to it (Sheldon, 2004, p. 8). That is because actors change their pace or even the story according to the audience's reaction. In that light, interactive games are a more natural way of storytelling compared to film or television. However, with games, you also need to add a third factor to the experience: the gameplay.

In this chapter, the main problem that challenges game stories is explained first. Secondly, the notion of the magic circle is elaborated. The last three parts will contain the most important story techniques for games: interactive story structures, environmental storytelling and emergent storytelling.

1.2 Difficult relation

Because there is a huge gap between playing and enjoying a story, gameplay and story are difficult to mingle. The first is interactive and non-linear and the second works better when it is pre-written and linear. Many game designers strive for branching storylines and different endings, which is a trademark of interactive stories. A good story has unity however, like the story of Cinderella (Schell, 2008, p. 266). This story is crafted as a unit and different endings would not fit the beginning of the story. Creating satisfying branching storylines can be done, but it is a very difficult process; not only do the designers need to write and design an exponential amount of story options, they also need to give every option sense. (Schell, 2008, p. 267).

One could argue that every kind of story is inherently interactive, because the story experiencer is continually making choices. When presented with a situation or problem in a story everyone will think of a possible or desirable outcome. The difference between literary or film stories and games however is that the experiencer has the ability to change the narrative (Schell, 2008, p. 263). It is also a point of perspective. With film, viewers have the illusion that the characters are free to go where they want when they immerse themselves in the story. In a game, that illusion does not work as well, because players are immersed on a different level. They either become a character or use it as a 'digital doll' (Kelly, 2011). The game world, or 'doll house', is therefore as immersive as the level of freedom that is offered to the player (Sheldon, 2004, p. 301). Due to the current state of technology there is always a limit to that freedom. Besides, even when a player is to some extent free to move around, it is very hard to get a well-timed story tension (Kelly, 2011).

Stories and games inherently contradict each other (Kelly, 2011). Stories, according to Kelly, are not the sum of all story elements, but the structure in which those elements are laid. Games use story elements, but if they are really games, they let players play with the order of these elements and interact or change them. This sense of dramatic freedom is called 'agency' (Kamphuis,

2013). Impactful stories and having a high level of agency are hard, if not impossible, to combine. Schell states that this is especially the case for dramatic and emotional stories, because they so heavily rely on the impact of unchangeable destiny (Schell, 2008, p. 270). For example, the story of Romeo and Juliet would not be so emotional if the characters are given a choice to not kill themselves.

This freedom versus destiny is one of the main reasons some critics claim that stories and games cannot be used together. But there are also more simple statements. Many stories are primarily told using human communication: by talking, pleading and crying people. Most games on the contrary are much more about jumping, running and shooting (Schell, 2008, p. 269) and with these actions it is more difficult to tell an intricate story. Another critic sees stories more as side dishes. Games with a story are *"...like having to complete a crossword puzzle before you are allowed to turn the page of your novel."* (Koster, 2005, p. 86) Of course it is more nuanced in reality. Feil and Scattergood use an analogy with Maslow's Pyramid of Needs (Feil & Scattergood, 2005). When the baser 'gamer needs' like interface, use and goal specification are fulfilled, the players can focus on a story [image 1]. It is therefore paramount that use and interaction have to work perfectly if you want to give the story a central role.
The stated problem here is that interactive games and stories are very difficult to combine. However, in the beginning is stated that many games incorporate stories. How game designers (successfully) merge games with stories is explained in paragraph 1.4. But for the next part: why would we actually want stories in games?

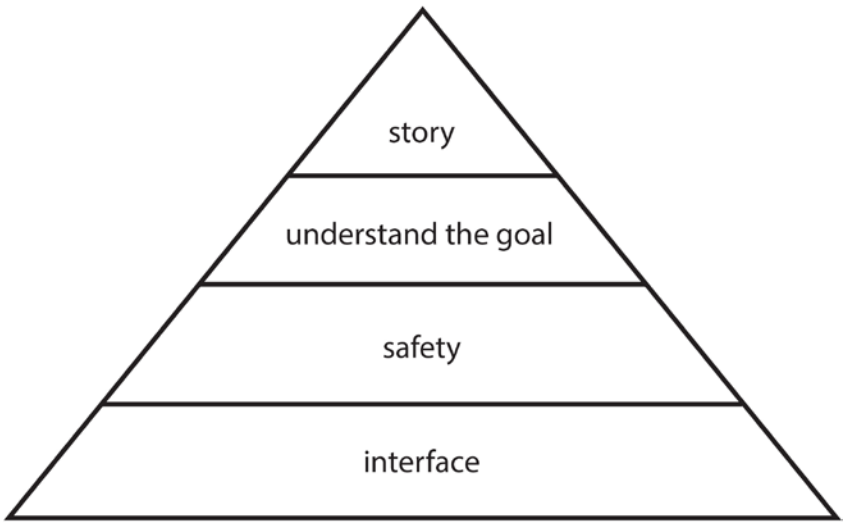


image 1 - pyramid of needs for players of games

1.3 Magic Circle

Games are a natural way for kids to learn the rules of the real world or to pretend they are in another. The reality created in a game is called 'the magic circle'. This term is introduced by Huizinga in 1971 and describes the workings of an imaginary world in any fictional situation. It draws back on ceremonial, spiritual and legal activities that people have done in history (Huizinga, 1980). In Huizinga's interpretation the magic circle is a physical playground, like

a tennis court or theatre stage. Nowadays this term is more widely accepted as a mental playground: The magic circle is the boundary between ideas and activities in the game and those in the real world (Adams & Rollings, 2007). Every game has a magic circle, even sport games. In the game of football, scoring a goal is equal to kicking a ball into a net in the real world [image 2]. Within the magic circle the actions are bound by rules and are given artificial worth.

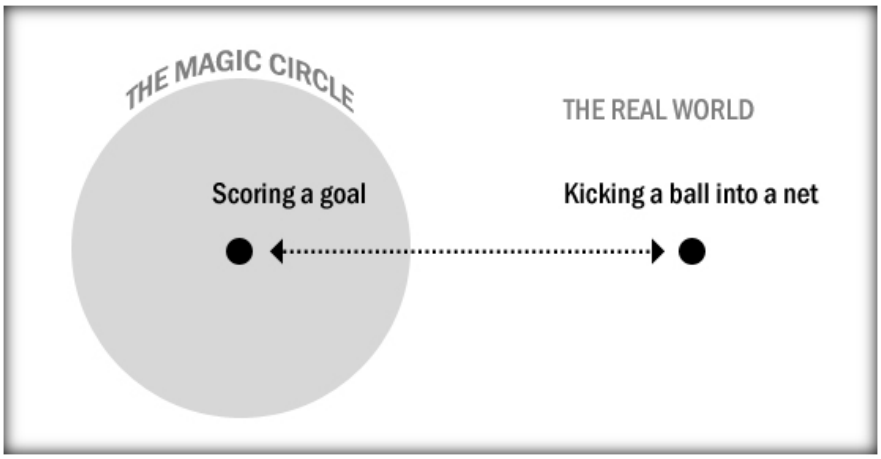


image 2 - the magic circle of football

Stories are capable of outlining the borders and the content of a magic circle. In almost every game, all elements are given a narrative purpose or setting. Prologues and background narratives for example can explain the game goals or the world in which it takes place (Adams & Rollings, 2007, p. 188). The immersion in a magic circle is easier when it is outlined by a story and characters: *"...it facilitates the essential act of pretending that all games require."* (Adams & Rollings, 2007, p. 182) A story can add significantly to the entertainment value of a game. It can make it more exciting on other levels than just trying to overcome a challenge. Greater emotional satisfaction can be reached by creating dramatically meaningful situations. Also, stories attract wider audiences. A story can motivate people to play, especially if they are less interested in difficult puzzles or challenges in dexterity. A story can also help sell the game (Adams & Rollings, 2007, p. 183) because characters and a story setting are easier to depict in ads and articles. A story can provide variety, so that players can do new challenges in new environments. Lastly, a game that takes longer than a few minutes can increase the players' interest curve by providing a story.

Not every game requires the same amount or same type of story elements. A lengthy game needs more story elements, a simulation game does not have much use of elaborate characters and abstract games like Tetris do not need emotional richness. Adams and Rollings make a very rough game-adapted distinction in story types. First a story in a game can be seen as a series of challenges and choices (Adams & Rollings, 2007, p. 206). In this type the story is being told every time a challenge has been met. The second type is the game story as a journey, and games that use this type advance the plot based on spatial progress[1]. The third and last type is the story as drama (Adams & Rollings, 2007, p. 208). There are not many games that use this type of storytelling because it takes away a lot of freedom for the players. These games usually tell the story on a strict time schedule: players cannot influence when something happens, they can merely react to it. The benefit of this type is that the designers can keep tight rein on the story and therefore make a more intense, and even emotional, story.

1.4 The interactive story

Games borrow a lot of storytelling techniques from other media like film and books. Methods like exposition and foreshadowing and also more basic techniques like the interest curve and three-step structures of crisis, climax and resolution is often applied to games to make the story work. Even the act of roleplaying in games uses a lot of methods from theatre. But games are more interactive than any other storytelling medium. How would an interactive story work? If a game was truly interactive, there would be an infinite amount of options to create a story, just as it would in real life. Game designers are limited however to a technology and time schedule to create structures that support limited amounts of options. There are several story structures that are most popular in game design and the ones that are most common are explained in this paragraph.

Adams and Rollings define an interactive story as follows:

"An interactive story is a story that the player interacts with by contributing actions to it. A story may be interactive even if the player's actions cannot change the direction of the plot" (Adams & Rollings, 2007, p. 187)

If the plot is unchangeable, it is still interactive because the players contribute to it. The story does not continue if players fail to accomplish goals for example. In an interactive story it is difficult to pinpoint which are the main events. Rollings and Adams distinguish three kinds of events: player events, in-game events and narrative events (Adams & Rollings, 2007, p. 186). Player events are actions performed by the player. Actions that are needed to overcome challenges usually don't influence the plot, but in some games the player is given the choice to kill someone or not or what to say to a character. These actions are labeled dramatic actions, because they can change the story. It may be noted that every possible action or movement of the player give shape to a story, the players can create their own story by doing whatever they want. More on that will be elaborated at the topic of emergence. In-game events are the game and game world's reactions to the player actions. They are also independent game events that do not contribute to the story, but add to the realism of the created world. An example is a guard checking if a gate is locked. Of course, the player might be in power of causing these kinds of events, preventing them or change them. The last, narrative events, are direct events that propel the story. They are unchangeable by the player because they are essential in moving the story and game forward.

1. Many open world games employ this method. Visiting new places has the benefit that it can tell story even without any story writing; the player will meet new situations and surprises by exploring the world. The freedom to explore the world without time pressure also gives the player the time to think about the situation and the story on his own pace. To guarantee that the plot moves forward in this type of story many game designers make use of one-way doors. These mechanisms, often mingled with the storytelling, make sure players cannot return to previously visited areas where all story elements are already told. Other games provide emergent gameplay and storytelling (see paragraph 1.6) in the already visited areas so that it is still interesting to return to those places.

In the remaining part of this paragraph some of the main structures of stories in games will be examined, based on linearity and multi directionality: linear stories, branching and foldback stories, web stories, modular stories and emergent stories.

Linear stories

The linear story is the most successful story, in every storytelling media. A straight line of events is easy and familiar and is able to communicate the simplest and most complex of stories in terms of emotions, events and characters (Sheldon, 2004, p. 301). For interactive stories, the linear story is by far the easiest to design, balance and is able to give the biggest dramatic impact. The player is forced on a rail and most narrative elements are told using cut scenes.

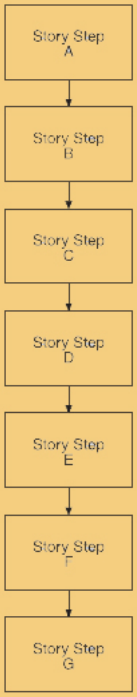


image 3 - linear stories

The interactive parts of linear stories are the player's actions to overcome challenges. Interwoven with the linear story, challenges are set up and if the player does not finish them, the story simply does not progress (Adams & Rollings, 2007, p. 195). Most linear games are based on a ´string of pearls´ mechanism [image 4] (Schell, 2008, p. 264). The parts that force a player in a single direction, using for example cut scenes, are the string parts and the parts where players are free to walk around are the pearls. To progress to the next pearl, players are forced to take another one of the string parts and so forth.

This linearity is not a trademark of games: interaction means freedom and a linear path interrupts that freedom. Players want their freedom, also in terms of story. That is why designers of games came up with different story structures to give the people more freedom.

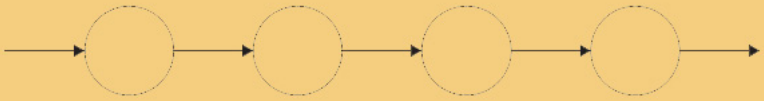


image 4 - the string of pearls

Branching and foldback stories

Since the beginning of video games designers had the dream of a fully interactive experience, where the player can influence everything and the game would be unique to every single play through. At this moment this is virtually impossible to create and the design task of creating structures that support endless freedom do not exist (yet). A way of creating a story and game that is not linear is by making branches in storylines. According to the actions of a player certain branches are picked and others closed off. The choice of a certain branch could be based on aware choices of the player, or by overcoming or failing a challenge (Adams & Rollings, 2007, p. 196). There is a difference between immediate, deferred and cumulative influence when it comes to branches pickings. Immediate influence is when a player choice directly chooses a branch, deferred influence is when the branching takes place a while after the choice

has been made and cumulative influence is when multiple choices cumulate to a point when the branching is activated. According to Adams and Rollings it is very important to make the consequences to making a choice very clear, and relative to the triviality of the choice (Adams & Rollings, 2007, p. 197).

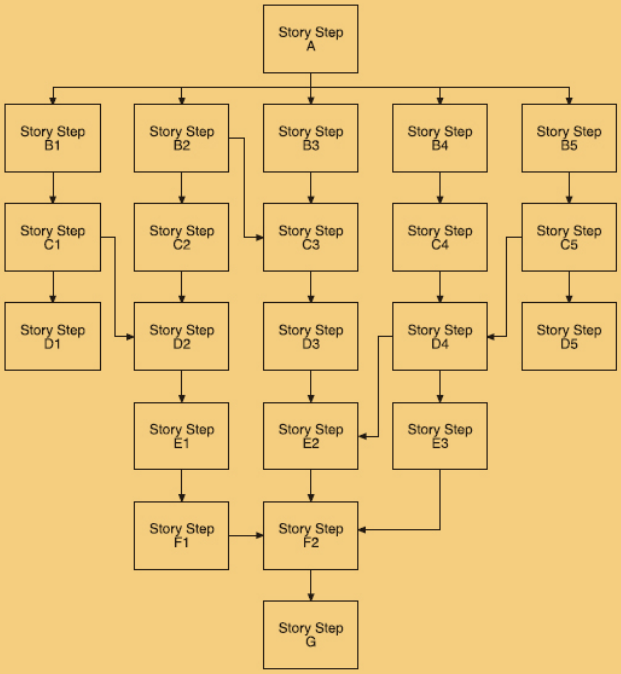


image 5 - branching stories

The structure of a branching story looks like a tree (hence the branches) [refer to image 5]. The difference with a real tree is that certain branches can merge to other plotlines and another important tool for game designers is to return all plot lines to one single ending. This concept is called fold back storytelling (Adams & Rollings, 2007, p. 200) and can also happen in any part of the story. The tree then starts to resemble the string of pearls of the previous paragraph, but then with multiple strings. Using inevitable events has the advantage that the story will be more impactful, but really branching stories offer more dramatic freedom to the player.

Branching brings a lot of complications and downsides however. One of the most important ones for the player is that the story will be less impactful. People tend to go for the golden path in a story, when they notice that there is a path that is more right (both for the story and the main character). But if a story has many branches, it is very difficult to make every path impactful. Next to that, having multiple endings can easily disappoint (Schell, 2008, p. 268). For the designers it also very difficult to create many branches, because it takes a lot of time to make. If a designer makes three choices per scene, having ten scenes would already create 88.573 unique outcomes: it is a combinatorial explosion (Schell, 2008, p. 267). A game designer should ask himself the question whether it is worth to make multiple paths, of which some paths will never be

visited by a player, or one impactful path that everyone will see. Meaningless branches make branching meaningless (Sheldon, 2004, p. 304). Branches should encourage people to play the game again and then offer a different and just as thrilling experience.

Web stories

In an attempt to get to truly non-linear storytelling, Sheldon came up with the web based story structure (Sheldon, 2004, p. 307). It is best compared with a map of building with multiple rooms, like early graphical games obliged you to draw to get to the end of the game. The essence of the web structured game is that progression is possible in multiple directions; the player could revisit rooms once they were there and explore new rooms using that previously visited room. In a story that would mean that story elements would not only be in linear or branching order (A to B to C) but in multiple directions (A to C to B). The player can get to story parts using several routes. However, there is no true freedom because the story forces the player through some chokepoints: where important story progress needs to be told.

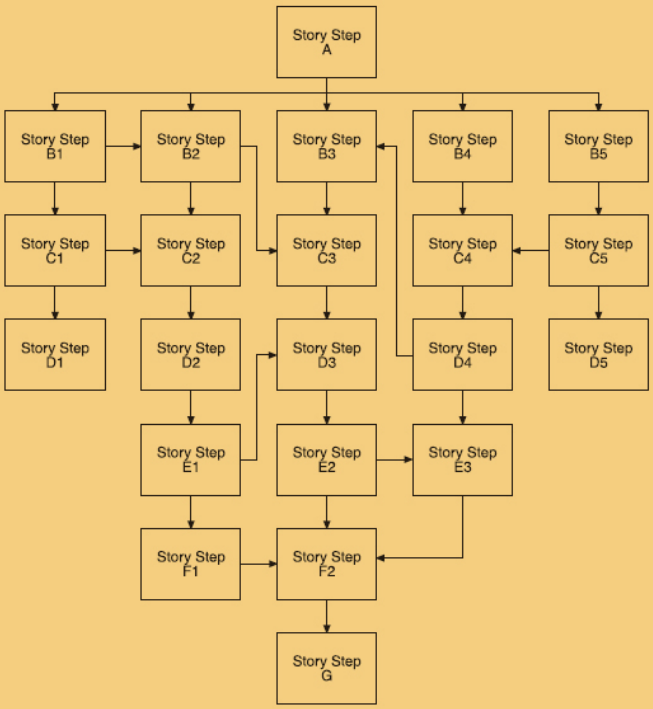


image 6 - web stories

Modular stories

Storytelling outside of games is mostly a linear experience, but that does not mean that the story is told linear. There are plenty of examples of books and films that mix up events of a chronological story (for example, Pulp Fiction) (Sheldon, 2004, p. 296). However, these stories are not interactive and will always offer a fixed experience. Branching and web based structures remain linear, because they rely on fixed strings between certain story events. In a truly modular story, every element could be experienced in every order.

Sheldon takes the story of Don Quixote and studied the Spanish 16th century picaresque novels where this story is an example of (Sheldon, 2004, p. 281). These stories are based on episodic events, that have an own story arc and interest curve and that could be read in any order. Every event becomes a module that could be visited after a fixed introduction module. Don Quixote for example, fights with windmills, scatters flocks of sheep mistaking them for armies and seizes a bowl thinking it is a famous golden helmet. These and more story modules can be read in any order and the build-up of every event after the other makes sure there is a successful interest curve. Synergy of the emotions and thrills makes sure the reader experiences every story module as a rising experience, heading towards a climax at the fixed ending.

In games, this same storytelling system can be used. Getting rid of the paths that force players in any direction removes any notion of linearity (Sheldon, 2004, p. 312). The modular structure fits perfectly well with gameplay, offering a lot of freedom and the same amount of fun to the player. The story can be just as impactful, providing there is a fixed start and a fixed ending. Using tracking and flagging mechanisms the game can react corresponding to the modules that have been visited by the player.

According to Sheldon modular storytelling is the answer to the problem of integration of story and game (Sheldon, 2004, p. 322). Offering almost total freedom for the player to experience a story, every module is a fixed experience however. There is another step forward in terms of freedom.

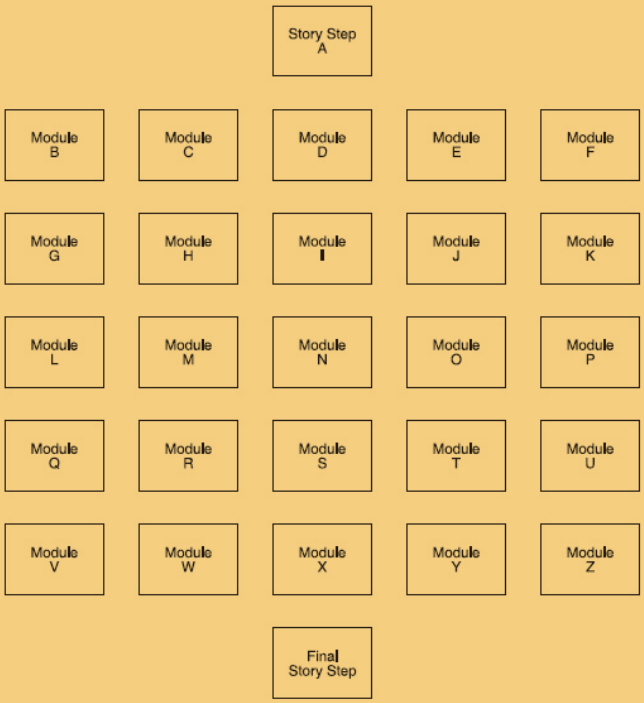


image 7 - modular stories

Emergent stories

This step forward is called emergent storytelling. Emergence is the art of emerging situations, performed by (simple) actions of the player. With emergence, the player is a painter or writer, creating the story solely with his own actions. The story emerges from the act of playing (Adams & Rollings, 2007, p. 202). Using existing actions and mechanics, the player can create stories that he can tell to others as being his own unique experience. A well-known example of a video game that offers emergent storytelling is The Sims [image 8]. In this game certain actions are allowed to the player, like building a house and certain social and life actions. Using these actions players can create their own stories. Emergent storytelling comes very close to playing real life games and is a hyped subject in the current games discourse. Because emergence recurs in every aspect of video games, a separate paragraph is dedicated to this topic in each part of this thesis.

image 8 - The Sims 3, Electronic Arts 2009

1.5 Environmental storytelling

Another method to add story element to games is the micro narrative[1]. Micro narratives help shape the player's sense of a larger world than is portrayed. When using the right triggers, like these micro narratives, the player will unconsciously make cognitive leaps in creating an image of the game world. These triggers are called *numina* (Kelly, 2011). This phenomenon is also used in other media, but is more powerful in games because the players know that they could miss them and knowing that the world becomes more believable. An example is the "Cake is lie" graffiti in Portal that suggests that other people went before you in solving the puzzles of the game. [image 9] Numina are part of the perspective of environmental storytelling.

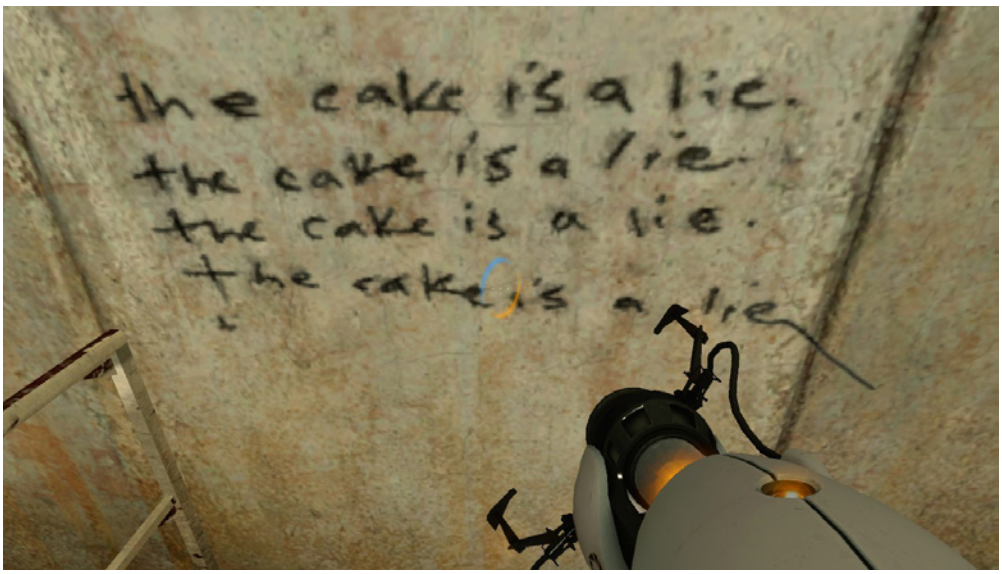


image 9 - graffiti texture in Portal, Valve 2007

Interaction and story can be mingled, but is not reducible to one element.

"(...) what makes a story a story is not the bricks it's the arrangement of those bricks into a specific structure which conveys more than the sum of its parts." (Kelly, 2011)

Kelly states that games with a prescribed structure a not really games. With games, players have remote control of an on-screen doll. This doll is an extension of the player and not an actor taking a role. The only time when some character can be contributed to the doll is when the game takes away control of the doll from the player.

What Kelly proposes is that games are a story sensing medium instead of a story telling medium (Kelly, 2011). A game should create the sense of a world in motion, filled with story elements that can be discovered by the player on his own pace. The player is control of the doll, not the world and that gives the feeling of participation and real interaction. In accordance, a game designer should not be a storyteller, but a painter (Kelly, 2011). A video game is more like a painting, which viewers can explore on their own pace and uncover stories that are portrayed. When thinking of portrayed places, you will ask yourself questions of who inhabits the world and why for example.

1. Micro narratives are small attractive events or views that give the player the sense of another sidetrack story. Even if a game has no large-scale narrative, these small and discrete narratives can help shape the player's emotional experience (Jenkins, 2003, p. 125). They have their origin in melodramatic situations, and can be the passing of a crying woman on a street or just the cheering of a fan in a football game.

Jenkins has an even larger elaboration on this standpoint and he calls it environmental storytelling (Jenkins, 2003). *"Games should be examined less as stories than as spaces ripe with narrative possibility."* (Jenkins, 2003, p. 119) What people remember of a game of chess is the moving of the pieces on the board. A video game is a virtual play space that compensates for the decline of the physical backyard in boy culture. And already many video games center their narrative elements on the "struggle to explore, map and master contested spaces." (Jenkins, 2003, p. 122). Games settle their narratives most often in existing genres of film and literature that are most invested in world-making and spatial storytelling (like fantasy, science-fiction and war). These arguments lead to Jenkins providing four views on storytelling for games using environmental storytelling that could help in the struggle with narrative: evocative spaces, enacted stories, embedded stories and emergent narratives.

Evocative spaces

Games can learn a lot from evocative space design used in the amusement park and attraction design (Jenkins, 2003, p. 123). In the design of parks and rides often a previously existing story is infused in the environment. The physical space in that way will tell the story in a passive way to the guests of the park or ride. For example, a ride based on pirates should be dressed up by everything that is related to pirates, from the employees' costumes to the material of the trash bins. This environmental storytelling evokes story associations with guests on one hand and on the other provides a setting for emergent storytelling. Games can also provide different experiences in an already existing story universe, like Star Wars (Jenkins, 2003, p. 124). In that way the game is an expansion and enrichment of the already known stories from other media. With that in mind the game itself does not need to tell a complete story but could be about the exploration of worlds and characters that are introduced in fully fletched stories.

Enacted stories

The design of the game world should be the main leading element in storytelling (Jenkins, 2003, p. 124). These spatial stories privilege spatial exploration over plot development and the story is propelled by the characters' movement across the map. The goal in this type of story is getting to a certain destination, which is the resolution of the story. Instead of writing a plot, game designers should design a geography and architecture of an imaginary world that supports a story. Obstacles delay characters and affordances facilitate movement towards this resolution. In this way interaction has a sensible influence on the story and although parts might be missed and events mingled because of the freedom, the story experience is interesting and impactful on the same time.

Embedded stories

Where Kelly talks about games as paintings Jenkins proposes that many games could be set up like a detective story (Jenkins, 2003, p. 126). Instead of putting game characters directly into spatially designed narrative events, the players and their characters could discover an already present story by noticing and examining clues that are present in the game world. With detective films, *"(...) narrative comprehension is an active process by which viewers assemble and make hypothesis about likely narrative developments (...)"* (Jenkins, 2003, p. 126). The viewers make mental maps

of the narrative action and the story space and watch on to see if those maps are valid. These mental maps are the basis of actually making decisions and acting in a video game. By distributing story information over the game world the player is really in control of uncovering the story, but the game designer can still hold some control if the world is designed correctly. Story elements should be recognized and repeated in the world if they are important for the plot. In this way a story in a game like this is more like a body of information than a temporal structure. Jenkins even refers to melodrama, where houses are filled with memory and even the art direction, costumes or lighting can evoke emotions and tell a story (Jenkins, 2003, p. 127).

It may be noted that with embedded stories actually two storylines are present, where one is the already present and discoverable story and the other is the unstructured story of the discovering, controlled by the player. A mixture of embedded and enacted stories in these two storylines could provide a lot of freedom for the players while still having a coherent storyline (Jenkins, 2003, p. 127).

Emergent narratives

Yet again, emergent narrative pops up in the discussion of games and story. The example of The Sims is used as well by Jenkins, this time with reference to the design of the objects in the world that players can place and create their stories with. All objects in the game have been designed with an eye towards increasing the prospects of social interactions, romance or conflict. In this way the player can create a story himself, and because actions are steered by the objects and surroundings, conflicts and romances are sure to follow. This can lead to a narrative satisfactionary experience (Jenkins, 2003, p. 128).

When talking about emergent narratives, Jenkins even refers to Kevin Lynch, who states that urban spaces should be designed with narrative potential in mind (Jenkins, 2003, p. 129). Some locations lend themselves more readily for the creation of memorable or emotionally meaningful spaces. More text on emergence is in the next paragraph and on Lynch in chapter 2.

1.6 Emergent storytelling

There still is this designer's dream that an interesting narrative can be created while still offering total freedom to player. This freedom in creating a story is called emergent storytelling. In this paragraph the phenomenon of emergence is studied, some examples are given and some tips from authors on achieving emergence (and the right mix with story) are provided.

The story machine

Many games try to tell a previously written story, but a game itself is a story creating medium. When playing a good game, it tends to facilitate in creating events that are worth telling to other people. It is more likely to be enthusiastic about unpredicted, self-created events in a game, even when they are smaller in scale than prewritten events. *"(...) a good game is like a story machine – generating sequences of events that are very interesting indeed."* (Schell, 2008, p. 265)
A very good example is the almost infinite amount of stories that are created in sports games like golf or football. It could be claimed that the stories created in these games are not really stories,

because they have no author. According to Schell it is all about the experience that is created and in that sense it does not matter if there is an authored story or not (Schell, 2008, p. 265). It is even arguable that the player himself is the author of the story.

Creating stories by playing games is a very different view on stories compared to branching or modular stories. In emergent games, players get a bigger sense of agency because their choices have an active impact on the world and the story (Sweetser, 2008, p. 62). Sandbox games, like The Sims or Rollercoaster Tycoon [image 10], really give players endless freedom, but are those games just as satisfying as games that do have a story? Before answering that question, the theme of general emergence will be elaborated.

image 10 - Rollercoaster Tycoon, Hasbro Interactive 1999

Emergence

Emergence is a term that has origins in biology and physics. Sweetser gives the following definition:

"Emergence describes the properties, behaviors and structure that occur at higher levels of a system which are not present or predictable at lower levels. In biological, physical and social systems, there is the potential for something new to be created from simple entities interacting with their environment and with each other. When these entities come together to form the whole, the whole is not merely a collection of these entities, it is something else entirely." (Sweetser, 2008, p. 2)

The best example of an emergent, complex system is perhaps the brain. All individual cells have simple tasks, but the collection of all neurons together creates a system that is more than the sum of its parts. At cellular level the possibilities of the entire brain are not recognizable. Life itself is also a complex system of self-organized organisms that react to their environment and form emergent structures (Sweetser, 2008, p. 25). Other examples of emergence are bird flocks, crystal formations and large social or political structures. The best working emergent system reacts to any change or input and adapts accordingly, keeping the balance and output of the entire system and (most of) its elements intact.

"The key to create emergent behavior [in a video game] is to define a simple, general set of rules and elements that can give rise to a wide variety of interesting, challenging behaviors and interactions in varying situations." (Sweetser, 2008, p. 6)

This is applied best on gameplay systems, but this will elaborated in full in the next part of this thesis since that is the theme of that part. For narrative structures, emergence is all about the internal story that players create using the available elements and actions. If the rules and affordances offer enough freedom for the player to create an interesting story then it can be said that there is a successful emergent storytelling system. Instead of focusing on what the designer wants the player to do in the game, the focus should lie on what the user wants to do. In the next paragraph some methods and tips are given to make a game story emergent.

Emergent games give players a lot of freedom, but games can profit a lot from a story (see paragraph 1.3). Completely emergent games like Rollercoaster Tycoon might be incredible fun, but are not often the incentive to emotions or thrills that a story can provide. It is of course a matter of preference: both pure games and pure stories entertain. Both gameplay and narrative use the drive in human nature for emotions of curiosity and surprise (Sheldon, 2004, p. 210) According to Sweetser, the most interesting experience for games can be created by mixing linearity and emergence in the right way (Sweetser, 2008, p. 316). If a game story is separated in pieces, the size of those pieces will determine the amount of bottom-up freedom of creating a story versus top-down thrills of a linear story. The smaller the pieces, the more freedom the player gets in using and mixing those elements. If the pieces are big, there is not much freedom, but more depth in the story [image 11]. To get the best of both worlds, player actions and plot should be mixed and behave more as equals.

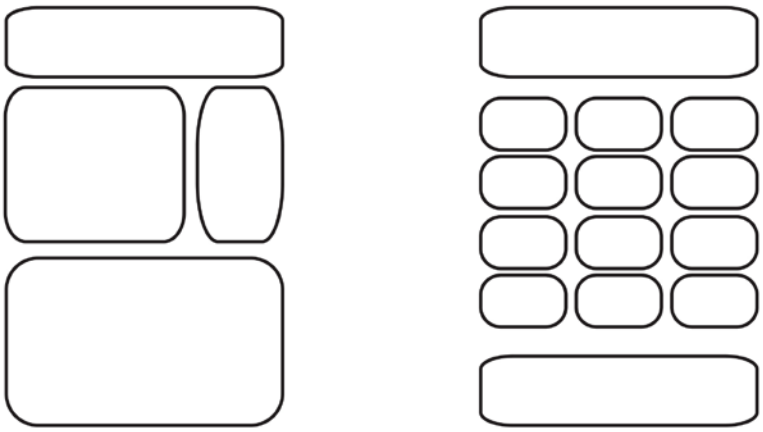


image 11 - left: large story pieces make for less choice and freedom - right: small story pieces give more freedom but often less story depth

“There must be an exchange between low-level actions and high-level plot structure to give the player a role in creating the plot and impacting the world.” (Sweetser, 2008, p. 318)

This could be the key to get close to that dream of an interesting, emergent narrative. One of the most successful game series that has achieved this exchange between actions and plot structure is Grand Theft Auto [image 12]. This game offers a large, freely accessible world with many possible actions to interact with this world and its characters. The player can roam around and create emergent storylines for himself or start story pieces whenever the player wants to. The story is interesting itself, but the most interesting about these story pieces is that they take place in this open world and with all these possible actions[1]. Many open world games use this technique where the player can choose between free play and a story structure. Although the story will always end the same, players get significant ability to co-create the story (Sweetser, 2008, p. 100).

image 12 - Grand Theft Auto 5, Rockstar Games 2013

Achieving emergence

On the subject of achieving emergence, or the right mix between emergent stories and compelling narratives, a lot is written. This paragraph sums up the most important strategies: providing backstory, recording and retelling experiences, planning trajectories and transitions, culminations of actions that lead to effect, indirect control and using relevant objects and actions.

1. For example, in a story cut-scene, you could get the assignment to kill a certain person. This could be done by shooting him, hitting the person with a motorbike or by crash-landing a helicopter on a highway above, thereby dropping a truck on the person’s head. Then, a cut-scene with dialog shows that you accomplished your task and thus narrative and player actions are interwoven and synergize to a more interesting experience.

Backstory

In almost every storytelling structure, providing a backstory before the player gets in control is helpful. For emergent storytelling, it could be the only storytelling in a game: it could provide with a setting, characters and motivation even if there is no further narrative in the game (Sweetser, 2008, p. 314).

Instead of a story moving forwards, a backstory could also be used in emergent storytelling by telling it backwards. An existing story could be discovered on the player's own pace and players could explore the game world creating their own unique path while still enjoying a narrative. This is similar to the embedded story method, discussed in Environmental storytelling (paragraph 1.5). A more detailed option for this kind of storytelling is given by Sweetser: Hebbian storylines (Sweetser, 2008, p. 314). In a Hebbian story, chosen story pieces unlock, activate or close off other story pieces so that choices have a sensible effect on the story. Story elements are given weights and the chance of discovering them could be enlarged or reduced. The story structure keeps changing in this way, much like a neural network [image 13].

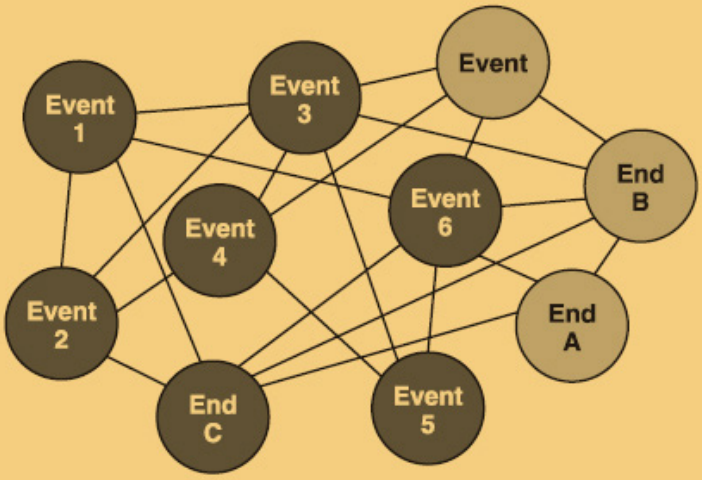


image 13 - Hebbian storyline structure

Recording and retelling

When players create their own story by playing a game, a very effective way of giving that story more sense is by recording and retelling that story. Player's actions can be measured at any time in a game, by keeping track of the current state of the game world. If this state is shown somehow to the player, the actions and the story the player creates gets a lot more meaning and depth. Next to making the story more explicit, it also becomes real (Sweetser, 2008, p. 322). A way of showing the progress could be by showing statistics, player trends and written storylines in journals, logs or diaries. There are some games where the game gets narrated while the player is doing actions and this is most common in sports games. The sports commentary is entirely adaptable to the gameplay and makes the experience very real. Another way of making the story more explicit is by letting players do that themselves. An example is an in-

game camera that can take screenshots and recently more games and game consoles are including recording options, with which players can share their most interesting moments online.

Another interesting way of showing the players their own story is by creating a detailed post-game narrative (Sweetser, 2008, p. 331). This is a reward for player the game, or a part of the game, and could show a map of the progression, a cinematic or a written text that provides closure and reflection. The most known post-game narrative could be the replay of a simple arcade game [image 14].

image 14 - Super Meat Boy, TeamMeat 2010, shows all played sessions in one replay

When playing alternate reality games (games that take place in real life) this method of recording and retelling also works very well. Benford explained an app for smartphones could make a story from photos the people take while playing a game (Benford, 2011). Another real-life example of post-game narrative is personal souvenirs like photographs after theme park rides. [Image 15]

Planning Trajectories

Benford studies emergence in border between games and real life and introduces the topic of trajectories. Planning and designing an itinerary for players is the right way to get control of the route and actions players will take and do (Benford, 2011). There are two kinds of trajectories, the canonical trajectory (the designed route and experience) and the participant trajectory (the actual happened journey and experience). Both should be planned, and with extra attention to transitions, which are points where chances are bigger where the player will leave the canonical trajectory. If a player leaves a canonical trajectory, there should be tools and strategies to pull them back to the intended experience [image 16]. This should not be done too much however, because some divergence is desirable for the players. Benford also acknowledges the premise that interactivity drives divergence and orchestration drives convergence. The essence of making use of trajectories in a design is that the experience is journey oriented instead of a goal oriented experience.

image 15 - a personal comic as souvenir from a theme park ride

Culmination of actions

If a game wants to tell an intricate story with specific chapters, a very good way of doing that would be to activate them when a certain threshold of culminated actions is reached (Sweetser, 2008, p. 319). The benefit of this method is that the players can do what they want in between story telling pieces and that the player can decide for himself if he will do the prerequisite actions to propel the story. This could also be done more inexplicit, without the player knowing what exactly propels the story. This method works very well with Hebbian storylines and the degree of emergence is determined by the size of the free-play parts versus the story parts (see Emergence and Backstory).

Indirect control

Instead of giving players real freedom, some say that it is also very good to give players the feeling of freedom. Schell proposes indirect control to obtain this feeling (Schell, 2008, p. 284). With indirect control the designers are still in control to a certain extent over the player's actions while the player is still gets the feeling of being free. The best example of indirect control is the constraining of choice. When someone gets the open choice "pick a color:" it is more difficult to control the outcome then when a multiple choice is given; "pick a color: a. Red b. Green c. Yellow. For developers, in the first case there are too many options to create, but a constrained choice is more realistic and players still have the feeling of choice. There are more examples of indirect control, but they will be discussed in other parts of this thesis since they belong more to gameplay and environmental design.

Objects and actions

A way of constraining freedom and thus creating a more interesting story is done in The Sims. This game is referred to often as an emergent game (also in this thesis). A sandbox game like this can create interesting stories because the designers put in well-thought possibilities on a limit of objects.

"There is only a limited set of interactions that are possible with every object and character, but these interactions have been carefully chosen to create dramatic tension and exiting moments." (Sweetser, 2008, p. 312)

In The Sims a highly legible narrative space is created using specific artifacts that greatly improve the chance of narrative happenings (Jenkins, 2003, p. 129). When talking to people for example, characters in the Sims can choose from a range of negative or positive reactions, provoking either fights or romances. The characters also talk in a non-existing language everyone can relate to. As said before, these techniques of enhancing chances of narrative happenings by designing the environment are described by urban designer Kevin Lynch. This will be further examined in the next chapter about architecture and narrative.

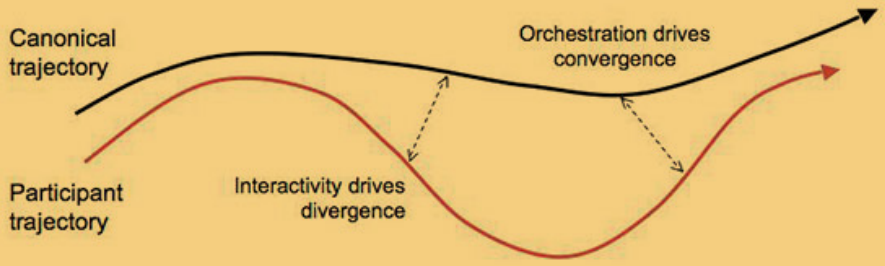


image 16 - two of Benford's trajectories: the canonical and the participant trajectory

To summarize, this chapter started by explaining the problem of the restricting nature of stories versus the open ended nature of play. Because stories are able to enhance and strengthen games by providing context however, designers implement stories using different methods: interactive story structures, environmental storytelling and emergent storytelling. The next chapter will elaborate two architectural theories that support the different nature of stories and play.

2. Narrative and Architecture

This chapter is included to sketch some of the studies that already exist on the topic of narrative and architecture. The purpose of this inclusion is to be able to relate the conclusions of the previous chapter to the architectural discourse on narrative. It will include short summarizations of selected works and interpretations on raised topics.

2.1 Intro

Narrative and architecture is a more obvious connection than suspected. Not only do cities and buildings create the stages for many stories, they are a main factor of influence for those stories. Places can enhance events and create stories for all people that inhabit them. Many theorists and architects have written about it. First a more practical example in the shape of architectural promenades by Le Corbusier will be given. Then Kevin Lynch' take on creating urban landscapes that facilitate emergent narratives will be described.

2.2 The architectural promenade

Le Corbusier, one the most famous architects of the twentieth century, inserted narrative into his works in the shape of the architectural promenade. *"The promenade is rooted in (...) the idea that it can create a tension between idealized spatial arrangements and the sensations they trigger as one navigates through them."* (Nitsche, 2008, p. 75) In his buildings, the promenade refers to a physical route that can be walked, but the term is also referring to Corbusier's complex web of ideas about architecture (Samuel, 2010, p. 9).

The more physical side of the promenade is based on the perceptory experience of architecture: sensory stimuli that elicit responses (Samuel, 2010, p. 39). Using sequences of spaces, scale, axes and lighting contrasts Corbusier creates architecture that reflects on the physical perception of humans. He also states that architecture should be experienced *"while moving from one place to another",* because only then *"one sees how the arrangements of the architecture develop"* (Samuel, 2010, p. 41). He adds the time dimension to the three dimensions of architecture.

In the houses and other buildings Corbusier designed, he always inserted his ideas of savoir habiter: how people should live. The architectural promenade was an allegory for the process of life, and in time Corbusier developed a formula for his promenade that is similar to the stages of life that psychologist Carl Jung describes (Samuel, 2010, p. 81). Corbusier's thinking on the promenade was heavily influenced by heroic and religion stories like that of Theseus and Mary Magdalene. The stages of the promenade are related to the stages in those stories: threshold, sensitizing vestibule, questioning phase, reorientation and culmination. These stages also closely relate to the stages that are described by film makers to structure story (exposition, rise, climax and resolution). Le Corbusier tended to see his promenades as filmic montages as well. The architectural promenade is therefore a 'narrative path through architecture' (Samuel, 2010, p. 66).

A side quote of importance might be one of Josep Quetglas, a Catalan architect:

"(...)"a continuous, linear form of time, like the time of calendars and narration, is incapable of recording the arrhythmic chain of events, the zigzagging, multidirectional turmoil, full of remorse and securities, the backwards leaps of and compelling prophecies"that happen in the course of any architectural project." (Samuel, 2010, p. 58)

Quetglas opposes Corbusier's stand point on narrative and architecture, because Corbusier clearly takes his promenade as a single chronological experience and that is also the way he designs them. It is very remarkable that Corbusier designs very rigid structures of promenades, but still wants the inhabitants of his buildings to be free to create their own stories in them (Samuel, 2010, p. 13).

A clear example of the rigid architectural promenade is Villa Savoye, one of Le Corbusier's most famous works [image 17]. The free structure of his cinq points statements that is incorporated clearly in this design made the distribution of the elements of the promenade possible (Samuel, 2010, p. 126). This rigidness and free plan might be counterintuitive, but this house clearly shows that they actually strengthen each other [image 18].

image 17 - Villa Savoye, Le Corbusier 1931, Poissy

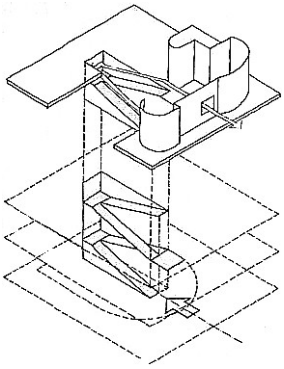


image 18 - diagram of the promenade, VIlla Savoye

2.3 Creating emergent urbanism

Not only Le Corbusier had the idea to shape structure around the experience of the visitor, who explores it through movement (Nitsche, 2008, p. 75). Many religious and cultural events lead to the design of buildings, like the shape of the Christian church. Landscape architecture also has many examples of route and story, providing pathways and vistas.

Following landscape design, creating narrative on larger scales also comes back in urban designer's writings. Kevin Lynch is an urban designer who strives for a clear organization of urban space. He put forward five city elements that make cities understandable, and that are able to create a clear identity and image of the city. Possibilities for narrative in the built environment are a direct result of this clear image, Lynch states in his book Image of the City (Lynch, 1960). His plea for legibility and coherence in cities on an urban scale is the basis for enhancement of human life and activities: *"(...) we need an environment which is not simply well organized, but poetic and symbolic as well."* (Lynch, 1960, p. 119) Lynch continues with saying that a well-knit place "in itself enhances every human activity that occurs there, and encourages the deposit of a memory trace." (Lynch, 1960, p. 119) In a sense, what Lynch proposes here is to make emergent places of cities, using clearly defined elements and structures. He claims that the built environment should be "capable of continuous further development" (Lynch, 1960, p. 6) and should be open for the creation of own stories and meaningful experiences for the people who inhabit it. Urban designers should be encouraging a dynamic world, not a final order. *"A landscape whose every rock tells a story may make difficult the creation of fresh stories."* (Lynch, 1960, p. 6)

Gordon Cullen has a similar claim, although he claims that minor manipulations of the environment can add drama to human lives (Cullen, 1971). He studies certain paths and axes through cities [image 19] as being thrilling narratives. Although this might be more of a linear claim than Lynch makes, Cullen also strives for the creation of meaningful memories using urban tools, vistas and frameworks.

Summarizing this chapter, it can be concluded that architecture has to deal with the same conflict of linearity and freedom as games do, concerning the topic of narrative. Le Corbusier precreated linear paths while Lynch pleaded for open ended urban structures to support emergent narrative. The next chapter will synthesize the findings in detail and explain how game techniques could improve architectural theories like the promenade and the image of the city.

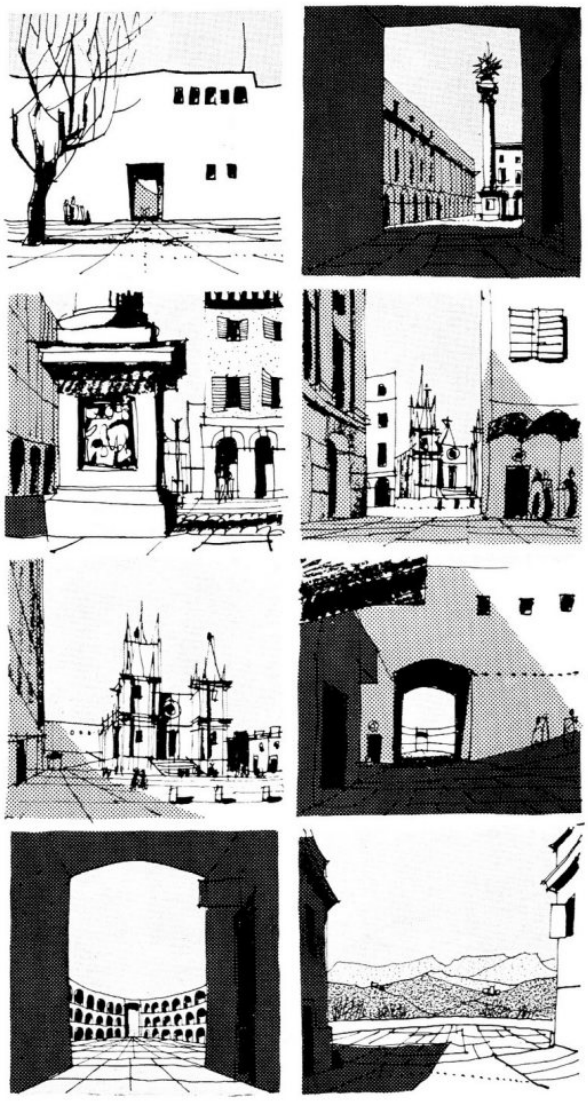


image 19 - a visual study of the route through a small city by Cullen

3. Synthesis

In this part of the thesis narrative in video games and architecture is studied and this synthesis will ultimately sketch out the possibilities of the most important elements and methods for architectural design. First however, a paragraph to summarize chapter 1 and 2 is given and the solutions game designers and architects found to the problematic combination of narrative and play is described. Then, a comparison and discussion of these solutions is given, which will lead to the list of elements.

3.1 Summary

Narrative and Games

The main problem of narrative in games is the conflict between the linear and destiny-bound nature of stories and open-ended and freedom based nature of games. Games do incorporate stories however, because they can draw the outlines of a magic circle very well. Stories can also keep the players' attention and serve as entertainment on a more emotional level. Different types of games require different story elements, varying from more journey-based games to arcade games that require very few story elements.

Though games can learn a lot from other media, there is a new factor to storytelling in games: interaction. Interactive stories can be linear, branching, web structured, modular or emergent. Story events like numina give players the sense of a larger narrative world and are part of environmental storytelling.

Environmental storytelling takes on the problem of freedom and destiny in game stories and links it directly to game environments. Game worlds should tell the story, because they are capable of holding the story elements and communicating them to the players in a meaningful way. Firstly, evocative spaces can call up story memories and a sense of story to the users of those spaces. Secondly, enacted stories are carefully choreographed stages that provide story elements based on spatial design and encounters. Embedded stories thirdly are stories that lay embedded in the game world and can be uncovered by the player like a detective story (numina fits in this method). Emergent narratives finally rely on carefully chosen elements of and interactions with the game world, which should facilitate the creation of interesting stories.

To give the role of story building to the player, methods that support emergence need to be applied to games. Emergence in games is achieved when a simple system of rules gives rise to a wide variety of unpredicted happenings. A story can provide a setting and backstory for an emergent game, but this disconnects story and gameplay. Retelling a story afterwards based on the actions of a player links the two a lot more and gives meaning and sense to the journey the player made. Really mingling story and free gameplay can be achieved using tools like transitions in trajectories and story triggers at culminations of actions. A free system of carefully chosen objects and possible interactions is very capable of creating emergent stories. Many game designers also fake the feeling of freedom for the player by keeping indirect control over progression and choices.

Concluding, there are three main solutions game designers found for the stated problem of linear stories versus free play:

1. Making efficient use of interactive story structures
2. The perspective of environmental storytelling
3. Methods that stimulate emergent stories

Narrative and architecture

Examples of architecture and narrative are Le Corbusier's promenade and Kevin Lynch's description of urban emergence. The promenade is a linear pathway through a building that, according to Le Corbusier, is able to give the strongest architectural experience and linking it to the use of people. Kevin Lynch describes that cities should be understandable and be able to give rise to the creation of memories, by providing symbolic context.

These examples will be compared to the elements of game narrative, and will be discussed in a wider scope in the next paragraph.

3.2 Comparison and discussion

Just like in video games, stories can apply borders to the use or function of a space. Stories can also improve the experience on levels physical spaces cannot achieve, in the sense of providing backstory and setting, or enhancing the experience on different levels.

Interactive story structures are comparable to architectural layouts, because the choices people will make in progressing in a story are strongly based on architectural elements. How the space is designed, the people will experience a story accordingly. If there are many choices, the story will become more interactive, but less thrilling and dramatic. Corbusier's architectural promenade is a very linear structure, but offers an exciting architectural narrative. Seeing and designing the architectural promenade as a multi-linear, branching or even modular structure could be a real benefit for architecture.

Environmental storytelling, a perspective on stories in games, could also be applied to architecture. Embedding, enacting or evoking stories could be a gain for architecture, since architecture is all about the shaping of spaces and placing elements that possess narrative or elements that can be used to create narratives or at least are a setting for new stories. Using methods that environmental storytelling prescribes, the same effects and improvements as in video games can be achieved.

Lastly, the link between architecture and video games on the topic of emergence is very clear. Jenkins even directly refers to Lynch when sketching out his perspective on environmental storytelling (Jenkins, 2003, p. 129). Creating a meaningful environment that stimulates the creation of events and stories is what encompasses both mediums. In both, emergence is a topic that is separate from linear paths, and really focusses on story creation instead of experiencing pre-created stories. Le Corbusier created the free plan, an emergent system that can give rise to

many architectural possibilities. Next, he inserts his rigid promenades, which counter these ideas of freedom, but provides an interesting narrative. Le Corbusier apparently has the same struggle as game designers, because he also wants to give inhabitants the freedom for the creation of own stories. In the case of Lynch, games also should be well-knit places that enhance human activity and stimulate memory and story creation. In physical architectural situations however, many video game techniques used to control and stimulate emergent storytelling are not yet applied. These techniques (like transitions, culminations, dramatic choice of elements and retelling) could make for improved spaces and use of these spaces in real situations.

The next paragraph will portray more practical possibilities of previously mentioned links and comparisons.

3.3 Possibilities for Architecture

Why games can use stories very well is explained in paragraph 1.3 and architecture could involve stories for the same reasons (as seen in paragraph 2.1). This paragraph enumerates the three elements of storytelling in games that could be beneficial to architectural designs or the architectural design process. Additionally, of each element a more direct description of its possibilities for architecture is given.

1. Interactive story structures

While being completely multi-linear already, physical architecture could still learn some things from the way game writers structure their stories.

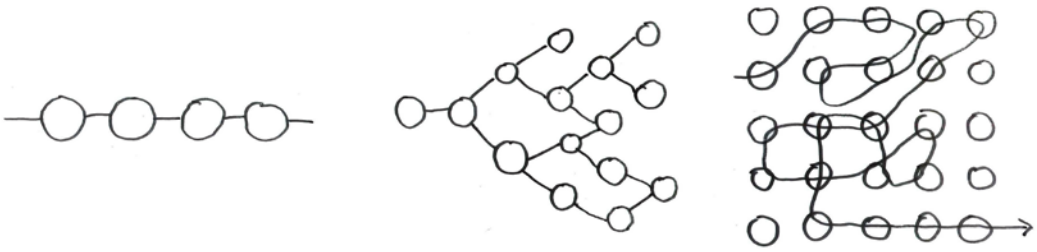


image 20 - interactive story structures

a. The linear, or *String of Pearls*, structure of interactive stories can offer new views on linear pathways. Leading people through chokepoints and offering more open spaces in between is again not new to architecture (take museums for example) but the perspective it offers is new. Games are designed as such structures from the beginning; architecture often starts from other views. Using this structure at the base of an architectural design could improve the story the building will tell.

b. *Branching stories* could have effect on the views of promenades: what if there are multiple routes and endings to an architectural promenade? Offering people a choice on specific points on a rigid route could improve the experience and maybe even the functionality of the building around it.

c. A *Modular Structure* is not new to architecture, but the perspective of a fixed beginning and ending could be. Modularity in the real world has problems of dealing with framing experiences, and this framing could be accomplished by a clear beginning and end to a route or a way of using the building.

d. Offering *clear Quests and Goals* may not be a story structure, but it can be used very effective to give more structure to a story, or a building for that matter. Making goals and quests could be done with apps, or with techniques like foreshadowing (showing a certain element of a building so that people know that they can go there).

2. The perspective of environmental storytelling

Environmental storytelling implies that stories in interactive world can best be made by infusing the world with story elements. Architecture lends itself perfectly for this method. Evocative stories are left out here because they are already based on physical situations (theme parks) and this effect might not be applicable for more common real life situations. Emergent storytelling is left out here because it will be elaborated more fully in point 3.

image 21 - environmental storytelling: the environment tells the story

a. The view of *Enacted stories* could improve architecture by implying that carefully designed environments can tell stories very well. When you design a building, you can choose to tell an existing story or come up with a new story by designing the spaces and objects that fill the spaces. Of course the story could be seen more as a metaphor for real life situations, but in some cases this could be done quite literally. This could be in buildings that tell a story, like a museum or building on a historical place.

b. *Embedding stories* could offer the same advantages for the same type of buildings, but on a different level. Adding architectural elements, like decorations, that are able to tell a story, will add significantly to the experience of a building. Just like in a game, people will be able to miss these numina, but when do stumble upon them, it will be surprising, informative and will sketch out the context of the building they are in.

3. Techniques of achieving emergence

Emergence might be seen on some levels to be the counterpart of affordance, flexibility and behavior encouragement in architecture. It is also fundamentally different, because it is not just about encouraging flexibility or behavior; it is about being able to create situations that are unexpected, not only designed as flexible. It is a view on elements as part of a system that can do more than only the elements suggest. Therefore it can be a very effective tool or way of seeing things in the field of architecture. Here some of the most important ways of achieving emergence are given.

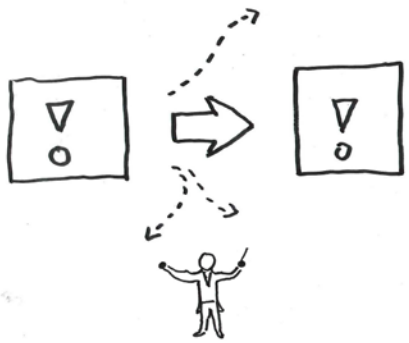


image 22 - orchestrating emergence

a. Providing a *Backstory* for a game is not only entertaining, it can give the players a context and a motivation. Providing a backstory in a building could be done to inform the people that enter it what is allowed and what is possible in the building. In this manner people will enter the building more knowing of its purpose and the people themselves might be more creative if they know what they can all do with it.

b. *Recording and Retelling* the actions people have done in a building would not work for every function. For social and entertaining functions like museums, malls, restaurants and bars it might be very interesting; the story people created themselves will become more real afterwards and even shareable when presented in the right way. Benford even gave a practical example of retelling in real life, in the shape of an app for theme parks with which people can make a personalized poster with photos of their day (Benford, 2011). Retelling happenings in buildings using architectural means is bit more difficult, but not impossible. Giving spaces dynamic shapes that people can change themselves, will leave a place that literally shows what happened there. Of course there is a blurred line between real architectural means and furniture, which often can be moved and changed more easily.

c. Benford also mentioned his trajectories and more particular *Transitions* within those trajectories (Benford, 2011). Putting the focus on the design of these transitions, where chances are big that people will leave the canonical (planned) path and create an own participant path, will allow for a more controlled situation. In architecture, if you want people to stay on a path but still offer potential freedom to let people move around, these transitions (like squares for example) need to be designed very carefully.

d. Keeping track of the movement and actions of people and changing the environment and story of the building accordingly, could be done on *Culmination of Actions* basis. For example, if a certain amount of people pass through a door, that space will change in layout, lighting or color. A certain person going a lot to the toilet might trigger a shortcut to it. The architecture in this way becomes interactive and the story that people experience will be different according to their actions.

e. Referring to environmental storytelling, the environment is very able to encourage emergence. Focusing on which elements and possible actions with these elements are present and possible, the environment will become more engaging and able to create meaningful and interesting situations. Just like in the Sims, placing *objects that are relevant* and engaging for people in a space will make for a much more social, functional or interesting experience of that space.

Gameplay

Gameplay as the working mechanism of games is described in chapter 4. Chapter 5 describes gameplay as it occurs in architectural situations. Chapter 6 will give a synthesis of chapter 4 and 5 and will provide comparison, discussion and the best elements of gameplay to be used in architectural design.

4. Gameplay and Games

4.1 Intro

Gameplay is the core of a game, both when it is digital and when it is not. Where story can provide outlines for a game and brings other kinds of entertainment to a game, it is the gameplay itself that engages the player with interaction and is the driving force for making the game 'fun'. But what exactly is play? What is a game, what is interaction? These questions will be answered in the coming part using definitions of core elements of games and game design. After that, gamification is explained as it offers a larger scale of games and how they can be applied to the real world in serious situations. Next, the patterns of games that entertain us and motivations for choices made in games will be elaborated. The next paragraph, flow, relates to this, because of its psychological nature. Finally, the topic of emergence resurfaces, this time more based on systems of play.

4.2 Definitions

This paragraph contains explanations for several game-related terms based on several sources. The order of explaining these terms and elements is not consciously chosen, but will make sense when they are explained.

Interactivity

The book 'Rules of Play' encompasses a large range of academic definitions (Salen & Zimmerman, 2004) and serves as a starting point in this paragraph. First, games need meaningful play[1] to be successful (Salen & Zimmerman, 2004, p. 32). To get games to work, interactivity is needed, because (meaningful) play is only possible when players interact with the game system (Salen & Zimmerman, 2004, p. 69). All interactions present choices to the participants of the system and the space of possibility is the space of all possible actions, choices and outcomes. Regarding interaction in games, it is useful to distinguish different interaction patterns. Defining which system of interaction and multiplayer play is present in a game can be of great effect for the gameplay (Fullerton, 2008). The possible patterns of interaction can be seen in [image 23].

1. This means that the actions players do need to be in direct relation with the results of those actions.

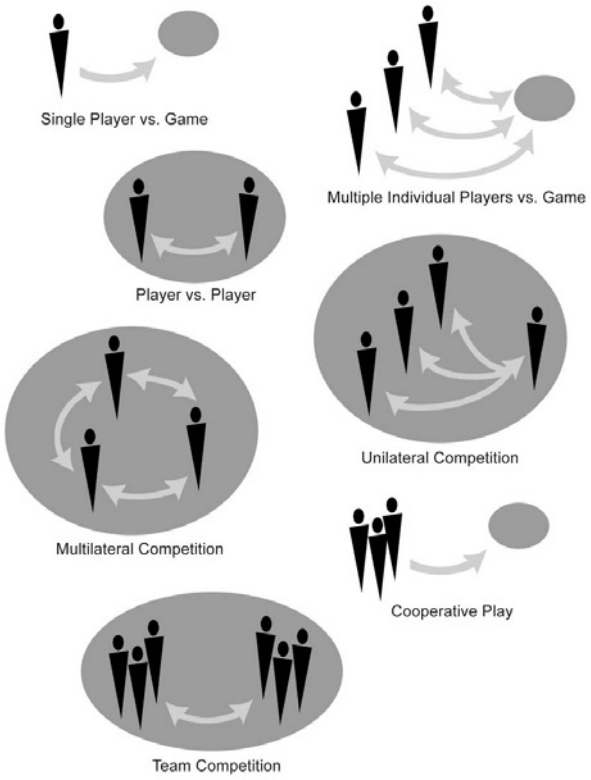


image 23 - different patterns of interaction

To get from interactivity to a game, next to a possibility to act, there needs to a specific necessity to act and resolving this necessity and its outcome will influence the system and give the player enjoyment (Vorderer, et al., 2003, p. 2). Where stories can provide the magic circle for games (see paragraph 1.3) interactivity can provide the magic cycle (Arsenault & Perron, 2009).

The cycle is a loop of the following sequence:

1. The game system shows the present game state, the game word and the possible actions.
2. The player perceives this via the output (audio, visual etcetera)
3. The player makes a decision based on his own analysis
4. The player implements the decision using input devices and skill, and with it changes the state of the game system (Arsenault & Perron, 2009, p. 120)

This loop is returning over and over and increases in difficulty and scope, to provide an interest curve for the gameplay. The result is a spiral which contains all interactivity loops [image 24].

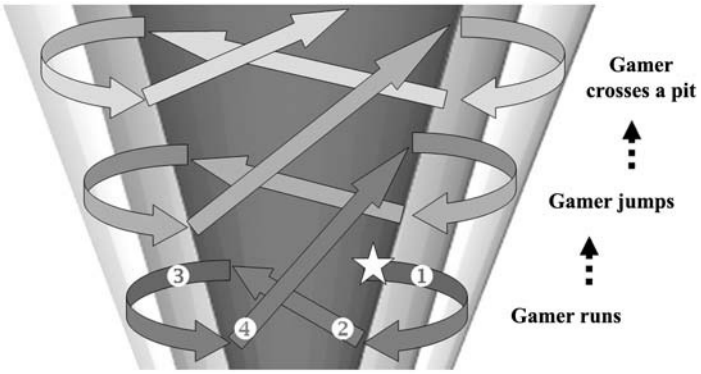


image 24 - the magic cycle: upward cycles of interaction

This cycle of interaction relies heavily on feedback and the quality of the feedback will influence the decisions of a player (Schell, 2008, p. 228). Feedback is the source of many things in games: instruction, encouragement, challenge and reward. Continuing, a game is an interactive system with objects that have attributes. Many of these objects and attributes can be changed by interaction and need to communicate their state to the player to show if and how they are manipulatable (Schell, 2008, p. 136). Again, feedback plays an important role in this manipulation using interaction.

Game or play

Returning to the most important terms, there are many different definitions of 'game' and 'play' and there are several possible relations of these two terms. Play could be the subpart of a game, when it describes games as a framework for play. Games could also be a subpart of play, when play is defined as playful activities (Salen & Zimmerman, 2004, p. 83). Salen and Zimmerman give a definition of the term 'game':

"A game is a system in which player engage in artificial conflict, defined by rules, that results in a quantifiable outcome." (Salen & Zimmerman, 2004, p. 80)

In this definition, the terms system, player and artificial are relatively self-explanatory, and the quantifiable outcome refers to the term feedback that is discussed earlier. Conflict arises between players and the system in an interaction pattern [image 23]. Often between players or between a player and the system conflict emerges when these actors have different goals. Conflict arises within the game and is restricted by the boundaries the game rules imply. These boundaries are often made clear by the space where the game takes places, the contested space (Salen, 2006, p. 32). Continuing with rules, they *"(...) constitute the inner, formal structure of games."* (Salen & Zimmerman, 2004, p. 125) They limit actions but interesting choices and interactions arise out of this formal structure. Rules in games are separate from cultural and societal norms and are intrinsically artificial to support gameplay in dynamic systems and digital worlds.

Challenge

Continuing the definitions of game terms, challenge is a game defining element that is at the core of almost all gameplay (Schell, 2008, p. 179). Challenges need to be balanced, varied and should accommodate player skills levels. Furthermore, they need to consist of meaningful play: they need to be a meaningful connection between action and reaction. Taking meaning further, a challenge would be even more meaningful when it is connected to the story, game world and maybe even to the real world outside the magic cycle (and magic circle). According to Feil and Scattergood, there are several types of challenges: time based, dexterity based, endurance based, knowledge and memory based, logic based and control based challenges (Feil & Scattergood, 2005, p. 10). Objectives make sure that players want to complete challenges. There are several types of objectives: capture, chase, race, alignment, escape, construction, exploration, avoiding, outwitting and solution-based objectives (Fullerton, 2008, p. 60). To complete objectives players need resources. Examples of resources in games are: lives, health, currency, units, actions, inventory and time (Fullerton, 2008, p. 72).

Finally, the term boundary refers to the physical or conceptual game space where the rules and story are in effect (Fullerton, 2008, p. 78). Boundaries are often provided by the story, but are also very visible on many occasions [image 25].

image 25 - the boundaries of a tennis game field

4.3 Gamification

Games are embedded in the human nature and as the field of game study grew, people started to see the potentials of gaming in real-life situations: outside the magic circle. One of these people is Jane McGonigal. In her book, 'Reality is Broken', she claims that the competences of gamers could change the world if they are projected on real-life situations (McGonigal, 2011). She takes many games as examples that already show that playing can improve lives. Using the right attitude games could even help in solving world-scale problems like hunger and cancer. This idea is not so farfetched if you take the game Cell Slider for example [image 26]. In this game, people have to spot cancer cells in microscope photographs and tag them as such.

With many people playing this game, the recognition of those cells becomes easier and the process of finding cures goes quicker. Another example of gamification, though less scientifically important, is the game called Epic Win, in which people will receive points and story elements by completing chores and tasks they have to perform in real life [image 27].

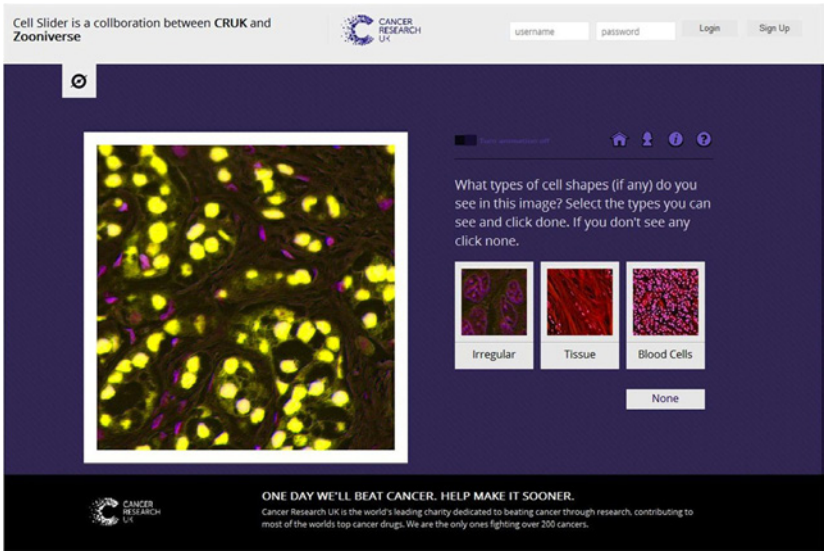


image 26 - the browser game Cell Slider

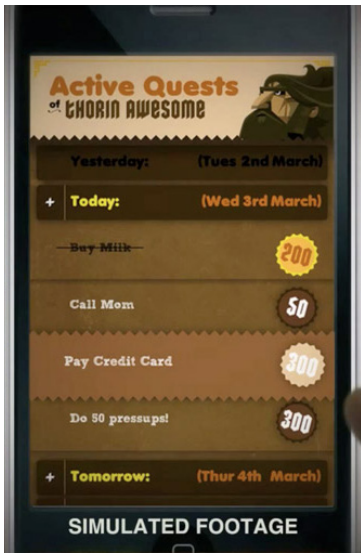


image 27 - the mobile game Epic Win

Psychological background

Why does gamification work? Psychologist Mark Coulson explains that the phenomenon is very old, but the term gamification is projected on a new set of techniques that is based in the video game industry (Robinson, 2013). Turning real life situation in to games is effective, because it deals with a very fundamental psychological question: why do we do things? People do things because they want to be competent, autonomous and related to other people; this is called the self-determination theory. What gamification games tie together, is this need of people to achieve the three elements of that theory and positive feedback on our own actions. As explained in the previous paragraph, it is this feedback that drives us forward and that provides satisfaction. In real life, there is no obvious feedback on how well we are doing, so games could provide us that feedback. Coulson also presses on the fact that people are very goal-driven. Games can provide very clear goals and will cement the reaching of a goal to be a more pleasuring process and therefore enhancing the effectiveness of the person doing the task. In video games themselves this gamification is used as well; achievements and trophies stimulate players to game more, even while the achievement itself is not worth anything notable. The difference between entertainment games and serious games is that with serious games everybody can win, while with entertainment games players can easily lose from the system or other players. Because of this, serious games can be very effective, but will not appeal much to competition-driven players.

Serious Gaming

Serious gaming is another ongoing trend and has a lot of overlap with gamification, but it focusses more on educational and business situations. An example of a clear serious game is the game TeamUp, by Arne Bezuijen (see interview in appendix B.1). In this game people have to learn to work together by completing tasks in a virtual three dimensional world. The potential for serious games as educational tools is clear; the advancement of information technologies and an increased passion for and reliance on technologies for entertainment and communication is a basis where educational tools should rely on and make use of (Hiller, et al., 2008, p. 1). Serious games rely on game techniques and entertainment, but need a clear meaning and relevance to reality to make them work. This design method for serious games is called Triadic game design (Harteveld & Van Den Bergh, 2010, p. 3). The meaning refers to the purpose of the serious game; teaching teamwork for example. The relevance to reality is needed to really make people apply their experiences in real life. Bezuijen emphasizes that the game and entertainment part is too often minimized, and many serious games tend be more models of reality than games (see interview appendix B.1). Because of that, they become less engaging and less interesting to play.

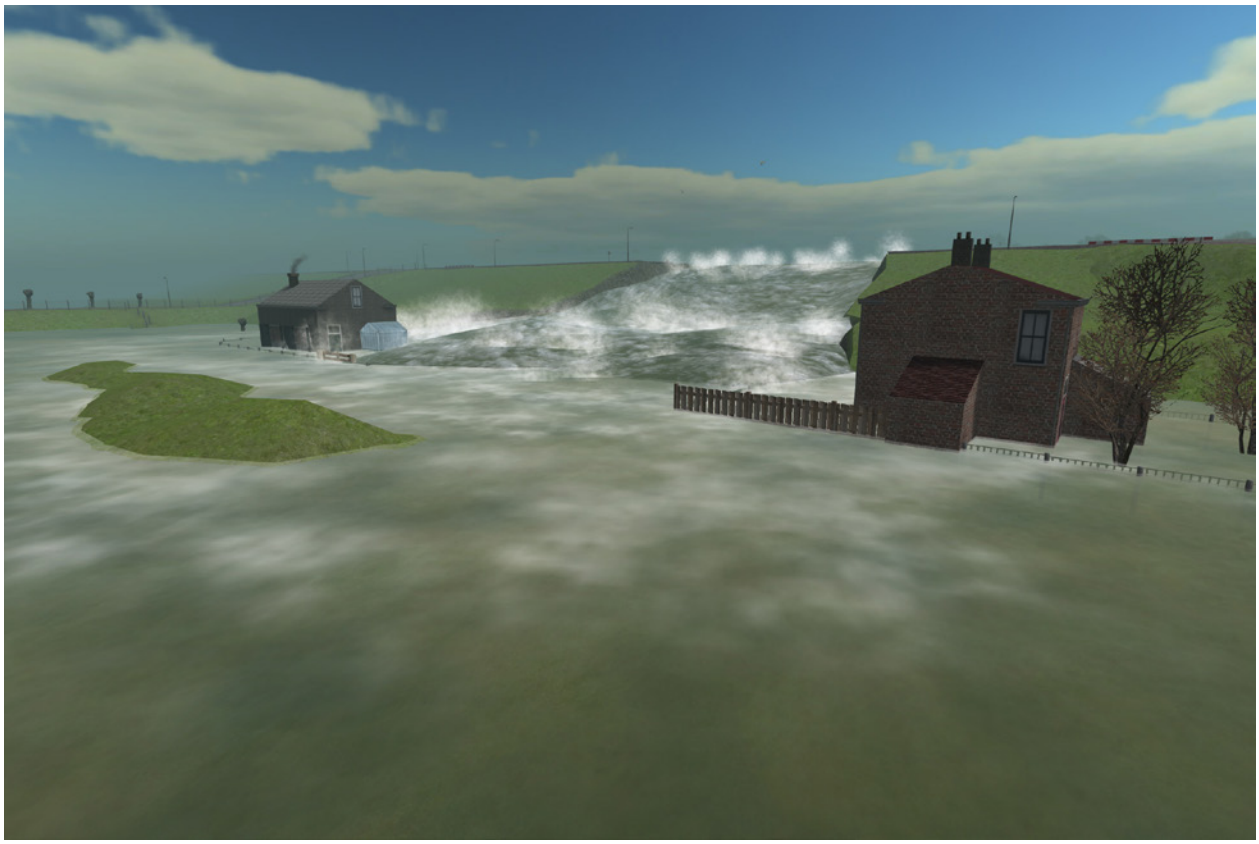


image 28 - Another example of a serious game is the game Dijkpatrioulle from Deltares, where people can learn how to inspect dykes on weak spots

4.4 Motivation and patterns

In the previous paragraph it was explained that motivations of people are based on achieving competence, autonomy and relations (Robinson, 2013). Those motivations also apply to playing video games in general, not just serious games, but there are more theories on motivations. For motivations for leisure in general Hills refers to many studies; self-determination, growth of skills, stimulation and just the passing of time are some of them (Hills, et al., 2000, p. 764). Another theory on motivation is by Apter and describes the difference between the two motivational states telic and paratelic (Apter, 1982). Telic activities are more serious and aimed at long-term goals, while paratelic activities are done because they are immediate and playful. This psychological difference both applies to video games, relating to achieving goals and the simple act of play.

Motivation

Vorderer directly links to the enjoyment of video games by claiming that competition is the most important motivation (Vorderer, et al., 2003). When playing a video game, players are constantly in competition with the system or each other and when they successfully complete a competitive task they are motivated to continue because of their euphoric experience of enjoyment. When players fail to complete a competitive task, they might be even more motivated to continue, because they want to complete the task in a new run (Vorderer, et al., 2003). This does however lead to the diminishing of the entertainment experience and turns it into pure competition with accompanying frustrations.

Bostan makes a different classification of the motivations of game players (Bostan, 2009). He discerns the following motivations, or needs in video games: materialistic (building or obtaining), power (dominance and aggression), affiliation (friendship and help), achievement (overcoming obstacles), information (understanding and learning) and sensual (amusement, perceptual quality and eroticism). In video games, these motivations are directly linked to Salen and Zimmerman's concept of meaningful play and when this concept is achieved, motivations are fulfilled more effectively (Bostan, 2009, p. 22).

Patterns

An important view on the psychology behind video games is Koster's theory of patterns (Koster, 2005). Relating to the positive effects of serious games and Bostan's element of understanding and learning, games are actually very tasty patterns of information to our brains according to Koster. Our brain encounters patterns every day, from the route to our jobs or school to the process when we get out of bed and the order of seasons. Games provide fun because they are abstract models of reality that provide small challenges in the shape of mastering and/or recognizing small patterns. *"We crave predictability, but need unpredictability for fun. We play games that provide that unpredictability, but the medium itself is predictable."* (Koster, 2005, p. 116) Games are about mastering unpredictable situations and are therefore learning mechanisms in safe environments. It is now understandable why playing games for kids is necessary for survival, and thus is explainable in evolution. Schell relates to this, by stating that *"The enjoyment of problem solving [is] an evolved survival mechanism."* (Schell, 2008, p. 35) A person that is more capable of problem solving (or solving patterns) is more likely to survive. Real fun is however only possible when games are played in a context where there is no pressure (Koster, 2005, p. 98). To solve patterns people are very capable of ignoring the fiction that wraps a game and thus stepping outside the magic circle. This process stimulates creativity. With the

ever expanding possibility space of video games, using technology, emergence and multiplayer situations, games are increasingly interesting for adults as learning and entertainment systems. Making serious games and gamification are steps that take games outside of the motivation space of power and materialism and on this account Koster is clearly in line with the aspirations of McGonigal (see previous paragraph).

In line with these patterns, learning the way how to approach those patterns of games is an important part of game design. Most games offer extensive manuals or tutorials, but recently games are designed in such a way that their system is teached in a natural, playful manner. A very effective way of achieving this manner is by using instructional level design[1] (Van Der Spek, 2013). Moving around in space and motivations for spatial choices is something that will also be explained in the next part on level design, because it is part of the topic wayfinding (paragraph 7.5).

4.5 Flow

Another element that has ties with player motivation and psychology, but has a wider scope over games in general, is the concept of flow. Flow is first mentioned by psychologist Csikzentmihalyi (Csikzentmihalyi, 1988). This concept explains that individuals want to be engaged in a balance of challenge and skills at a threshold level, so that that they immerse completely in the activity. This especially counts for games, since they offer more challenge than for example watching television. Schell states four key ingredients that are needed to put a player into a state of flow: clear goals, no distractions, direct feedback and a continuous challenge (Schell, 2008, p. 118). Flow activities must manage to stay within the narrow margin between anxiety and boredom, because too anxious activities are too difficult and distracting too dull activities require not enough skill and focus. Csikzentmihalyi calls this margin the flow channel, and it is based on the challenge the activity offers and the skills the activity taker has [image 29]. In time, the skill goes up and the challenge needs to be more difficult. Schell adds to this that the ideal flow experience in a game would be going up and down [image 30], because of the fact that players want to be rewarded with a little less difficult activities after they mastered a more difficult one. The concept of flow is applicable to many activities, but is an especially important theme for games since games need to keep the player engaged and entertained at all times.

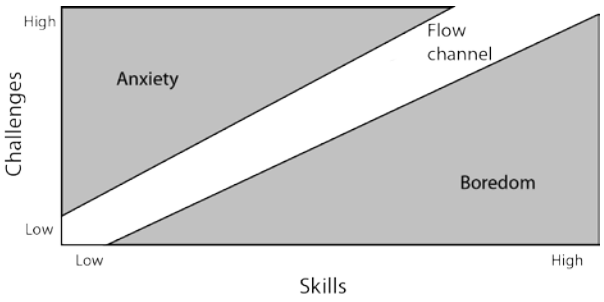


image 29 - the flow channel

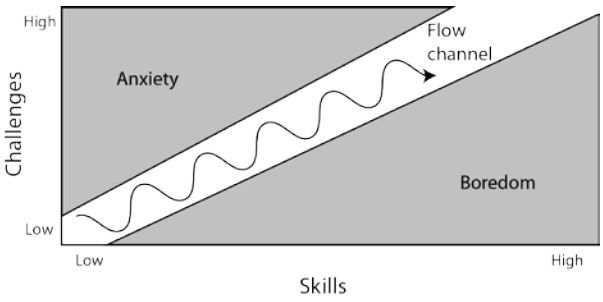


image 30 - the flow channel with experience

1. In the design of levels, which is a process that is very close to designing the patterns in a game, elements are added where the player literally stumbles upon. When stumbled upon, the player sees the possibilities of the element and thus learns how to interact with that pattern.

Cliff Bleszinsky, a rather well known game designer also states the importance to the concept of flow, but makes the level designer responsible for it. *"The Game flow of a Single Player title is driven entirely by the level designer."* (Bleszinski, 2000) Because the levels need to offer a constant stream of interesting events and objects to keep the flow, games and levels easily tend to interactions of a violent nature like shooting and fighting. But also other important level parts are the incentive for the player to move on; what Bleszinsky calls 'the carrot at the end of the stick'. Meigs continues on this environmental focus to get flow (Meigs, 2003). He states that every object and level should enhance this flow and should be designed very precisely to the player's abilities (Meigs, 2003, p. 40). Character flow is based on shapes and sizes of the environment, and thus special attention should be given to this. Transitions between spaces and elements are key elements in getting this character flow and should not be obstructions.

Nitsche states that next to level design, the gameplay itself is also very capable of immersing the player completely (Nitsche, 2008, p. 204). Some games reduce spatiality and give very simple visual feedback to players. In these games, like Tetris, players do not have the notion that they are 'present' in the game environment; instead they are immersed in the playing of the game itself. More on presence in virtual environments in the next part of this thesis, because it is more related to level design.

4.6 Emergence

In the part on narrative in games, emergence is explained as a scientific phenomenon and is related to the topic of emergent game narratives. It is also explained that emergence can be choreographed, to still create a game experience with different facets like a compelling story. In this part, I will elaborate on this theme more on the topic of a game as an emergent system and in relation with gameplay.

Design your own game

The term of paratelic activities is at the base of emergent play, because emergence is about arising situations in a system that allows for playful interactions without clear goals. A game that envelops just this gameplay is called a sandbox game (Breslin, 2009). However, Breslin claims that even sandbox games need some kind of oriented framework to become interesting. Take the example of the game Minecraft [image 31], a popular emergent game and system at the same time.

In Minecraft people can mine resources like wood, sand and stone in cubical shapes and build limitless constructions with them. This game lies very close to being three dimensional modeling software if it was not for the boundaries and rules that are inserted. When building and mining, it becomes dark and the players have to defend or hide themselves to protect them from certain enemies. The first thing players will therefore probably construct in this game is a simple shelter. Next to the building blocks, players can equip themselves with armor and weapons. These gameplay elements make minecraft more than a modeling tool and keep the process of building something interesting.

image 31 - building in Minecraft, Mojang 2011

Minecraft has no explanation, tutorial or even instructional level design (Cotton, 2011). The way players have to learn the game is by asking the community (or friends) and the collective knowledge these possess. This makes for learning the patterns of the game more challenging. Also important is that Minecraft does not contain any objectives or a time limit. People have to give meaning to their actions and set goals themselves. In this game, these goals are either about construction or exploration. Construction is the most common one and Minecraft is often seen as the digital version of Lego (Cotton, 2011, p. 5). Lego is not defined as a game, but a tool and system that provides emergent play. Children build whatever they want and then play with it. Just like with situations that arise when playing with Lego, Minecraft is a true emergent system but also makes use of gameplay elements to support it. What is also important about Minecraft as a game is that it is never finished. Being a system, the developers keep adding and removing elements to improve the game. They do this when situations emerged when players invented new ways of playing the game and they want to support these situations. Next to being an emergent game, in this sense Minecraft is a democratization of gaming and game design where emergence and design go hand in hand (Cotton, 2011, p. 8). The designers do not only give the freedom to the players in the game, they also give people the freedom to help design the game.

Multiplayer emergence

Playing with Lego with other people opened up many options and creates objectives for players because there is an opponent or friend. In video games, the multiplayer interaction pattern is a very important tool to achieve emergence. That is why multiplayer games have less story and objectives. All a multiplayer environment or arena needs is a set of rules (Breslin, 2009, p. 4). Social emergence in online games and especially massive multiplayer online games is very hard to support however and are closely linked to the fields of psychology and sociology (Sweetser, 2008, p. 102). Another way of achieving the same kind of emergent interactions between actors

is by adding intelligent artificial intelligence (AI). AI's need the appearance or impression that they possess intelligence (Breslin, 2009, p. 3). Because it is still impossible to create a truly intelligent system, game designers need to be adaptive in faking intelligence. The appearance of intelligence all depends on the presentation and situation of the AI character. In sandbox games in particular, like The Sims, AI characters (or NPC's, Non Player Characters) are made to be independent, emergent behavior systems that can interact with the world and other NPC's in a seemingly natural way. They need some level of self-motivation and keep the game world alive and to some extent believable and immersive. Things seem natural when situations arise because of actions of the NPC's that were unpredictable and unique.

Mixed experiences

According to Jesper Juul, there is no hard difference between sandbox games and games of progression (Juul, 2002). Many contemporary games include intricate weavings of the two game systems, like Minecraft, or Grand Theft Auto (GTA). In GTA, there is a large open world structure that allows for complete freedom of movement and play with cars and weapons. Next to that, there is a linear story that is infused in the environment and is a progressive game system of missions and tasks. Players can choose to start a mission freely, but once engaged, are encouraged not engage in free play. Just like Juul, Sweetser claims that emergent games are not sandbox games alone; they are a new era in the timeline of digital interaction (Sweetser, 2008, p. 54). The four eras are interactive fiction, linear gameplay, sandbox games and emergent games. Games become more mixed experiences which offer the best of both worlds. Making games with some or a lot of emergent systems makes experiences richer because the gameplay becomes largely about exploring the possibility space (Sweetser, 2008, p. 52).

Physics

An effective emergent system is the introduction of physics in games. The first game that contained a realistic physics system was Half-Life 2 [image 32]. Making use of gravity and weight of objects players can interact with the environment and create lots of different situations to achieve the goals in the game. These systems are introduced to players by instructional level design, but after that players can move objects to their liking with a 'gravity gun' and create experiences that are different each play through. Expanding on this system, many games made use of Half-Life 2's physics system and created other, even more emergent games. An example of this is Garry's Mod, a modification of the Half-Life engine where players can build anything using premade models [image 33]. They can then apply the physics engine on their creation and create anything from working rollercoasters to catapults.
True sandbox games like Minecraft and Garry's mod are claimed by many not to be games at all, but just systems that apply some game techniques. The physics engine from Half-Life 2 is also a system, but is embedded within the game and does not encompass the whole experience. The workings of these systems are very closely related to the programming that lies behind a game. Objects have properties, behaviors and relationships (Fullerton, 2008) and are engaged with each other in Active Systems (Sweetser, 2008). Sweetser explains that many mathematical systems can be applied to the programming of emergent systems that can enhance the variety and probability of arising situations, while keeping meaningful relations with other elements of the game. Mostly this meaningfulness comes from making the world more like the real world, like adding realistic physics engines.

Games as state machines

Joris Dormans wrote in an article that for game designers, it is very useful to see games as state machines (Dormans, 2009). Games are complex systems that can be in several states and can change between these states (transitions) [image 34]. Some games have a relatively simple diagram of possible game states and transitions, like games of progression, but a board game like Risk is a way more emergent game system and a diagram for that game would focus more on the possible transitions than on the infinite amount of possible states it could be in. Taking the game system as state machine a step further, Dormans adds the term game economy to his theory. Games have many resources and possible traits that objects and characters can possess. The states of many objects in a game are based on the amount and/or quality of these resources and parameters. A dynamic game system uses AI and rules to exchange these resources and create unique situations all the time. This system is also responsible for the control of the distribution of resources, the game states and for giving correct feedback to the players. Analyzing and using the game state diagrams to design games could lead to a more formal understanding of games and could lead to games which offer more emergence. Dormans does note that his view is limited to game systems that operate without the interactions of a player, but games do require a player to be a real game. Adding the interaction of the player to dynamic systems allows for situations that are even more unique.

Creativity and guidance

Interaction with a true sandbox game does require some creative insight from players. Players need a mental model of a possible future situation (Fullerton, 2008) and will work their way towards that model using the game rules and systems. In games of progression, players can just follow the route and do not really need to design their own paths or goals. Created goals in Minecraft for example could be to build a large skyscraper or in The Sims to have a family with 13 children all sleeping in the garden shed. Some people need more guidance and are more attracted to games of progression, while others want a lot of freedom and a system to apply their creativity to. Again, combining both free play sandbox games and objectives and story elements from linear games could lead to games that are more interesting for all types of players.

Concluding this chapter, and already create opportunities to link emergent game design with architecture, it is worth noting that game design is a second-order design problem (Salen & Zimmerman, 2004, p. 168) Game designers create the game system, but do not shape the player experience. Understanding how the systems of existing games work will lead to a higher ability to anticipate how the player's experience will ultimately be.

Summarizing, this chapter explains the working mechanisms of a game. Gamification and serious games show that these mechanisms can help in other processes. Motivations of playing games are based on patterns and the effect of flow helps the understanding of psychological drives. Finally, emergent systems provide a framework that is aided by gaming mechanisms to provide the best experience. The next chapter will provide architectural examples of play, connected to gameplay mechanisms and interaction, gamification and framework systems.

image 32 - Physics as play in Half-Life 2 Deathmatch, Valve 2004

image 33 - Physics as sandbox play in Garry's mod, Facepunch Studios 2004

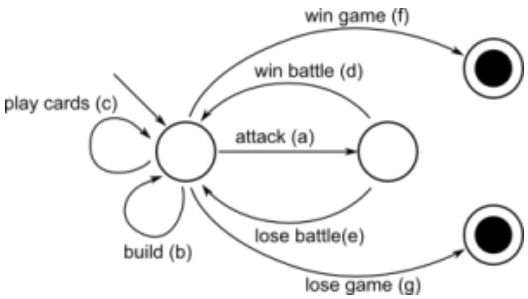


image 34 - The possible state changes of a game of Risk

5. Gameplay and Architecture

5.1 Intro

In many cases, architecture is supposed to be functional and practical. Architecture as design discipline also focuses on other aspects, ranging from artistic statement to inspirational spatial elements. Games have the same multi-purpose character; in general they are made to be enjoyable pastimes, but goals like education, artistic expression and even functionality for business situations makes game more than just a side activity. Being multidisciplinary, some architects already include game elements in their designs or speculations on how architecture could work. Relating to the elements of the previous chapter, here are some examples that combine architecture and gameplay.

First, some practical examples of playful situations in the built environment are given. Then, important parts of computational architecture are given. After that, it is shown that gamification already penetrated the discipline of architecture. Ultimately, some examples are given of architectural systems that can support dynamic and emergent behavior.

5.2 Architecture and play

Architecture and games have a direct and simple relationship if you consider buildings that are related to sports, children's playgrounds, theaters and entertainment complexes. A football stadium is literally a construction that is built around the boundaries of the game of football. No construction element should be obtrusive to the game and the construction is almost solely to make place for a live audience to the game. Theaters are quite the same, although it could be argued that these are not places where a game takes place (but a play). Children's playgrounds and entertainment complexes are also mostly designed to support separate constructions, objects or boundaries of games. With some exceptions like mazes and some others, architecture is always a separate, supporting element for gameplay.

The discipline of Industrial Design (at least in Eindhoven and Delft) has a research focus on spatial objects and playful environments. Broad researches define how people want to play with each other and the environment (Tieben, et al., 2012) (Bekker, et al., 2009), others define interactivity and interest in interactivity in the physical environment (Tieben, et al., 2011) and there is also a study which examines examples of intelligent playful objects that combine the physical with the digital world (Rijnbout, et al., 2012). The focus of these industrial designers is broad, not only on playing with objects and furniture but also on more architectural features like building blocks, lighting walls, spatial sound interactions and alternate reality games [image 35].

image 35 - an interactive children's playground

An even more architectural and playful object is the folly. Primarily meant as a decorative architectural sculpture, these constructions are more voluminous than playful furniture and sometimes even enclose space. Their purposes next to decoration vary from testing new materials, styles and building methods, to temporarily filling up spaces like city squares, design exercises and attractions. It is difficult to draw a line between installations and follies, but focusing on interaction and playfulness there are some more at place in this chapter. First I like to mention the installation 'The Rope Show' which was stationed at a public square in the abandoned Carlsberg brewery area in Copenhagen [image 36]. This installation consisted of a roof off which 3500 white ropes were hanging. Visitors were free to walk through the maze of ropes, which created a maze-like space which reacted to your movement. Being free to interact with, people started climbing in the ropes, knotting them together and hanging in benches to create swings. This free-play construction therefore has many similarities to an emergent game system. The purpose of the Rope Show was to draw people to the abandoned factory area and public spaces, to revitalize the space.

Another more recent example of an interactive installation is the 'Iceberg' folly on the Muntplein in Brussels [image 37]. This construction serves partly as an attraction, space filler, awareness creator and advertisement of an energy company. It consists of two simple rows of steel frames, which can be passed under. The interactive part is that sound is emitted from each row, so when you walk underneath them, you get an interesting three dimensional experience of iceberg sounds. Lastly, it is important to note that people were clearly led through the frames, creating a clear and linear path on the open Muntplein.

image 36 - the 'Rope Show' installation, Keinicke & Overgaard Architects 2010, Copenhagen

image 37 - 'Iceberg' installation, ATOMIC3 2013, Brussels

Another architect that saw the benefit of follies is Bernard Tschumi (Tschumi, 1994). He claims that a genuine architectural experience can only be achieved in a space when it is based on events and movement. Architecture should not be a fixed image, but a complement to city events. The movement through and interactions with architecture are subject to change; events could be exchanged for other events and movements and the architecture should change accordingly. This is clarified because people change their ways of interaction and movement and architecture is thus experienced differently. Architecture should therefore be dynamic and not a linear experience; there is no single experience of a building. Follies are able to support this dynamic architecture, especially if they are flexible systems that allow for different kinds of use (see affordance, paragraph 8.5). A realized example based on this is Tschumi's Parc de la Villette in Paris [image 38]. In this design the follies, lines and spaces are open to interpretation and event to all users and will therefore lead to many different experiences.

image 38 - Folly in the Parc de la Villette, Bernard Tschumi 1987, Paris

5.3 Computational architecture

At the faculty of architecture, TU Delft, writings from the chair of Hyperbody offer some interesting perspectives on the theme of architecture, digital technologies and games. Therefore this paragraph is included to sum up some of the most interesting ones for this thesis, all originating from the book Game, Set and Match 2 (Oosterhuis & Feireiss, 2006).

First, Kas Oosterhuis writes about a swarm architecture that consists of active components that communicate and interact with each other, the world and people (Oosterhuis, 2006, p. 14). It describes architecture as a complex and dynamic system with movable parts, changeable lighting or other physical aspects that is driven by a programming language. Oosterhuis goes a step further with this than his previous writings about parametrically designed buildings: buildings that are created using computer program languages, parameters and mathematical equations. [Image 39] Buildings should be able to show real time behavior and adapt to contextual situations like the weather. Many existing buildings already have automatic blinds for example, but Oosterhuis pleas for an architecture that has more similarities to a virtual game or an artificial intelligence with sensors and actors that change the way we design and use architecture significantly. New and popular technologies such as smartphones and the Kinect make implementing and functioning dynamic environments able and also make sure there is acceptance of digital systems into our everyday environments.

Continuing with architecture as dynamic system, Streitz writes about cooperative buildings, the disappearing computer and ambient intelligence (Streitz, 2006, p. 38). Cooperative buildings are buildings that cooperate with people and other buildings in creating the best functionality and experience. The disappearing computer is a phenomenon that Streitz claims is going on in architectural situations; computers are helping us more, but are melting with the architecture while creating a more seamless experience. Ambient Intelligence is the term given to (currently non-existing) intelligent environments that think and act proactive about the inhabitants and their needs.

Taking a less futuristic approach, Dekker writes a short history of interactive installations (Dekker, 2006, p. 116). Mainly the focus of artists, interactive installations explore the possibilities of merging the real world with the digital world using game techniques. Interactivity, goals, rewards and many others are used to create physical experiences that might be (have been?) of influence to designers of spaces. Many times these installations are gimmicks however and do not go further than providing a short thrill to people passing by [image 40].

Computer-Aided Design like AutoCAD changed the way we design architecture since a few decades, but the rapid rise of Computer-Aided Manufacturing (CAM) is helping to change the architectural practice as well. Using 3D printing and lasering, progressive architects are able to create new building processes and results that are flexible and beyond anything that people can make with conventional techniques. Kolarevic gives examples of many facades that are created with these techniques and pleas for a new architectural ornament using these new technological creation methods (Kolarevic, 2006, p. 172) [image 41].

Lastly, Edler and Edler give some examples of lighting grids that serve as a more integrated and discreet media facades on buildings (Edler & Edler, 2006, p. 181). Screens are the most used feedback tools for digital systems still, and using them on buildings is not uncommon (Times

Square). A building like the Kunsthaus in Graz however uses a lighting system called BIX and is much more a part of the building and much more unpretentious while still having the same functionality [image 42].

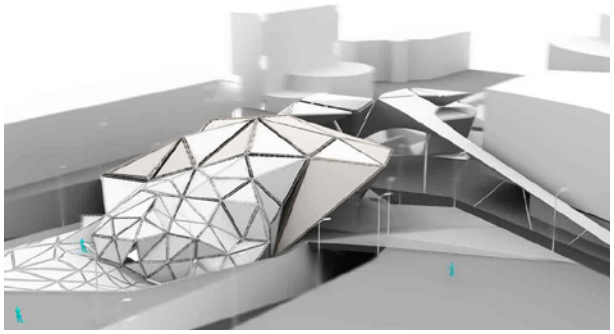


image 39 - example of a swarm architecture design, Hyperbody chair at TU Delft

image 40 - interactive installation 'Body Paint', Mehmet Akten 2009

image 41 - façade created with CAM technology

image 42 - BIX screen on Kunsthaus, Peter Cook and Colin Fournier 2003, Graz

5.4 Gamification of the architectural design process

Gamification is already happening to architectural related processes like designing. This is especially the case with urban design, which is applied to urban situations in the Netherlands more and more. An example of this is the research and practice team Play the City, by Ekim Tan (Tan, 2010). This team supports urban designers and strategists (mainly governmental) in creating settings to brainstorm and design neighborhoods, cities and towns. By giving persons a specific role and goals, the participants will fight for their goals using a simplified model of the plan and some game rules. The result is often a mediated result with which every participant should be satisfied: there are no losers with this game. Self-organizing systems, financial stakeholders and temporary urban situations are all addressed in this game system [image 43].

Ryu et al designed a system that uses game techniques and digital technology to make designing architecture in to a community-based service (Ryu, et al., 2012). They plea for a more flexible and open design process in which everyone can have a say, using web interfaces like blogs and phone apps to reach many people who have a stake and ideas in designing a building. Architecture is for its users and that is why they should have a say in the design, not just a lone wolf who defines everything in the design.

A third example is one by the mind of architect Will Alsop, who created the multiplayer urban planning game PlastiCity (Von Borries, et al., 2007, p. 307). This game uses a game engine to show a virtual version of an urban area that needed to be transformed and players of the game could change the surroundings, erase or change buildings or add new volumes using in-game 'wands'. The results of play sessions were used by urban planners to really design areas.

image 43 - a game of Play the City in action

5.5 Architecture as a system

Just like games, architecture can be seen as a system. Christopher Alexander states that the city is not a tree (Alexander, 1966). At the time of writing, the sixties, Alexander found that urban views were focused on hierarchical scales and pyramidal relationships of cities, districts, sub-districts, neighborhoods, streets and buildings. He claimed that cities are much more natural systems, structured as a 'semi-lattice', in which elements of different scales interact and relate to each other in an open system. The city cannot be broken down in smaller parts, but must be seen as a set of units, which support and enhance each other in a complex and interdependent whole. He meant to argue that good design is not a matter of elements functioning properly in a mechanical system, but of spatial regions that amplify each other in a larger whole.

A different approach on architecture as natural system, but originating from the same decade, is the concept of Japanese Metabolism (Van Den Anker & Van Schaik, 2008). This architectural trend originated as a reaction to the static simplicity of post-war buildings. In japan at that time a lot of buildings were needed to support the growing population and some architects plead for dynamic, flexible mega structures that would be able to grow with the development of the society. Buildings and the city should be seen as an organic metabolism, with growing and ever changing elements. A famous example of this style of building is the Nagakin Capsule Tower in Tokyo, which is an apartment complex built out of prefab capsules hanging on a backbone structure. The building is flexible, because capsules could be added and removed if needed [image 44].

Lastly, the Dutch artist-architect Constant Nieuwenhuys designed an urban utopia that was based on the Homo Ludens of Huizinga (Huizinga, 1980) and called that city New Babylon (Von Borries, et al., 2007, p. 218). All elements of that city, from walls to buildings to streets and colors are in a constant state of transformation, to support the ludic nature of people. Playful instinct and creation would make this city both entertaining and functional, because people would be able to change modular objects at will and spontaneously. It would have been needed to change our ways of life entirely, but it would fit our playful nature better. One of the first natures of people is the need to explore, understand and transform their surroundings to fit their needs; important features of play. New Babylon would be really possible if all societal systems of work and production (utilitarian principles) are automated and with that people would get the freedom and time to express themselves creatively (Nieuwenhuys, 1974). These ideas are inherently part of the Situationist ideal, a group that strived for the integration of play and meaningful creation instead of mass-production into society (McGonigal, 2006, p. 171). This opposition given to 1950's strict modernism rules had great impact at the time.

This chapter showed a myriad of possible situations where play and open systems exist within the architectural world. Some of them being more simple and practical, others being more theoretical, artistic and abstract. The next chapter will contain useful comparisons and discussion, linking the examples to the game theory of chapter 4.

image 44 - Nagakin Capsule Tower, Kisho Kurokawa 1972, Tokyo

6. Synthesis

Just as in the previous part synthesis, I will first summarize this part. There is no clear problem statement as in the part on narrative on games, but the most important elements of gameplay in video games will be mentioned in this summary. After that, there will follow a comparison between chapters 4 and 5, combining perspectives of games and architecture. Lastly, a list of architectural possibilities and perspectives will complete this synthesis.

6.1 Summary

Gameplay and Games

Gameplay is the driving mechanism of games and the main factor that make games fun, challenging and rewarding. Gameplay is based on choice, interaction, feedback and conflict. Conflict is possible in many interaction patterns, varying from player against computer to player against player. Contested space is the space where the conflict takes place. Rules and boundaries are at the base of every gameplay and game space, focusing play and possibilities.

Gamification is the adding of gameplay elements to real-life serious situations. Using on-screen games, activities like chores are given visible feedback and are thus made more rewarding. Taking the problem-solving attitude of gamers, larger scale problems could eventually be solved. Serious gaming, a comparable trend, focuses more on education, business and team work situations. They are built to train employees in certain tasks, using games that have a fun-factor.

Motivation of people to play games is based on psychological drives like competence, autonomy and maintaining relationships. Competition is also an important factor, but they are all related to understanding and completion of patterns. Games are patterns for our brains and bodies that are engaging and fun to complete. In that process we learn the skill of completing that pattern, which makes us feel good. That feeling of problem solving is evolutionary explainable; solving a problem would make you survive. Games are abstract models of reality, taking place in a safe environment without pressure and are therefore ideal for learning. Learning to play a game is closely linked to playing itself and therefore most games embed that learning process.
The concept of flow is also based on psychological backgrounds, explaining that full engagement of the brain is reached when there is a balance of skill and challenge at a threshold level when doing a certain activity. Gameplay is very capable of delivering this flow, making games a very engaging activity. Next to gameplay itself, the design of the game world also defines the flow.

Lastly, emergent gameplay often arises if the game structure is an open framework that has gameplay elements like objectives and rewards on top of a sandbox game world that lets players do and build everything they want. The goal of these games is mostly about exploring the possibility space. Emergent play is also supported by social situations and believable artificial intelligence. Added engine systems like physics make games more real and make the possibility scope of game objects larger. Emergent games are based on active program systems and could be seen as state machines, that develop based on the system itself and choices of the player. Distribution of resources and traits, based on a dynamic economy, are driving factors of free play. In closing, emergent games really test the creativity of players, because designers of such games only create the framework; players have to design their own gameplay.

Gameplay and Architecture

There are many practical examples where architecture meets play: sports, theaters, playgrounds, follies and installations. They all share that they are flexible systems that provide opportunities for play. Computational architecture describes the possibilities for a computer-based design process and more interactive and dynamic architecture, but is not yet implemented widely. The design process of architecture already shows some examples of gamification and is mostly based on larger, urban designs. Finally, three examples of architectural systems show that cities and buildings are dynamic structures and claim that they should also be designed as such.

6.2 Comparison and discussion

Architecture focused on games mainly just support separate game boundaries, like a football stadium. Playful objects, follies and interiors weave the two systems more together and they could therefore be seen as the (inter)actions and challenges that games pose us. They can be dynamic and interactive and they are able to give feedback to our activities. As implemented by Tschumi, follies serve for a playful system of architectural objects that serve different kinds of events and use. This is also the case with buildings that will have an ambient intelligence and cooperation; but alongside architecture and computer-aided manufacturing, this element is still very theoretical, too far from working as intended and not easily applicable to contemporary architectural designs.

Salen states: "*How might the form and body of architecture be translated through the rules of strategic conflict into spaces that evoke interaction, be this material, social or psychological?"* (Salen, 2006, p. 32) She states that contested spaces are something games and architecture have in common, taking the example of the Shibuya crossing, where hundreds of people need to cross a square whilst dodging each other [image 45]. A comparable game situation might be the game Frogger [image 46], where players have to cross a street whilst dodging cars.

image 45 - Shibuya crossing, Tokyo

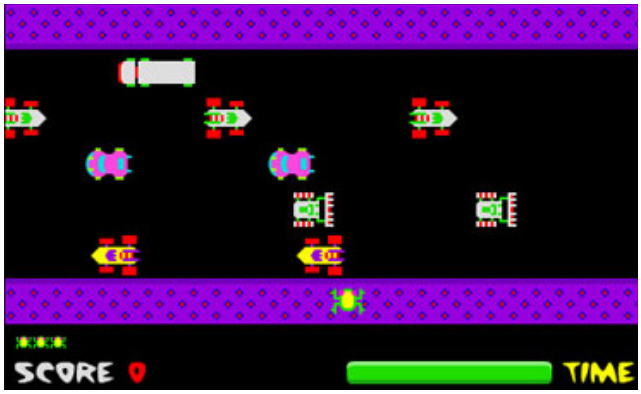


image 46 - Frogger, Konami 1981

Another element of games that might be of use to architecture according to Salen is the application of rule sets: *"How might the design of rule sets be conceived to take advantage of the real-time nature of dynamic systems like games and architecture?"* (Salen, 2006, p. 33) Rules, alongside the limitations of technology, limit the use and play of spaces. How could combinations of the two be applied to architectural spaces and with that improve the quality?

As seen with the examples of gamification of the design process in the previous chapter, it is already being applied to the architectural practice. Gamification is more difficult to apply to architecture itself however, because the purpose of buildings is often not connected to activities that entertain or that are in need to be amplified to improve our lives. In some cases however, like buildings that have an entertainment or commercial function, elements could be applied to the use of those buildings, improving the experience and the sales.

The psychological drives for games are quite different from those in architecture. Motivations for people that use architecture are mainly based on wayfinding (see paragraph 8.4), but in the aesthetic appreciation of buildings and surroundings some similarities might be found. This is also the case with previously mentioned buildings of entertainment and commercial buildings. Carefully deciding what people want in a building and using methods and perspectives like patterns and flow could improve the experience of buildings.

Lastly, architecture as a system is not a new notion according to Alexander, the Metabolists and Nieuwenhuys. As to Alexander, it is more a way of analyzing urban scales, but the metabolists see the profit of dynamic and flexible situations based on nature. Nieuwenhuys even pleas for a systematic and dynamic approach to the city, directly linking it to the playfulness within human nature. Emergent game systems and sandbox games are the same kind of dynamic system, offering a backbone structure which supports flexibility. Salen also states that buildings could be seen as open systems: we could *"(...) orient the practice of architecture towards understanding buildings as contexts for user interaction, or 'sandboxes', which create contexts for user creativity."* (Salen, 2006, p. 35) In an open architectural system, people can apply their own creations and change layouts to fit with their needs. This idea is not so far off from Nieuwenhuys' and the Situationists' ideals.

Grasping back to those ideals, the virtual world of Minecraft is remarkably close to the world Nieuwenhuys describes in his plea for New Babylon (Nieuwenhuys, 1974). Even McGonigal sees a future for a larger role of play within society, if gamification would get free reign (McGonigal, 2011) (McGonigal, 2006). Play and creation become more important because we get more free time and with that the ability and freedom to create the world around us to our desires. If technology and societal standards are up to a certain level, an urban environment and culture are possible where the cores of play, creativity and emergence, will peak.

6.3 Possibilities for Architecture

This paragraph will sum up the four most important lessons from game design for architecture, as concluded from the previous chapter and paragraphs. Two elements that Salen describes in her article about games and architecture are left out here, because they offer merely a perspective and are too undeveloped to be practical. These two are the concept of contested spaces and the application of rule sets to architecture, and although they could be very beneficial for architecture eventually, they might need more research to be of use.

1. Dynamic space activators

Follies, installations and objects are dynamic, impulsive and interactive. People are tempted to use them and explore their possibility spaces just as people do with games. Because of their dynamic nature, they change or can be used in many different ways. In this way they stay

interesting to people, attracting them to places and revitalizing them. These structures are therefore meant for the public realm of architecture, like urban settings like squares and parks or public buildings like museums, malls and transport hubs.

image 47 - dynamic space activators

2. Gamification of the function of a building

Together with the concept of intelligent buildings and constructions, the experience and use of buildings could be changed drastically when using game techniques. This element is beneficial for architecture, but it does not compose of architectural means: gamification is best applied using border technologies like smartphones and computer screens. Using specified apps and screens to communicate with the building, to find your way and to be rewarded for reaching your goal in the building are examples of gamification in architecture.

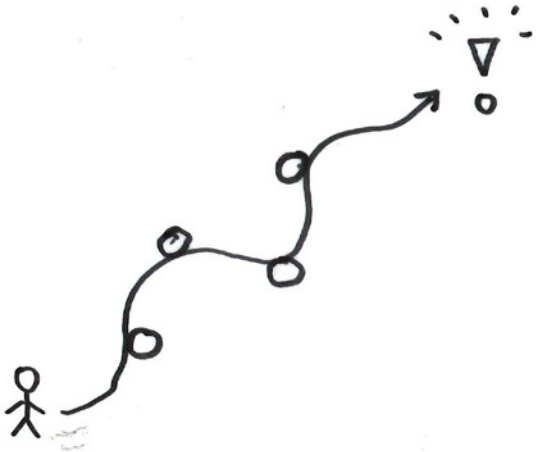


image 48 - gamification: goals and rewards

3. Designing buildings on patterns and flow

Interesting patterns that engage us could be applied to many aspects of architecture. From the detail scale, to ornament to the layout of the building, surprising patterns will make the experience more interesting and motivate people for certain kinds of use. Patterns are not new to

architecture, especially in the apparent visual pattern, but in moving around and use they could learn something from patterns of games. It is paramount however that if a building has a certain serious function, these out-of-line patterns should not intervene with it. Making architecture more interesting and surprising is directed at experience levels of architecture.

Flow is comparable to the perspective of patterns, and is related to the experience and engagement of architecture as well, but could also be of use to more serious functionalities of buildings. Giving the layout and structure of the building a more engaging level could make buildings more interesting, but applying supple movement possibilities is effective in every kind of building (even very serious buildings like hospitals could benefit from this).

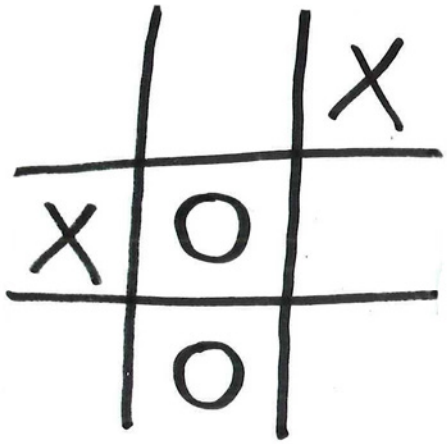


image 49 - recognizing and learning the patterns of a game

4. Architecture as sandbox contexts for user creativity

Architecture has always been a framework for human activity. Designing architecture with game frameworks in mind could be a new perspective. Games offer a certain amount of freedom to players, using mechanisms, engines and creators that could inspire practical architectural features in a building. Using the building construction, the social network that will inhabit the building, the application of active and interactive state systems, flexible tools to change the environment and the application of some game elements like rules and rewards, architecture could become more emergent. In this way, people could change and play with their environment as they see fit and therefore become more productive or satisfied. This might then even be the incentive for a different use of architecture, the environment and a new view on the relation of person-environment.

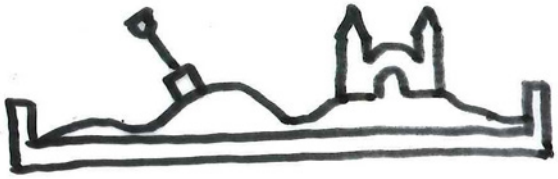


image 50 - the sandbox as framework for play and creation

Level Design

The place where games take place is often referred to as a level and the design aspects of these levels is described in chapter 7. Chapter 8 will contain descriptions of real-life buildings that have a connection with play. Chapter 9 will be the synthesis and comparison of chapters 7 and 8 and conclude in a list of level design aspects which are beneficial for architectural design.

7. Level Design and Games

7.1 Intro

Designing a good virtual world is not as simple as it may seem, due to the amount of freedom that virtuality offers. Many designers of game levels therefore refer heavily to real world situations, or at least recognizable settings, like medieval castles and classical temples. Glazer claims that people are very traditional in their desires and though imagination can run free in worlds where gravity is not necessary, many game worlds are relatively more conservative than real world architecture which tries to defy many rules (Glazer, 2005). On the other hand, there are lots of examples of game worlds that are new and progressive and that give players both the surprise of discovery and the challenge of gameplay. This part will start with a view and definition on virtual spaces and outline several spatial structures that govern the virtual realm. Then, the process of designing a level is explained, focusing on elements that are unique to the industry. After that modular and procedural design will be elaborated on how they contribute and could potentially contribute to game design. Concluding this part the topics of wayfinding and emergence will shortly be addressed.

7.2 Virtual places

Real space?

Virtual space might seem to be abstract and not tangible, but according some it is definitely real space. First this is because it is three dimensional, changeable and discoverable through time (unknown, 2007). Compared to pictures and film, game space is maneuverable and it contains perspective. Because the position of the observer can be changed, the space is just as much a space as physical space. It is therefore that game space can learn a lot from physical space and architectural design, and not just three dimensional spaces, but also text based interfaces like chat rooms (Erickson, 1993). Because space is able to structure our activities very effectively, those techniques and rules also work in more abstract spaces if they are applied correctly.

In games, the worlds define the actions of its inhabitants but just as in real space, the inhabitants can give meaning to space without the space suggesting it. In a popular MMO players gather on a certain bridge at all times to exchange items and talk with each other (Nitsche, 2008, p. 196). The bridge was just meant for crossing a gap, but people are able to give new meaning to spaces like these. This is why space is defined by the actions that take place in them. Space could suggest activity, but is ultimately the activity that shapes the experience of the space and the space itself. According to Erickson, it is just as important as in physical space to design virtual spaces that are able to catalyze and structure activity, but in order to really succeed they must remain open for many other activities (Erickson, 1993).

Places also become more real when they are part of a memory; a told story (Nitsche, 2008, p. 198). When players talk about a game space, they refer to it as it was a real space. This recapitalization is also bound to events actions in the game, but if the space is well designed it will be spatial elements that will be the instigators of those memories. It is also a matter of identity: players identify themselves as the main character of the game and will therefore refer to their character as “I” when they talk about happenings in the game (Nitsche, 2008, p. 193). “I am

there" gives a sense that not only is the player identifying with the character, it also suggests that there is a "there" and that the player exists there. This identity defines virtual space as real space.

Spatial structures

Just as with physical space, game space can be typologized. There are five mother categories: tracks and rails, labyrinths and mazes, arenas (Nitsche, 2008, p. 172), sandbox spaces and garden spaces (Taylor, 2006).The track is a linear space, offering little freedom to the player. Example games are race games or shooters that rely heavy on story and prescripted thrills. This type of space is often very detailed, because players are not able to stray of the path and designers only need to design that specific path. They also offer a tense and dramatic experience resembling that of a film. Labyrinths and mazes offer a lot of freedom, because they rely on exploration and the readability of space. Players can often walk freely in these spaces and the fun part of these games is the understanding of the level logic and acting appropriately. These spaces do not give away their structure easily, players need to undertake action and use logic to progress. Arenas are single spaces which offer the most freedom and the least progression. Many popular games like Counter-strike rely on this structure. These games are often multiplayer, non-narrative games that offer the creation of various strategies and emergent situations. Arenas are like a canvas for performance (Nitsche, 2008, p. 183). These spaces are comparable to game spaces that are used in sports like football or board games like chess. The core of these arenas is the collision points: the points where players or groups of players are most likely to collide (Geuttler & Johansson, 2000, p. 163). These points are difficult to plan, because working strategies to win a game session in an arena setting emerge out of playing the game. It is because of this that the designs of these arenas depend heavily on playtesting (paragraph 7.3) and wayfinding (paragraph 7.5). Taylor describes two other types of game spaces: sandbox spaces and garden spaces (Taylor, 2006, p. 98). Sandbox spaces, as mentioned in the previous chapter (paragraph 4.6), are spaces that allow for creative and emergent play, offering tools of creation, destruction and combination of spatial elements. Garden spaces are comparable to these sandboxes, but focus less on the creation of space than on emergent play in a garden-like space. The game of Grand Theft Auto for example is more like a garden, according to Taylor, because it is an open world that is predesigned but freely explorable and contains paths that guide players if they prefer a more linear experience; much like a real word garden. Garden spaces are not really labyrinths because the gameplay element is not directly connected to the understanding of the environment, but to the possible playful situations that can arise between players, artificial intelligences, objects and the environment.

Another way to categorize game space is simply by dividing them in two: spaces that are created by the game designer and spaces that are created as part of the game itself. Many games that have strict rules and a prescribed experience rely on precreated spaces, but games like SimCity allow players to create their own space within the system and sustaining that space is part of the fun.

Level structures are very closely related to the type of narrative used in the game. That is why levels usually get a derived shape from their story structure. Possible story structures are mentioned in part one (paragraph 1.4).

7.3 Level design process

The design process of games is, just as with other creative arts, not standardized for each person or company. There is however a trend structure in the design of three dimensional game levels. In this paragraph, the way actions and events are implemented in design diagrams and the notion of playtesting will be elaborated.

Diagrams and elements

Games of progression take place along a linear three dimensional path. Writings about level design focuses mainly on these progression games, so the elements given in this paragraph also refer to them.

To start, most level designers get their frame of reference by the narrative (Co, 2006, p. 90). Before levels themselves are created, the game designers already wrote most of the story and a lot of artwork has been done. From this designers distill the style, scale, landmarks and type of challenges and puzzles for the level (Co, 2006, p. 95). Before coming up with spatial ideas however, level designers, together with more general game designers, draw gameplay diagrams that will be the core element of gameplay in that level. These diagrams also serve as level concept are more like football play mechanics than plan drawings, because they describe the possible strategies and actions of players and artificial intelligences (Licht, 2003)[image 51].

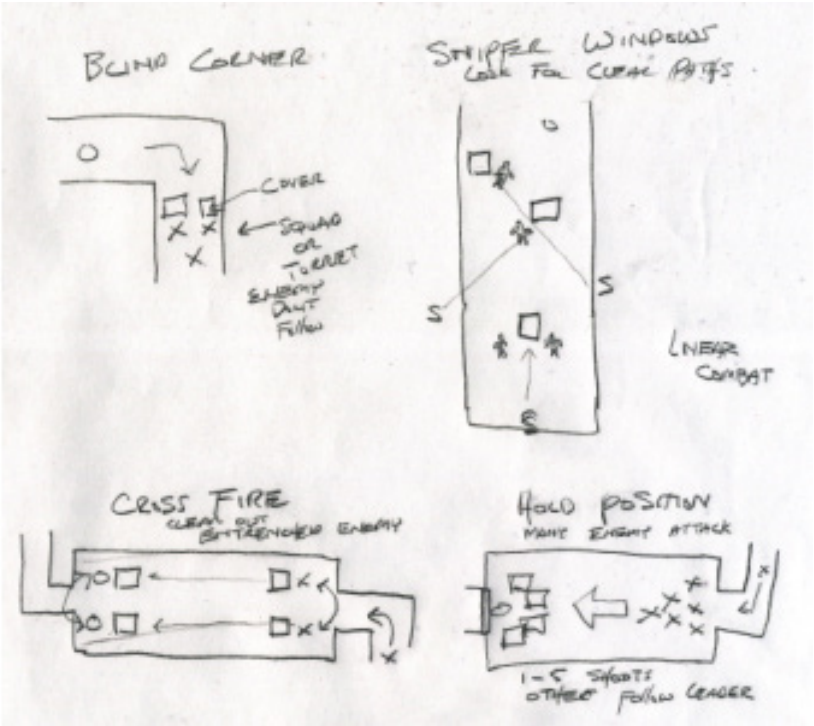


image 51 - gameplay diagrams describing combat situations

Licht states the following steps in the design of a game level (Licht, 2003)[image 52]:

1. *Post-its*: taking ideas and arranging them. Combining them with gameplay concepts and narrative.
2. *Bubble diagrams*: Simple diagram with bubbles that represent space and connections to represent the spatial links. All important locations are added in this stage and they are combined with descriptions of the actions that will take place on those locations.
3. *Drawings*: Top-down plans can be sketched, suggesting form and style elements. All locations should be supporting the gameplay and narrative at all times.
4. *Enlarging and detailing*: scaling up the plan and precisely placing elements and enemies. Use sections and elevations where needed.
5. *Modeling*: The actual building of the level in a 3D modelling program. The drawn plans can be used as layout images to build the level on.

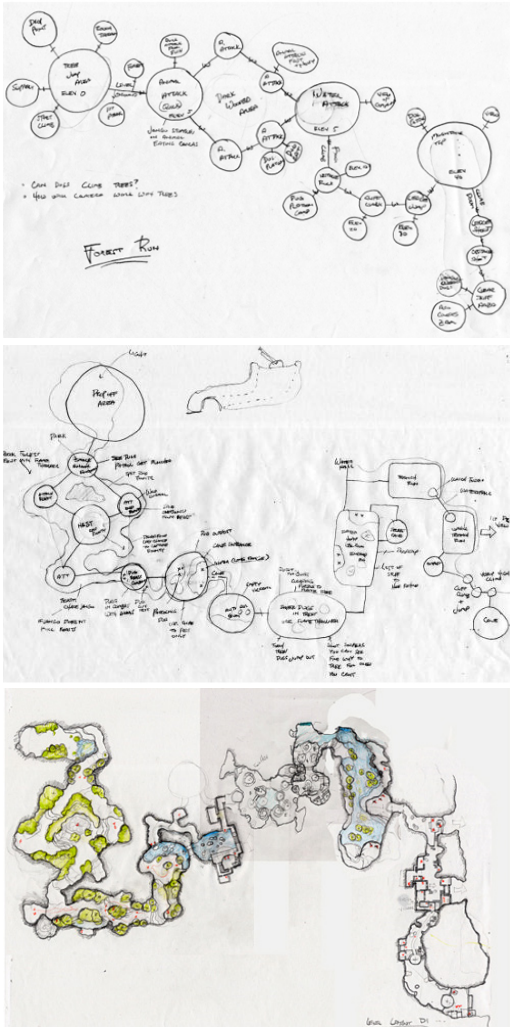


image 52 - bubble diagram and more detailed drawings of the same level

Very important for the design of levels is the placing of interactive elements, collision points, obstacles and encounters, actors (enemies) and items. Level designers include them early on in level diagrams, because they will define the gameplay. Level diagrams are therefore both spatial plans and time plans; what will happen where. Of course, the more freedom and non-linearity the game offers, the more dynamic the level diagram will be. Most games offer at least some kind of freedom and therefore all possible interactions are often inserted using symbols [image 53] (Co, 2006, p. 137)

The level layout will determine the game progression (Co, 2006, p. 143). Connecting spaces should therefore be done carefully, if you want to prevent players walking up and down the same paths to complete tasks; this is often boring. To create both freedom and the sense of discovery, layouts should offer enough paths to keep people engaged [image 54] (Co, 2006, p. 145).

Placing lights is an important element of level design, because they will determine what is more important, where players will look and how the atmosphere of the surroundings will feel. Ambient

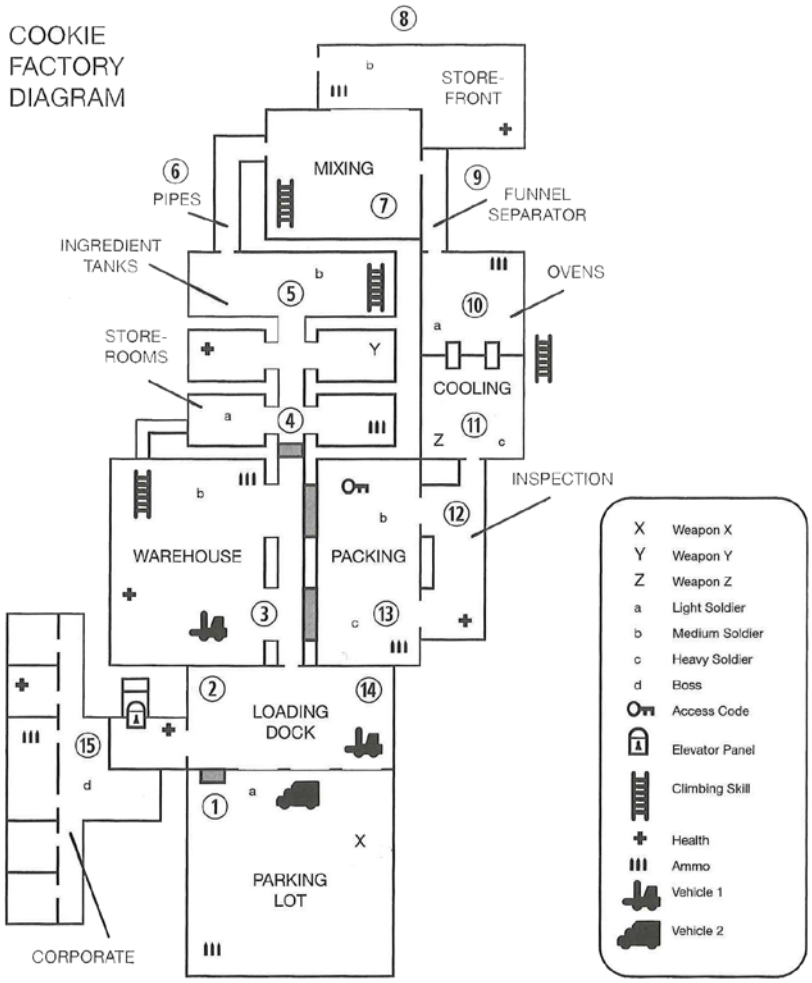


image 53 - level diagram with symbols indicating interactions and items

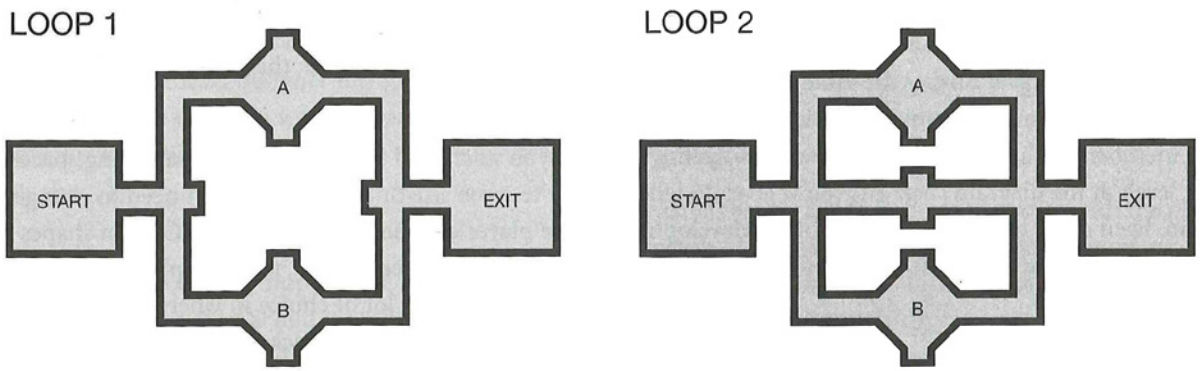


image 54 - level layouts, left: to get to A, B and the exit players need to walk at least one path twice
right: by adding one more path the route remains free to choose, but players will never walk the same path twice

lights, spotlights, soft spotlights and imitated sunlight are some of the most important ones (Feil & Scattergood, 2005, p. 86). The same effect counts for sounds. In three dimensional game levels, often sounds are implemented in the same way as every other spatial element: they are invisible, but linked to spatial coordinates and emit sound with certain intensity.

Finally, for games it is important to decide on the type and placement of virtual cameras: the actual input that players will see. Because game worlds are free to any camera movement and placement, there are many different options, like a third-person following camera, an overhead view, a first-person view and predefined viewing frames (Nitsche, 2008, p. 93). They all will have a different cinematic effect and experience, and will deliver different types of precision and narrative perspectives.

Concluding, the design and building of a level envelop every aspect of the experience the players will ultimately receive via their gaming systems. Not just sticking to spatial design, it involves gameplay, movement, sound, lighting and camera work as well.

Playtesting

As mentioned in the previous part (paragraph 4.5), level design also greatly determines the flow of the game. In other words, if the level is rugged and difficult to navigate, the game will feel slow and staccato, but if the world is rounded and fast to navigate there is much more flow. Because it is so important to know if a game will be fun, has flow and if ideas will work, game and level concepts need to be tested in a very early stage of design. This is called playtesting.
The first goal of playtesting is to find out if a game is fun, but there are other purposes, like finding bugs and errors, determining the target group and playtime and testing the functionality, understanding and flow of challenges. According to Ambinder the playtesting and design process should be a continuous cycle, where every design stage is a hypothesis for a fun game that needs to be tested (Ambinder, 2009). There are several types of playtesting: direct observation of the player, verbal reports and interviews. Analysis of player behavior can also be measured using statistics that come directly out of the game, like a heat map of player death concentration (which parts are too difficult or too easy)[image 55]. With this feedback, the developers will change certain elements and continue developing with remarks in mind. It is important to let many different people test a game, not just the intended target group. Next to that, it is important

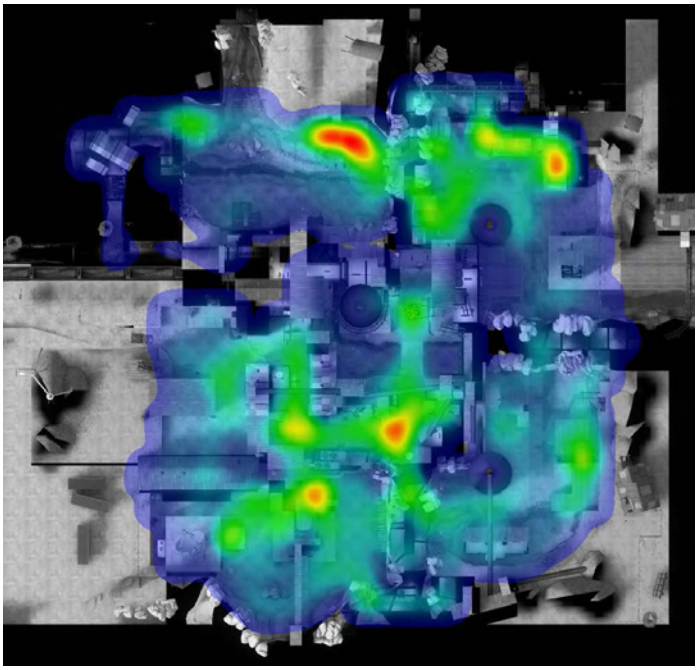


image 55 - player death intensity in Team Fortress 2, Valve 2007

to filter feedback that is personal and subjective, from the feedback that is more general and objective (Meigs, 2003, p. 177).

Games have a lot of factors and states that need to be balanced carefully. Based on playtesting feedback, designers need to alter amounts to get the right difficulty and fun in challenges. Balancing is an important part of game design and can be done by changing the environment (for example adding more obstacles), by changing gameplay elements (changing amount and type of interactions), or by adjusting parameters like health, ammunition or resources (Co, 2006, p. 241).

Bezuijen states that emergent situations always arise in playtesting sessions (see interview appendix B.1). Players might find different, unintended ways of solving puzzles or might start to play around with objects and spaces that were not intended to be fun. These elements should be strengthened, because they make a game more fun and add more freedom for players.

Concluding this paragraph, the level design process differs from many other design disciplines on its focus on event and being able to test events very early in the process.

7.4 Modular level design

When designing a game, designers often make use of modules to split and quicken the work. This is not just for geometrical objects in the game world, but also because of the object-oriented codes that are the technological structures that hold up those worlds. Modules in games can be used for procedurally created levels and are sometimes even part of the gameplay itself.

Game patterns

Level design and level building even more is based on prefabricated geometry (Meigs, 2003, p. 27). Building levels from prefab modules is needed, because computing performance and workload would be too great if it was not used. Adjusting the scale and the texturing will make similar modules seem different and keep levels interesting. Meigs calls these prefab elements like doors, trees and stairways 'digital Legos' that help build the environments quicker and more efficient (Meigs, 2003, p. 27). One of the more popular level engines, the Unreal Development Kit (UDK), uses these prefabricated elements calling them meshes. Next to these meshes, to create an overall level shape in UDK, designers first use a mold creator tool called brush. This is a template shape that can be 'sculpted' to get the desired shape which could be 'cast' and made solid. Meshes are subsequently added to this custom shape to fill up and complete the level; however brushes and meshes are also used alternately depending on your method and type of level [image 56].

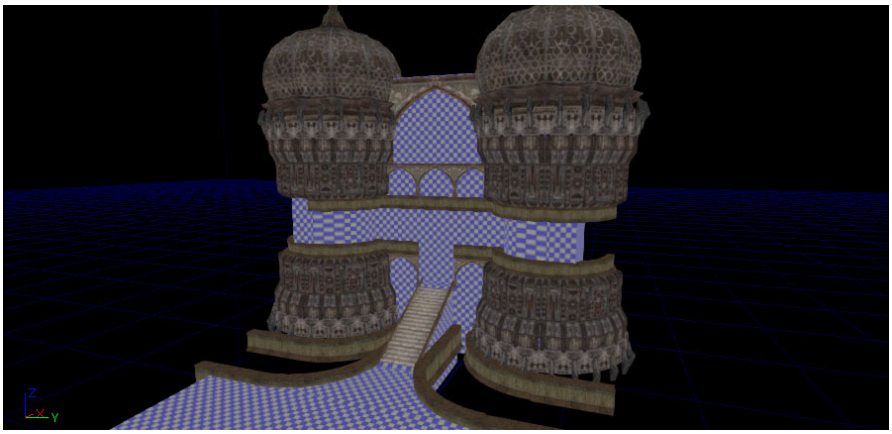


image 56 - screenshot of the UDK, the blue/white volumes are made with brushes, the rest is precreated meshes

But modularity in games is also visible in the playable stages of a game, especially is the game is about building itself. Strategy games like Command & Conquer and Age of Empires use prefabricated models of buildings with which the player can create defenses. Less violent games like SimCity use complete building modules to create cities, or building elements to create simple homes in The Sims.

When talking about modularity and patterns in more direct games, like action and adventure games, it is worth noting that the gameplay and level patterns designers create are closely linked to the cognitive patterns of play, which are mentioned in the previous part (paragraph 4.4). A gameplay pattern, which can be slightly altered and repeated, or even randomly generated based on several parameters, can be used more often by game designers to give the game more content. If used too often however, the game gets too repetitive because the pattern of the challenge is not new or difficult any more. Game designers therefore need to balance their work with the desired experience. Most games rely on a set of gameplay and level patterns, often copied from other games and put in a different context. A very popular game mechanic, like first-person shooting, is copied so often that the pattern is too well known by the whole gaming community and starts to lose public interest.

A thesis by Op Den Kelder states that modules actually do not really work in creating games (Op Den Kelder, 2009). This is because modules are based on a system of objective logic and artistic design conflicts with this system because it has a degree of randomness, intuition and human values. Dormans however sees the benefit of modular design and gives several suggestions to modular game design to improve its effectiveness (Dormans, 2013). First, modules should be more descriptive of their qualities. If it is very clear where a module can be used for, designers will use it more effectively. Next, modular methods should be more prescriptive of their system instead of descriptive, because many modules are more analytical tools than building tools these days. Lastly, Dormans suggests that there should be fewer modules, but more interactions between patterns. In this way modules are brought down to their core and are easier in use and implementation. This system is also called holistic design: an approach that sees an object as interconnected and integrated whole which is also part of something larger (McMahon, 2013). The connecting of modules and the emergence of something larger is therefore also important for the subject of emergence.

Next to building and playing with modules, the game industry has a large amount of 'modders' for games. Modders create modifications of games, adjusting existing levels and gameplay patterns to add more fun or even build new patterns in the same engine (see interview appendix B.3). This mentality is possible because of the dynamic state of computer programs and if people are able to change the code behind the program they can alter or enhance the experience. Some games support these modders by making open, simple game structures that allow people to play around with the code and the level structure, often expanding the fun and lifespan of a game. Some designers even build their games directly with the help of anybody interested, like the game Star Wars Galaxies (De Jong & Schuilenburg, 2006, p. 128) or release their game in an early stage of development, making the playtesting of the game a matter anyone can involve themselves with (game distribution system Steam by Valve does this, with their early-access system).

Procedurally created levels

Using the processing power of computers and a library of patters and modules, game levels can relatively easy be made in a procedural way. Most simulation and strategy games, like the ones mentioned in the previous paragraph, are the best game systems that can provide procedural level design whilst being played; every level will be unique. This is possible because of the open-ended sandbox play of these games. Levels in more linear games, like adventure games, cost a lot more work by level designers and are the same each time they are played. They are difficult to be generated on the flow by the game system, because of the fixed nature of storytelling and scripted events. Dormans however researched the possibilities of making adventure levels using procedural creation methods (Dormans, 2010). He suggests that an adventure level can be generated if it is split up in two abstractified parts: the spatial level and the missions [image 57]. These are two separate structures, which require different grammars to be able to generate them. Missions require a generative grammar that is based on string creation, but instead use nodes and edges: graph grammar. These nodes represent mission goals and the edges represent paths. To generate space, Dormans suggests the use of shape grammar, which is a mathematical approach to the rules of spatial elements and transformations. The result from the graph grammar for the mission could be used as input for the shape grammar. In theory, this system would make for a completely generated world and game, which is unique each time it is played.

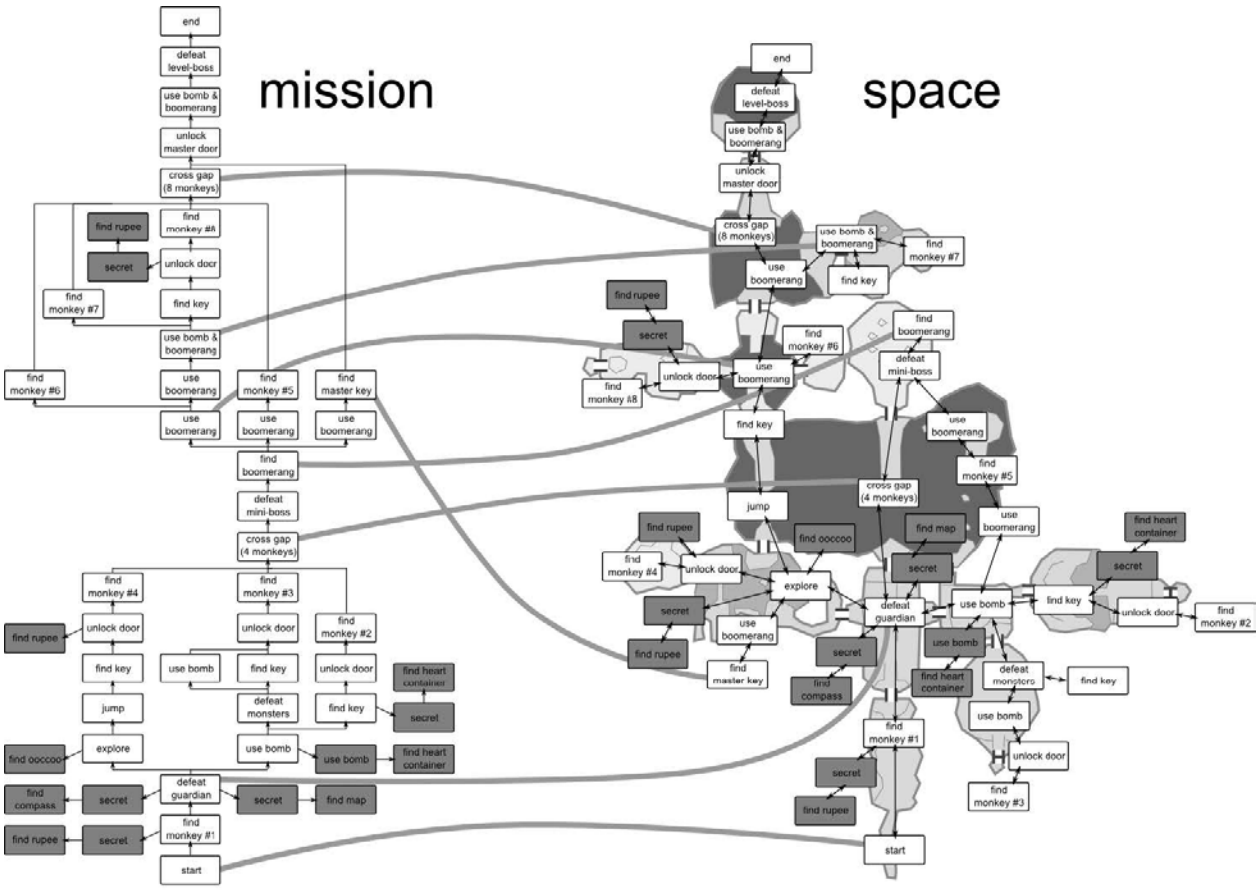


image 57 - mission space separated from the level space, in order to generate both with different grammars

However, many procedural game engines create worlds which are not meaningful, thrilling or interesting because of the randomness that comes with it (Nitsche, 2008, p. 167). According to Nitsche, this could change if the levels directly adjust themselves according to player behavior and choices. With this method, the game could easily adjust the world to the player skills and favorite interactions, making the world a personally generated space. Nitsche even developed a game that works with this method, called Charbitat (Nitsche, 2008, p. 168)[image 58]. To make the world even more interesting, procedural generated worlds could be coupled with handwork by levels designers. In this way, large worlds could be generated quickly adjusted and complemented by level artists making it generative, unique and interesting. An example of a modern game that used both procedural and handcrafted world is Bioshock Infinite [image 59].

Contemporary games make more and more use of procedurally generated worlds and Hosking supports this trend (Hosking, 2013). In her opinion article she pleas for less focus on beautifully hand crafted worlds which are too much like film and more focus on procedural generation of worlds. Games should be less cinematic experiences with a linear narrative, but more a playful experience in which players can explore the boundaries of the game. This is much closer to the nature of play and makes video games a unique medium compared to film. And now that computers are increasingly powerful they can even generate fully three dimensional worlds, as the promising upcoming game No Man's Sky can prove [image 60].

The previously mentioned Minecraft (paragraph 4.6) is the most renowned game with procedural generation of game worlds. Besides adding gameplay elements like survival, hunger and creation, the world itself is created using certain patterns. These patterns include geological elements, like rivers and caves, biological elements like trees and more culturized elements like small towns. Without these patterns, the worlds of minecraft would have been too random and not interesting to explore or transform.

To conclude this paragraph modular and procedural design could be stated as a wide method, not yet being used to its full potential in level design. Theoretical and practical examples and researches show that it is beneficial however and that it could be used more to support new ways of play and design.

image 58 - Charbitat, Georgia Tech 2006

image 59 - Bioshock Infinite, Irrational Games 2013

image 60 - No Man's Sky, Hello Games (TBA)

7.5 Wayfinding

In open game spaces where players can walk around freely, some navigational tools are needed to steer the players to a certain direction. Navigation in three dimensional game spaces has many similarities with the wayfinding of physical space. It has some distinct differences however, some of which are quite an advantage for the digital realm.

Navigation tools

One of these advantages is the use of discrete navigational tools (Nerurkar, 2009). These tools are part of the interface of a game ad are often disconnected from the game world itself. One example of a discrete tool is the map, which could be shown in a corner on the screen like in Grand Theft Auto [image 61] or by going to the menu of a game. A more immersed example of the map is the one of Far Cry 2, where the character pulls op a paper map of the world [image 62]. Another example is the marker, which is often a symbol or text which is floating above a character or object in the game world to show that interaction is possible, its properties or its identity [image 63]. Markers could also be floating arrows or other symbols that point players in a certain direction. There is also the compass, a simple element on the player Heads-Up-Display (HUD). This compass moves with the direction the players looks at and shows markers and goals which are somewhere in that direction [image 64]. A last and quite unique discrete wayfinding tool is one implemented in the online game Dark Souls, where players can leave messages on the floor of the game world which can give tips or directions for other players. Often game designers choose for a minimalistic use and appearance of discrete tools, because if they are too big and distracting they can easily break immersion of the game.

To really not break immersion, Nerurkar also discerns immersed navigation tools (Nerurkar, 2009). These are part of the game environment and therefore the responsibility of the level designer instead of the game designer. The first immersive navigation tool is one that is called ‘attract’. The idea behind this tool is that players are lured to a certain area by making it look important. This could be done by making sharp contrast (for example in color and lighting), composition of shapes (pointing elements), weenies (attracting landmarks) and motion (attracts attention) [image 65 and 66]. Characters in a game world can also point out directions or objects of interest with the goal of wayfinding. Lastly, by carefully placing items and pickups players can also be pointed in the right direction. These techniques are also perfectly applicable to the physical world, but games can also make use of cut scenes (small in-game videos) to make players aware of directions.

The second immersive navigational tool is ‘identify’. Using landmarks and style, players know where they are and remember these traits of an area when they need to return there. The third and last tool is the guides, which could be literal text signs or visual lines on walls and floors. Schell gives an example of a game with a large open space, where players are lead to a certain point by using decorative lines on the floor (Schell, 2008, p. 290). This last tool borders on the discrete, because if this is used too often and too obvious, it can also break immersion (except when the game is about signs).

Making wayfinding an even more immersed and meaningful element in a game is done by making it part of the gameplay or story of the game. The game Shadow of the Colossus does this by giving the main character a sword that emits a beam of light to the next enemy when it is pointed upwards [image 67]. In the Assassins Creed series the character has to climb towers to

get a high viewpoint and make parts of the map visible [image 68]. If wayfinding is mixed with the context of the game, they become more natural and people can find their way more spontaneous and immersed. However, Fillion states that for wayfinding, form should always follow function (Fillion, 2012). *"It doesn't matter how good it looks, if it doesn't work – it doesn't work".*

Nerurkar finally states in his article that in some instances it is not desirable to give navigational tools to players, because it can be part of the game to find the way, like in a labyrinth level structure (Nerurkar, 2009). It could also be the purpose, for example for narrative reasons, to confuse players by making them lost or surprise them with unknown routes. Nitsche also states this: *"Distortions, surprises and disorientation when 'losing one's way' (...) can enhance immersion and drama in a game."* (Nitsche, 2008, p. 228) An example of a game level that needs to confuse is the blood-trail dream maze in the game Max Payne.

The story map

A cognitive map is the interpretation and understanding of a space by a person. Next to the cognitive map players have of game spaces Nitsche states that players also have a story map of the same space (Nitsche, 2008, p. 227). The story map is based on the cognitive map, combined with the evocative narrative events that happen in the game. Players remember spaces to the experience they had in those spaces, not just by spatial or visual elements. Because games are interactive and always in motion, players attach a lot of value to dramatic elements and their own interactions. They therefore refer often to events and not to spatial elements when finding their way. Because of that, the story map is a very important tool for wayfinding in games. Designers have to keep track of all possible events and interactions and can weave an understandable experience based on both the cognitive and the story map of game space. The strongest elements would be spatial elements which are linked to goals or events; those are based on both the story and the space. Examples of these kinds of spaces could be a safe haven or a feared obstacle. The story map is closely linked to environmental storytelling (paragraph 1.6), because narrative objects and events that are embedded in the environment are responsible for the player's creation of the story map.

Finishing up, this paragraph listed all types of navigational tools that games designers can use, but also notes that not all levels need perfect wayfinding. Interpretation of game spaces is based on both cognitive and story maps, instead of just the cognitive map of a space.

image 61 - a discrete map in Grand Theft Auto 3, Rockstar Games 2001

image 63 - marker over a person in World of Warcraft, Blizzard 2004

image 62 - more immersed map presentation in Far Cry 2, Ubisoft 2008

image 64 - compass in the game Call of Duty 4: Modern Warfare, Infinity Ward 2007

image 65 - clear use of color contrast to show route in Mirror's Edge, EA Digital Illusions CE 2008

image 66 - immersed lighting contrast in Left 4 Dead, Valve 2008

image 67 - lightbeam sword showing the way in Shadow of the Colossus, Team Ico 2005

image 68 - Climbing to the top of a tower provides overview of Florence in Assassin's Creed 2, Ubisoft 2009

7.6 Emergence

Tools for wayfinding in games are just to guide players, but environmental elements can also inspire players to try new things and create their own gameplay. This paragraph is about those elements and their potential for emergence. *"Game worlds are the possibility spaces of games."* (Sweetser, 2008, p. 169) The space, objects, physics and effects constrain and dictate the possibilities for actions and interactions that compose the gameplay.

The game world can be a source for emergent play if it is active (Sweetser, 2008, p. 170). An active game world has objects that communicate with each other, that have awareness, an ability to change and certain start properties. If changes by the player or the active environment change the properties of the object, it must react realistic and relevant to its context. In this way the world adapts to unpredicted behavior and new kinds of play and situations emerge. Realistic effects like physics, fluid flow, fire spreading and pressure are examples of active environmental systems that could be applied to all objects. These systems are based on mathematical models implemented in lines of code that are at the base of the game engine. The Havok physics engine of Half-life 2 is an example of an environmental system and it allows for many possibilities of play.

A game that has many of these systems but also offer a different kind of environmental freedom is Far Cry 3. According to Stuart, this is game plays so well because its freedom is introvert (Stuart, 2013). This means that the game is an open world system that does not enforce any gameplay on the player, as opposed to many other extravert open world games, like Grand Theft Auto. Those games place missions, characters and interaction right under your nose while Far Cry 3 really makes those options optional. If you choose to ride around the tropical island of that game, you can do that uninterruptedly [image 69]. The clever system that keeps this game fun to play is that every activity in this game oftimes leads to the start of another activity, which is also interesting to undertake. Of course, you can choose to do something else completely, but the temptation of doing that next activity is great, precisely because it is not forced upon you so clearly. This kind of playground structure is a leap forward in open-world game design and is similar to Benford's theory of transitions (paragraph 1.6) (Benford, 2011).

A last topic of game worlds and emergence that is worth noting is the emergence of culture and behavior in game spaces. According to Nitsche, within our society a large online gaming culture has arisen, because of the many social connections people are able to make within games (Nitsche, 2008, p. 233). Virtual worlds offer more than just oral or textual communication, they let people share events and stories and create socio-spatial behavior that is both copied from the real world and completely new. People take over the game world together and use it as they see fit, for their own social purposes. This fact strengthens the theory that game spaces are actually real spaces, as stated in the beginning of this chapter.

This paragraph shortly addressed the notion of an active game space and introvert freedom of play. It also states that emergence takes place on a larger scale, where social behavior arises in larger groups of players.

Designing spaces is a central part of architectural design and therefore the next chapter will only address spaces and architectural elements that are related to play.

image 69 - riding around in the introvert open world of Far Cry 3, Ubisoft 2012

8. Level Design and Architecture

Virtual spaces need to be designed well to create interesting games, the physical world however has a much longer tradition of space design. This chapter will start with two paragraphs that describe the effect virtuality and virtual games can have on physical architecture and design process: alternate reality and pervasive games, and architectural visualizations. The architectural design process is shortly mentioned in the architectural visualizations paragraph. After that, the topics of the previous chapter (modularity, wayfinding and emergent structures) will be shortly projected on the writings of architecture. The topics could all be profound research theses on their own, but in the coming chapter only some of the most relevant writings and examples concerning these topics will be mentioned and shortly elaborated. The purpose of this is that by doing this, these topics (concerning games) are put into the existing architectural context and could thus be compared in the following synthesis chapter.

8.1 Alternate reality and pervasive games

There are several steps in which games invade reality, according to the writers of Space Time Play: reality based games, technological approaches to real world play, ubiquitous games, alternate reality games, pervasive games and a more theoretical step where games blend even more with the physical space.

1. The first step is *reality-based games*, a theory that projects the popularity of virtual game elements on the real world, not necessary involving technology (Von Borries, et al., 2007, p. 186). Live-action Role Playing (LARPing) is the physical version of Role Playing Games, where players play dress-up and enact a story, most often in a fantasy setting. Derived from such gaming is the group game Mafia (better known as Weerwolven), where people discuss who is the killer based on trust and deceit. Other examples are paintball, the real version of shooting games and also the Wii, a console where the controls are much more physical than just pressing a button.
2. The second step is when *technology is the driving factor* for play in the physical world. A popular example of this is the game of Geocaching, where people find treasure using GPS systems (Von Borries, et al., 2007, p. 222). Other examples are acoustic adventures and guides through cities and museums, such as the Nintendo 3ds guide to the Louvre Museum [image 70].
3. The third step is called *ubiquitous gaming*, which are games that are structured around spatial elements of a real place. McGonigal gives the example of the game Tombstone Hold'em, where tombstones on a

image 70 - Audioguide Louvre-Nintendo

cemetery are equivalent to playing cards (the shape and date of death represent the card's value) (Von Borries, et al., 2007, p. 234) [image 71]

4. *Alternate reality games* are the next step (Von Borries, et al., 2007, p. 238). These are massive multiplayer, trans media games that are played by many people all over the globe, oftimes to reveal information or a story. These games give away clues and people have to collaborate to find all of them, sometimes in virtual, sometimes in physical spaces. An example of this is the game I Love Bees, which was an advertisement for a video game (Von Borries, et al., 2007, p. 242) [image 72].

5. *Pervasive games* are games that combine virtual and physical spaces and that lets people play together using both space types simultaneously (Von Borries, et al., 2007, p. 248). Most of the time this is possible because of mobile devices and GPS, so that the digital game part can keep track of the physical part and the other way around. An example of this is the game PacManhattan, where players play the game of Pacman both on a device and around the city blocks of New York (Von Borries, et al., 2007, p. 262). Another example is Benford's Uncle Roy all around you, a narrative game with actors, where the people on computers have to guide the people that are running around in a real city. This game makes use of Benford's theory of trajectories (paragraph 1.6). The previously mentioned games like Epic Win (paragraph 4.3) and the running game Zombies, Run! are also examples of pervasive gaming, but then with a more serious purpose [image 73].

6.Lastly, the *blending of virtual and physical worlds* can be taken further into the future, when ambient intelligences (paragraph 5.3) and embedded systems make the borders between physical and virtual worlds fade (Von Borries, et al., 2007, p. 332). Architecture and game design both have a role in structuring and ordering both types of spaces and the combination of the two. Play can subsequently be embedded more easily in them to provide fun to people.

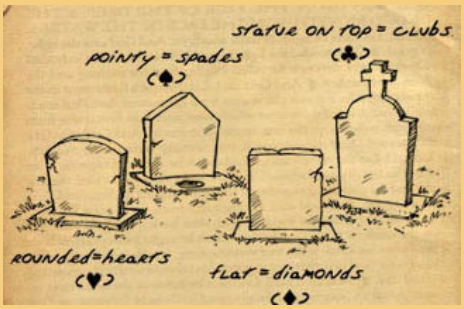


image 71 - Tombstone Hold'em

image 72 - I Love Bees website

image 73 - Zombies Run! phone game

All these types of games show a level of embedding in the real world, where games take an increasing importance for people as a source of entertainment and education. Architecture, next to technological possibilities, serves both types of spaces and is therefore leading in the design of these kinds of games.

8.2 Architectural visualizations

Another topic where virtual and real worlds collide is an important contemporary tool for the architectural design process: architectural visualizations. Most architects and architecture students are able to create their building in three dimensional virtual environments using tools like Sketchup, Maya or the more embedded design system Revit. Many of them even use these modelling programs to actually design their building, because they offer quick and relatively qualitative images. Architectural visualizations are even more qualitative when the models are rendered and photoshopped afterwards, giving them a level of detail and drama even real life sometimes lacks.

Going a step further is when these architectural models are implemented in game engines, to be able to present the building whilst walking around in it like in a first-person video game. *"The virtual world can also help architecture by providing a virtual promenade."* (Nitsche, 2008, p. 76). By showing the architectural design to future inhabitants in an interactive digital world, they are able to experience the environment and the journey before it is built. This technique is a solution for the passiveness in contemporary architectural presentations and gives people a sense of presence in a design that is not yet built. As virtual environments can be more sophisticated, more and more people use virtual environments for presentation, reconstruction and understanding of architecture (Shiratuddin & Thabet, 2002) (Richens & Trinder, 1999).

8.3 Modular architecture

"(...) architectural space comes to life through the way it is used, and specific structures can help particular patterns evolve."(Nitsche, 2008, p. 160) If the goal of architecture is the meaningful usage of space, you should understand and use design models that are based on patterns of use, according to Alexander (Alexander, et al., 1977). By providing these patterns Alexander hopes that similar problems in architecture can be solved easier, using previously proven architecture modules. He projects 253 patterns on all scales of architecture; from urban to interior.

Ching discerns and defines more visual elements like basic shapes and routing elements of architecture in his book (Ching, 2007). Using visual classifications, he shows examples of buildings that solve or propose a solution to geometrical and functional problems in architecture. He also establishes ordering principles for these visual elements, based on axes, symmetry, hierarchy, rhythm, datum and transformation [image 74].

Finally, the use of modules is a huge advantage for computational architecture, like parametrical design (paragraph 5.3). When designing a building or structural element using smaller modules, these can be placed along a mathematical formula giving shape to more fluid and blob architecture.

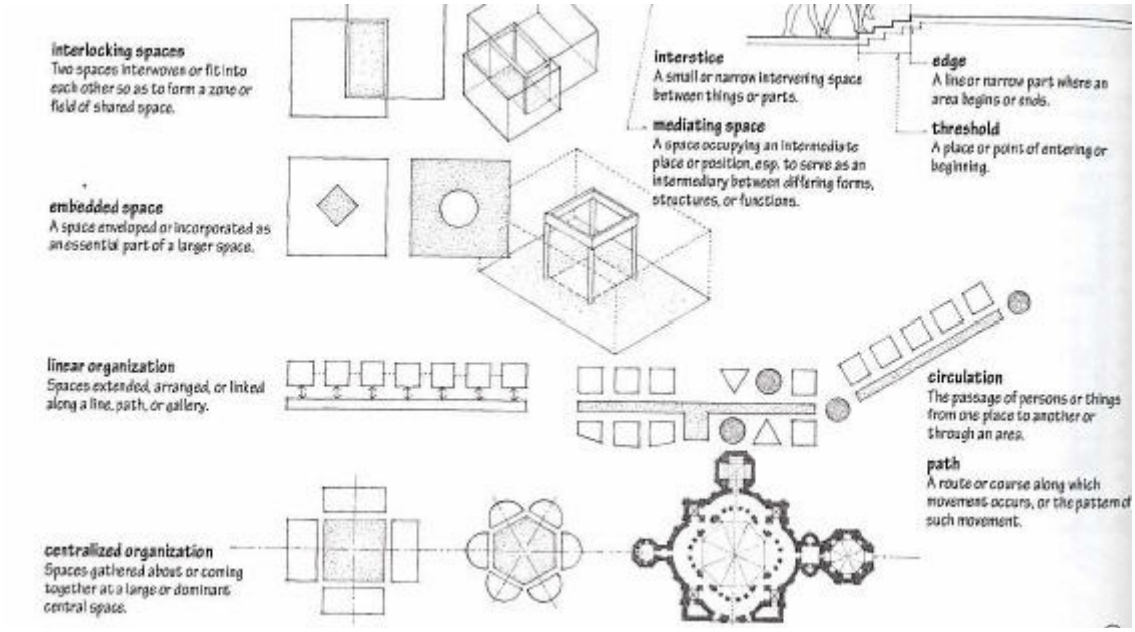


image 74 - architectural principles as drawn by Francis Ching

8.4 Wayfinding

What also links to the understanding of patterns of use but is more at home under the topic of wayfinding, is the work of Kevin Lynch (Lynch, 1960). The image of the city is just like the cognitive map people can have of a space and Lynch extracts five elements that make the understanding of a city possible: paths (streets or visual lines), landmarks (monuments or historic sites), edges (rivers or sea shores), nodes (crossings) and districts (suburbs based on identity) [image 75]. If the workings and meanings of objects in a city are understood and designed effectively, not only will the city be more efficient in use and wayfinding, it will also support the creation of dramatic memories (paragraph 2.3). As opposed to understanding cities and spaces, Lynch also sees the benefit of the unknown, because exploration of unknown spaces can provide joy if there is no danger and the structure can be apprehended in time (Lynch, 1960, p. 5).

Folz gives a more practical list of principles for effective wayfinding that is based on the elements of Lynch (Folz, 1998):

1. Create an identity at each location
2. Use landmarks to provide orientation cues
3. Use well-structured paths
4. Create regions of differing character
5. Don't give the user too many choices in navigation
6. Use survey views (like a map or a vista)
7. Provide signs at decision points and
8. Use sight lines to show what's ahead.

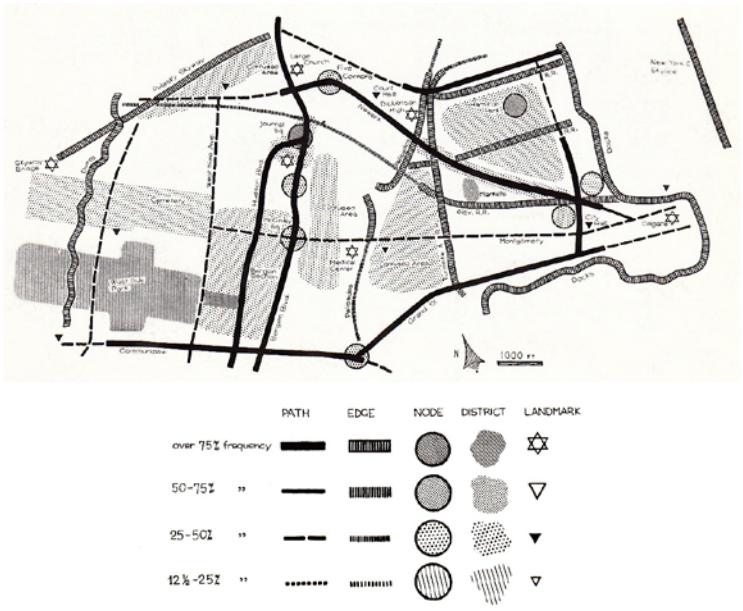


image 75 - analysis of a city by Lynch, based on the five elements

Finally, Passini wrote that for effective wayfinding buildings, buildings should not be dumbed down to simplistic structures with constraints, but should be well articulated spaces with wayfinding criteria that are incentives to innovative design solutions (Passini, 1996, p. 321). Places should however also not be cluttered with sigs or signals to point people the right way, because this will lead to an overload of information and confusion of the receiver (Mollerup, 2005). It is all about the balance of wayfinding elements and that those elements are bound to the meaning of the building and the users of that building (Trompert, 2012, p. 75). Besides that, a little challenge to find the way in a building will stimulate the wayfinding capabilities of a person.

8.5 Emergent architecture

This paragraph was difficult to differentiate from the paragraph on emergent architecture from the previous part (paragraph 5.5), because it also concerns architecture as a system. The coming examples, the Fun Palace, Alexander's patterns and Hertzberger's affordances, are however more practical and less theoretical and are thus included in this part.

The first example is the one of the Fun Palace, by Cedric Price (Mathews, 2006). Based on Situationists' theories like Nieuwenhuys' plea for a dynamic city (paragraph 5.5), Price designed a structure for downtown London in the early sixties that is best described as socially interactive architecture (Mathews, 2006, p. 39). The trends on cybernetics, information technology, game theory, Situationism and theater are the foundation for Price's idea of a dynamic architecture for everyone. A place of fun, freedom, informality, creativity and education, the structure of the fun palace is not much more than a large scaffolding which could support many different structures that could be placed and removed by the users at will, using an implemented crane [image 76]. It was to be a 'university of the streets' where people could learn languages, watch or make films, learn to cook, play games or simply watch everyone else, all in line with the sixties trends of emancipation and socialness. It was to be a theater where the guests where the players and

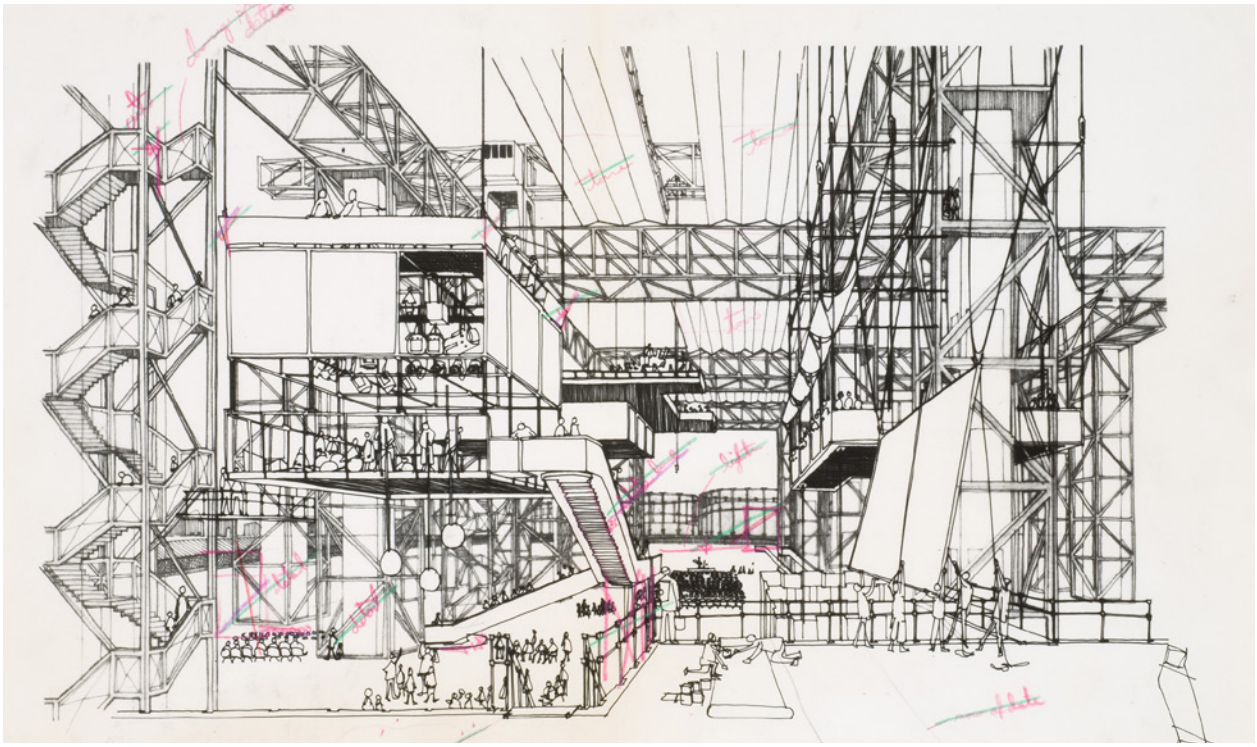


image 76 - drawing of the Fun Palace by Cedric Price

could change the decor to their likings. Focusing on the playfulness and the changing desires of people, it was a systematic construction that would last because of its adaptability to societal change. Based on Heidegger's assumptions that architecture is more a site of human activity than a static enclosure of space Price stated that *"(...) the architect must take care to understand the difference between spaces and events (...)"*(Mathews, 2006, p. 42). Price also took inspiration in the adaptability of evolving computer programs and object oriented code, which are digital versions of his fun palace structure and would also be a supporting technology for final design. Together with programmers, Price even developed a system that could learn from the use and building trends of people and anticipate and adapt the form of the structure to people's requirements. The architect actually came pretty far in realizing this improvisational architectural feat, but was halted by city servants in the late sixties. However, his plans served as an inspiration to Archigram and the Centre Pompidou in Paris. Price also got to build an Interaction Centre which was based on his ideas of the Fun Palace in 1976, but was demolished in 2003 [image 77].

image 77 - Interaction Centre, Cedric Price 1976, Kentish Town

Another architectural feat that supports emergence is some of the previously mentioned patterns by Alexander (paragraph 5.5) (Alexander, et al., 1977). Some of Alexander's patterns are namely based on multiple ways of using an object, like the patterns of the sheltering roof, the stair seats, the low sill and the sitting walls. The walls, roofs and stairs in these patterns are open for different kinds of use, for the people to discover and use at will. Psychologists call this feat of an object to support multiple activities affordance (Withagen, et al., 2012). They even claim that if designed right, an environmental object with many different affordances can invite certain behavior. Architectural elements can send visual invitations to people that can decide to act upon those invitations and use that element for multiple purposes. Hertzberger also describes this phenomenon of affordance, by stating that architectural elements should be flexible and offer multiple ways of use (Hertzberger, 2005, p. 177). Architects should not design objects to be rigid and support one function only, but should be more neutral and invite people to use their creativity. An example of such a neutral place is embedded in one Hertzberger's own designs; a plinth in his (demolished) Vredenburg Music hall that could also be used as a sitting place or a place to put some stuff on [image 78]. Affordances are even more easily sought out by children, or by people with a playful nature and purpose in the city, like people who do Free Running or Parkour in an urban environment (Von Borries, et al., 2007, p. 280). This links affordance directly to play.

This chapter showed some existing architectural examples that relate to the themes of chapter 7, being modular design, wayfinding and emergent architecture. Next to the invasion of games in the real world and architectural visualizations, these themes are quite different in character. However, they are all about the use, design and experience of space in combination with play, so they will be of use in the next chapter; the synthesis.

image 78 - sitting windowsill in Vredenburg Theatre, Herman Hertzberger 1979, Utrecht

9. Synthesis

In this last chapter I will summarize chapters 7 and 8, compare them and distill the most apparent architectural possibilities from video games; similarly to the previous parts. This part does not only focus on architecture as a product, or as the activity that takes place in architecture, but also on the architectural design process.

9.1 Summary

Level Design and Games

Virtual space has a lot in common with real space, based on matters of spatiality, activity, memories and identity. Spatial structures in games are classifiable in tracks and rails, labyrinths, arenas, sandboxes and gardens. Collision points are points where amounts of players and activities are highest in a level, most often in an arena structured level.

The level design process often starts by a frame of reference offered by the narrative and gameplay schematics that are the core of the game. Level designs are designed in certain stages of detail in diagrams, ending in the construction itself in a modelling program. An important feature of a level design is the interactive elements and events, because those are just as important as spatiality and connections. This is because those elements are very important to the experience and are vital for gameplay and storytelling. Furthermore, level design also includes the placement of lighting, sound and camera's and is very important for the eventual game flow.

Playtesting is the act of testing games in order to find bugs, testing functionality but first and foremost whether the game is fun. Playtesting should already be done in the early stages of design because the resulting feedback is very important for designers to balance the game and level design. Results of playtesting often also lead to emergent gameplay situations, which should be nurtured and enhanced by the designers.

Level design benefits greatly from precreated modules and patterns, combining them with custom shape building. Some games that are about building themselves, offer prefabricated modules to build with as a gameplay mechanic. With every game, the cognitive gameplay patterns coincide with the design patterns and modules the designers put in the game; both in level and in gameplay design. Modularity proves to be difficult to implement in the subjective level design discourse, but some claim that more prescriptive and effective modules will improve design quality and reduce design time spans. Lastly, the modder scenes of games take existing game patterns and modify them by changing the game code. Game designers can support this by adding editors and open-source game structures, thereby enhancing the time people want to play the game.

Many games with less narrative and linear structure support procedural level creation, which makes every spatial experience unique. Games that do have a linear story and scripted events could also be produced procedurally, if the design is split up in mission diagrams and spatial diagrams. Using certain grammars over those diagrams, the levels could be made by a computer but still be more thrilling than a completely random line of events. Procedural level design and

on-the-fly creation is getting more popular due to more efficient computers and effective use of modules. Also, some people plea for procedurality because procedurally generated games are much closer to the notion of play than linear games that are more like cinematic experiences.

To support the wayfinding in virtual worlds, designers have two types of navigational tools at their disposal: discrete and immersive tools. Immersive tools are related to real-world spatial wayfinding and include attracting objects, identifiable surroundings and lines to point people in the right direction. Making wayfinding part of the gameplay or storyline is even more immersed. Discrete tools are limited to virtual worlds and are mostly part of the heads-up-display. These tools are maps, markers and compasses. Next to a cognitive map of the game space, players form a story map in their heads of all the events and interactions that took place. Because of this, designers should combine wayfinding, story and goals using spatial elements and with that make both the experience and the functionality better. For games, it is however not always desirable to make wayfinding perfect; sometimes it is part of the game to get lost or surprise people.

An active game world is based on adapting and communicating objects that behave realistically and give rise to emergent playful situations. The benefit of an introvert open world is that it can be played around with, without feeling constrained, while linking activities using level design. Lastly, not only does behavior on a small scale emerge in games, entire social groups and cultures arise in virtual game worlds.

Level Design and Architecture

There are several steps in which games invade the physical world and play around with architecture, with alternate reality games being the most known. Architectural visualizations are another real world situation that benefits from virtual worlds, especially when those situations are interactive. Modular architecture is a large field within architecture, with examples by Christopher Alexander and Francis Ching being two of the most extensive writings on this subject. Wayfinding in architecture is all about articulation and balance. Finally, emergent architectural systems mentioned are based on free framework structures like the Fun Palace and different kinds of use of architectural elements as described by Alexander's patterns and Hertzberger's affordances.

9.2 Comparison and discussion

When defining virtual space as real space and when knowing the available degrees of embedding the virtual world in the real world, a lot of possibilities can take shape. Virtual worlds make the experience of and fun in our real world different. When designing for games, architecture or a mixture of these two, the elements of those disciplines start to merge and get similar purposes. As real world architecture starts to contain more virtual and digital game worlds, designers of the built environment can learn spatial, dramatic and interactive tactics from game designers, just like game designers already learn a lot from architects.

The design process of architecture and games is both very subjective and bound to personal taste and efficiency. The staticness of real world architecture does not imply that building design products should not be static as well; applying game technics to the experience of unbuilt

buildings make them even a little bit more real. At the moment, architectural presentations in three dimensional game environments still do not give people the sense of presence, because they are not interactive enough (Nitsche, 2008, p. 206). Adding possibility of interaction and event is therefore needed in those three dimensional walkthroughs, because then people will really experience the spaces. Samuel also sees the benefit of this:

"I feel strongly about this at a time when basic skills of design are being eroded by the nascent world of digitally generated images which, despite appearances to the contrary, often avoid real investigation of the tectonic pleasures of route and space. I am not necessarily arguing for a luddite pre-digital world, but for a melding of this territory with that of film theory and game space in which narrative and meaning can be somehow reasserted." (Samuel, 2010, p. 29)

This does not only work for presentations, but for architecture itself too: level designers focus a lot on events, interactivity and the actual use of the space than most architects do. This is because games need to be constantly engaging and need to stay interesting. The connections of spaces should be combined with the connection of events and activities, just like introvert emergent games do. The analysis on cognitive maps and story maps afterwards is just as important as the design attitude beforehand, because architects will make more engaging spaces if they focus on the activity possibilities of a space.

Apart from presentation tools the architectural design process can learn something from the phenomenon of playtesting. If it is possible to give testers a clear role and purpose, they could test buildings on many different levels. Of course, most buildings do not need to be fun, or do not need to convey a specific experience at all, but playtesting is also focused on functionality like wayfinding and spotting mistakes. By putting an architectural design in a game engine and letting people walk through them and interact with them, the visual and functional experience could be adjusted to real feedback and not just to the experience and knowledge of the designers. Going a step further, playtesting could even be implemented in the system of Building Information Modelling (BIM). This system is an integrated building model that can be adapted by different specialists that work on an architectural design, by making use of a single digital building model that can be imported by different design programs. It is not unthinkable that playtesting could easily be inserted within this integral model, thereby proving that structures and designs work and climate systems are not in the way all during the process of design. This makes for better balanced buildings and more satisfied inhabitants. It would be a matter of constructing a working game and feedback environment in a Building Information Model. The concept of architectural playtesting definitely needs to be tested in a case study before showing real results. It is also important to note that many qualities of a real building, like temperature, touch and ambience are difficult if not impossible to portray in a digital environment still.

On the topic of modularity, it is almost certain that game design can still learn more from architecture than the other way around. This is especially the case for patterns of use, like the patterns of Alexander. Architecture is based on physical materials and structural elements and games are based on object oriented code. The advantage of game modules over architecture is that they are much quicker to adapt, because of their non-physical nature; this explains the popular modding community and quick rise of complex situations in the virtual world (as opposed to the millennia of evolving architecture in the real world). Next to that, game worlds are not bound to rules of gravity and can therefore explore architectural situations that border

the abstract. Because of the freedom to physical rules, games have the potential to include modularity in the patterns of play: they are dynamic structures that can be changed by the designers while it is used by the target group. Playing around with modules by the players themselves is also easier, giving games an edge over currently existing dynamic spaces. Interactions and the ability to change the environment is something people are naturally good at and games provide the possibilities to play around with modules and design the space as they see fit. This dynamic spatiality is something real world architecture can learn from games, but only if the right tools and technologies are existing and made practical. But not just advanced computing techniques could be used to create dynamic spaces, the example of exchanging follies of the previous part (paragraph 5.2), changeable interiors, flexible workspaces and affordances of objects could also be at the base of a more dynamic and creative space. These modules could be part of the architect´s tool set and will enhance the experience and functionality of many different spaces. It could also lead to more user generated architecture, where people can change the environment to fit their needs.

Procedural architecture is even more difficult in real-life, because moving architecture takes constructions more in the realm of mechanical engineering. Movable parts have not proven to be very effective in a building that is built to last and at the moment are only realized in the shape of doors, blinds and curtains. However, with new, Computer Aided Manufacturing technologies, these things could change. The production of similar building blocks that can adapt their position or shape to change the physical environment or its climate are in a rise (see Hyperbody, paragraph 5.3). At the moment, building tools remain more conservative however, so real procedurality is difficult to put in to architecture right now. Yet, procedurality can still be used to aid the architectural design process, if it is combined with human work. At the moment, the designers of games have one small step ahead on this method, due to the playfulness of randomness and procedurality. If procedurality combined with modules and patterns like in Minecraft, it might be able to generate a functional and aesthetically pleasing architecture. Also, the combination with playful, interactive and dynamic spaces could more easily be made. That is something of the not-so-near future however, due to the current state of physical technology and materials.

Wayfinding in games is much like wayfinding in real architecture if it is compared to immersive tools. Tools like contrast, lighting, lines, color and even mere signs are used in both games and architecture and work quite similarly. Games really have an edge if it comes to discrete navigational tools on the other hand: always being able to see a map or a marker is not yet really possible in the physical world (but it might be in the near future if you observe technology like Google Glass). Wayfinding in a dramatic place is however not always needed or desired, which might also be true for real life hedge labyrinths, but not so much for theaters or attractions that still contain (immersion breaking?) exit signs. Wayfinding is always based on attraction, direction and identity and is both in games as in architecture best linked to the meaning of the context: when the wayfinding is intertwined in the use and experience, it goes more natural.

A comment of importance here, that does give a significant difference in wayfinding for the two disciplines, is one by Arne Bezuijen (see interview appendix B.1). He states that wayfinding in games has a very different nature than that of real life if it is compared to exploration. He supports this with an example: in a video game, if you are at a crossing and you know which route will actually lead to your ultimate goal; most players will actually take the other route first.

This is because players have learned this pattern and know that the other route is very probably a dead end containing a certain bonus. Once players have obtained this bonus, they return to the crossing and the route to their goal. This teaches that wayfinding in games could actually have an opposite effect. Comparing this with real life architecture teaches that game environments are still very limited: real life has a lot less dead ends, all roads lead somewhere and it is impossible to follow them all to a certain bonus. Buildings are limited however and could reward people that venture of the clear path in a building by showing for example a vista. Rewarding exploration and straying off the path is the actual opposite of wayfinding, but it could make a building more exiting and more appreciated.

Comparing real and virtual emergence based on systems is already done in the previous comparison, paragraph 6.2. New in this part is the notion of introvert open spaces that are at the core of some games and could be recognized in the Fun Palace of Price. Even more important could be the concept of affordance, where many architects and psychologists wrote about, but is also mentioned by a game designer. There is always a limit to the things people and players can do in an emergent game space, so “(...) you want to design a space such that it encourages [people] towards the things you can actually offer.” (Von Borries, et al., 2007, p. 402) Both architecture and games are limited by technology and designers should therefore think of more ways of using certain objects and encourage people to use objects and spaces in the possible ways. This encouragement is visible in elements of immersive wayfinding in games and in the linking of activities in introvert open spaces. These tools originate in the field of games and architectural design could benefit from them as well.

9.3 Possibilities for Architecture

Having described the incentives for many possibilities for architecture in the previous paragraph already, this paragraph will only contain a summarized list of them. The conclusions are condensed in to four possibilities that convey the most important elements. Level design as a process and product can serve for the following possibilities:

1. Design on activity and event possibilities

Making possibilities for activities and events in spaces will make for more engaging and people-focused places. Linking the activities can also help to make open spaces more functional by improving flow and engagement. Interactive environments give people a better sense of presence.

image 79 - designing events and activities next to desiging the space

2. Playtest architecture

Using virtual game worlds to playtest architecture can improve the design process and the eventual design itself. Giving testers clear roles could lead to effective feedback on building functionality and experience early in de the design process. Also, making interactive architectural presentations could lead for a better sense of presence and understanding of designs.

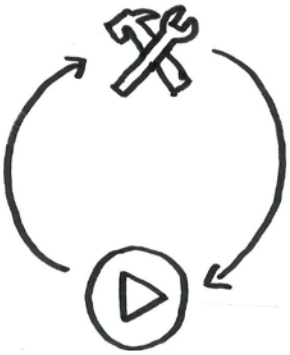


image 80 - testing the building in a game environment whilst designing

3. Create encouraging, flexible and modifiable structures

By using affordance and changeable structures, and by encouraging people to use and change those structures, the spaces where people live in will become better suited for their purpose and people will become more satisfied.

image 81 - emergent behavior inspired by the building

4. Reward exploration and straying off the path

As opposed to a clear wayfinding, designers of buildings could reward people that do not take the obvious route. Exploration could be a goal on itself and people to explore the possibilities of a space should be rewarded with vistas, shortcuts or other possibilities.

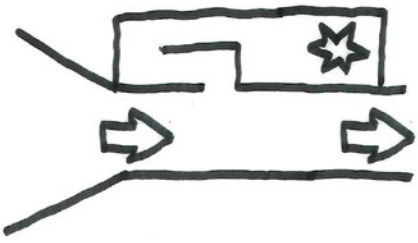


image 82 - rewarding exploration

Conclusion and recommendations

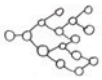
The all-encompassing nature of this thesis naturally leads to a large amount of conclusions. These conclusions at the end of each part, made in the synthesis chapters, serve as answers to the research question that is given in the introduction. The aim of this last part is to combine conclusions that are similar, or at least have overlap, and formulate a simple, concrete and manageable list of elements. First, the research question and goal is shortly repeated. After that, the final list of elements is shown in a table. Then, an elaboration is given of the combinations that were made to fill the table. Finally, some limitations and recommendations for future research are given.

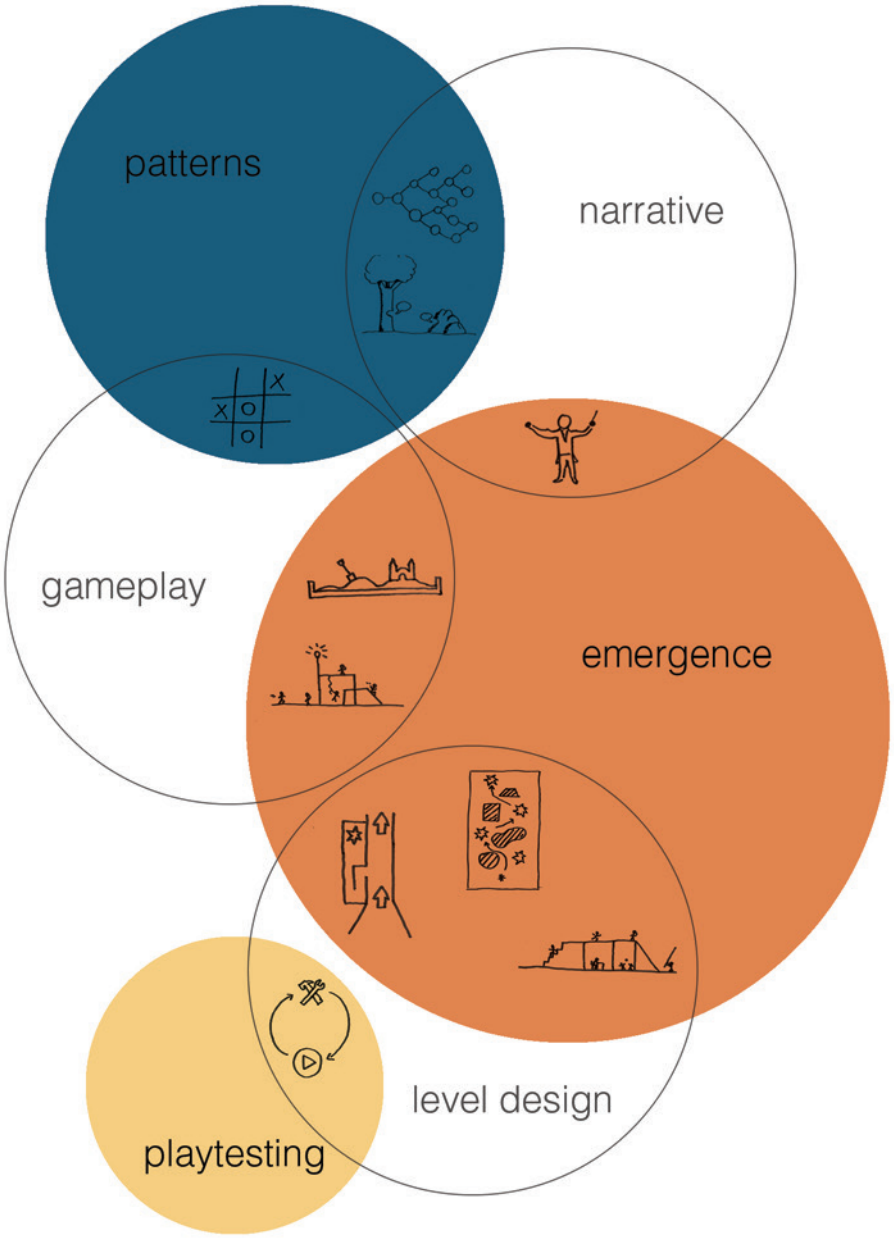
Research question

How do story-driven, ludic and environmental elements operate in video games and how could those elements be applied in architectural design?

This study results in a list of recommendations for architecture by comparing the main methods of game design with architecture. The list can be found in table 4 and includes combinations of the elements found in the parts of this thesis, concerning narrative, gameplay and level design. In the table, the elements and techniques are aligned and some practical examples are included.

The list

	explanation	elements	element logos	techniques	example
Patterns	techniques to improve precreated experiences; focused on storytelling, learning and coupling motivations with the function of a building	interactive story structures		branching pathways	multi-linear promenades
		environmental storytelling		embedded stories	objects that tell history or function links
		patterns and flow		engaging patterns	surprises and learning patterns
				designing flow	unobstructed paths and use
				focus on experience and relevant use	relate paths to target group
Emergence	designing a playful framework system and flexible spaces that offer creative use and emerging situations	emergent storytelling		creating structure by adding story	let people plan out their path beforehand by showing the functions and paths
				transitions	offer clear visual orientation and goals
		sandbox contents		flexible frameworks	a truss and plates construction
				encourage people to be creative with their environment	provide stimulating feedback to interactions
		design possibilities		event and activity possibilities	festival or market areas, interactive mechanisms
		design affordance and flexibility		flexible architectural objects and furniture	sittable windowsills
		dynamic space activators		changeable and interactive spatial follies	active and temporary installations that encourage to interact
		rewarding exploration		reward straying off the path with unexpected designs	vistas, shortcuts or calm workspaces in not apparent places in a building
Playtesting	testing architectural designs in virtual game spaces	playtesting		sessions of play in three dimensional game models of a bulding, resulting in practical feedback for design	modeling building in Unreal Development Kit and letting people 'play' the building


patterns
narrative
gameplay
emergence
level design
playtesting

Elaboration

The problem of precreated experience versus free play structures that is stated in the first part also recurs in the other parts. It is therefore a core to the creation of game experiences and is transferable to the field of architecture by using the same techniques. It is because of that, that these two are the first on the list of game elements that are applicable in architecture.

The first one, called *patterns*, is a combination of the perspectives of interactive story structures, environmental storytelling and the design on patterns and flow. It helps in creating more predefined experiences and types of use. They are focused on surprise, flow, learning, engagement and creating the ideal structure for the target group.

The topic of emergence was split up in the three parts of this thesis, to be able to explain the topic according to the themes of narrative, gameplay and level design. It is however pasted back together in the second element: *emergence*. It encompasses the perspectives of emergent storytelling, sandbox contexts, design for possibilities, design for affordance and flexibility, dynamic space activators and rewarding exploration. These elements are combined in to one because they all convey the same message: explore and create your own environment using a framework that supports and encourages change. Tools from emergent storytelling can help in fixating and controlling these environments. Sandbox contexts describe the design of an architectural system of elements that allows for flexible space. Possibilities of use convey the message that spaces should be able for different kinds of use and activity and encourage that. This last one has overlap with the encouraging, flexible and modifiable structures, because they both plea for flexibility and dynamic structures. Creating dynamic space activators originates both out of dynamic game elements and the phenomenon of follies and installations and will activate spaces by attracting people by being temporary, interactive and adaptable. The last one, rewarding exploration and straying off the path, also pleas for more freedom and playing around with environments.

The third element does not fit within the elements of precreated patterns and the freedom of emergence, because it focuses more on the design process: *playtesting*. Using a game engine to test the qualities of a space will lead to useful feedback for designers on themes like wayfinding, aesthetics, experience and spatial functionality. By adding gameplay systems such as goals and rewards people are even more stimulated to test the surroundings to their purpose, but this could also be done by giving people tasks beforehand. Feedback of architectural playtesting sessions could lead to significant changes in the design that could be very beneficial for the eventual design; all without having to build the structure in real life first.

A missing element in the table is *gamification*. It is difficult to apply gamification using architectural means, because it is more effective to use technologies such as smartphones, touchscreens and other computer-based machinations to give people feedback and rewards. It could be used in buildings, but is thus not very applicable to architectural design and is therefore left out of the final list of elements.

Limitations and recommendations

The scope and different goals of the disciplines of architecture and games are limitations to this research and more research is recommended in designing with game elements as working methods.

The first and foremost limitation of this research has been the enormous scope. By studying practically every element of game design, the results remain on the surface and it was not possible to study some aspects more in-depth. The list of the previous paragraph could serve for future research that dives in to details. This could lead that some elements are better applicable than others and some might be more impactful on architecture than predicted here. The different goals of architecture and games also make for a difficult comparison: games are primarily focused on the fun and the experience, while architecture is more often focused on functionality and fitting in the context. This vital difference needs to be kept in mind while using the elements for architectural design.

Patterns could be researched more in full if spaces would be designed and tested based on the elements flow, interaction, reaction, engagement, surprise and learning curve. For emergent systems testing spaces should also be made, and in this they should really be physical instead of virtual. This is because physical limitations and construction offers fewer possibilities than the virtual world and to get a working flexible and modifiable system a simple but effective structure and materials should be designed. Activators have already proven in some cities to be working, but to strengthen the statement given here, tests with amounts of people could be held to see if they really activate a space and how long this effect lasts. Playtesting is a matter that should be researched as well to see if design choices are made more easily, or if those choices are already made by architects based on experience.

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Image References

	description	source type	location	date acces
image 1	maslows pyramid for games	book	Beginning Game Level Design, Feil & Scattergood	
image 2	scoring goal magic circle	self	Fundamentals of Game Design, Rollings and Adams	
image 3	linear story scheme	book	Character Development and Storytelling for Games, Sheldon	
image 4	string of pearls	book	The Art of Game Design, Jesse Schell	
image 5	branching story scheme	self	Fundamentals of Game Design, Rollings and Adams	
image 6	web story scheme	self	Fundamentals of Game Design, Rollings and Adams	
image 7	modular story scheme	self	Fundamentals of Game Design, Rollings and Adams	
image 8	the sims image	internet	http://www.the-sims-4.com/the-sims-4-expectations-and-predictions/	11-1-2014
image 9	cake is a lie	internet	http://www.funnyjunk.com/funny_pictures/4566498/Stupidity/79	11-1-2014
image 10	rollercoaster tycoon	internet	http://www.holarse-linuxgaming.de/node/1177/revisions/5250/view	11-1-2014
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image 12	GTA image	internet	http://www.residententertainment.com/watch-grand-theft-auto-v-official-gameplay-video/	11-1-2014
image 13	hebbian story scheme	book	Emergence in Games, Sweetser	
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image 23	interaction patterns	book	Game Design Workshop, Fullerton	
image 24	magic cycle	book	The Magic Cylce, Arsenault and Perron	
image 25	tennis field (boundaries)	internet	http://maldivy.ru/images/hotels/huvahendhoo/huvahendhoo24%20x.JPG	11-1-2014
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Gameography

Age of Empires series, Ensemble studios
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Bioshock Infinite, Irrational Games
Call of Duty series, Infinity Ward
Cell Slider, Zooniverse
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TeamUp, The Barn
Tetris, Alexey Pajitnov
The Sims, Maxis/Electronic Arts
Unreal Development Kit, Epic Games
World of Warcraft, Blizzard
Zombies, Run!, Six to Start

Appendices

A. Game Tower Workshop

On November 13th I organized a workshop with the same theme as my graduation: architecture and video games. Together with Rémy van den Wijngaart, who is a Bachelor in game design, we gave several lectures and assignments to the eleven participants. In this workshop review I will first describe the workshop, then I will give the results of the assignment (and the principles behind them) and after that I will shortly reflect on the whole process and execution.

Workshop description

The Game Tower workshop was conceived with the purpose of enrichment of my graduation research, to see if others could come up with new game and architecture designs and give others the chance to learn and think about both themes. Because of my choice of the Overhoeks tower in Amsterdam as the design part of my graduation I wanted to give the workshop participants the same setting, but on a smaller scale. Because the workshop would take place on the faculty of architecture in Delft it seemed logic to take the (also empty) tower of this faculty as the subject of a redesign assignment. The workshop was set up in three assignments, each building on the previous one and the last one being the redesign of the tower.

My workshop was split in three parts, according to the themes used in my thesis. These were gameplay, narrative and level design. After a short introduction lecture Rémy presented his first story on gameplay. Het shortly explained interaction and gave several examples of different interactions in video games. My lecture continued on his story and included explanations of patterns and emergence. Next to that, I made the connection to architecture by showing examples of interactive architecture and installations and some play related buildings. Then, the first assignment for the participants was given: the design of a play or game space in a room of 5 by 5 meters and 3 meters height. The next part was about narrative and Rémy explained examples of linearity and non-linearity. I complemented this story by telling about the monomyth and environmental storytelling. Some examples of architecture and narrative were given as well, before explaining the second assignment: using the design of a game in a small space and enlarging this space to a height of 30 meters. The participants had to add story elements to get people up in the space, while maintaining their gameplay ideas. The last part was about level design and Rémy laid the process of designing a game level bare and explained some terms used in the level design practice. Subsequently I told about wayfinding and made the connection to architecture with modular architectural design like Alexander. The last assignment was the definite one, the redesign of the Bouwkunde tower as a game. Set design themes were route, story, game and space. The participants were asked to think about questions of relevance and realism, leaving these topics open for the design groups to decide upon.

Results

Three groups came up with a design each, which they presented at the end of the day in small ten minute verbal presentations. Afterwards, winners were decided by letting everyone put stickers on the posters according to which design they loved most, which design was most realizable and realistic and which design was most original and whacky. Here I will describe all three designs.

Urban Emergence Playground

Koen Kegel, Niels Klomp and Rudo Koot

This design was the winner of the titles original design and most loved design. The concept was a structure of beams and columns replacing the largest part of the tower. In between this structure (semi)

transparent blocks are placed that are movable in all directions. With this system a Tetris- or sokobanlike game is created, where groups of players need to get to the top by making a path. A path and steps are created by moving these blocks. Different groups would contest and thwart each other to the top by blocking paths of the other groups. A defined stairwell would lead the groups down after reaching the top.

This design was the most emergent system, not hanging on precreated story or gameplay elements but on a rule based system providing new experiences and situations each time it will be played. The system is based on this physical structure and the ability of people to move the blocks around in each way they want. Except for this system little attention was given to goals and relevance for the faculty.

Light Tower

Jeroen van den Brink, Ruben van der Plas, Evita Pronk and Zahraa

Being a more linear experience, this design leads players from level to level posing tasks to perform on each level. Completing these tasks right will give access to a door that leads to the next floor, not being able to complete the task or doing is wrong gives access to a door that leads to a slide. This slide goes from top to bottom and the game has to be replayed when the player has to slide all the way down. The tasks themselves are light oriented, like setting up mirrors to reflect light in the right order or finding words that are not readable without the correct light beams. At the top of the tower the words can be placed together and, next to the view, will serve as a reward.

This design handles the existing tower with the most respect; no walls or floors need to be removed, only added. This group took each level of the tower quite literally as a game level and their attention and time mostly went in the design of each task on each level. The linear experience that is created is simple in its structure and not very revolutionary but could be an overall enjoyable experience.

2013 Skybar Odyssey

Seline Wijker, Nina Verkerk, David van der Vegte and Michael Tjia

The 2013 Skybar Odyssey was the design that won the prize for most realistic design. This design also leaves the original structure of the tower intact and incorporated most elements that Rémy and I explained in our lectures. The central theme of the game was cooperation and their design consisted of 9 levels with traversal challenges that are only completable when working together. One example of this is where the players would have to lift each other to reach places. An elevator could take the duos to the 4th floor where they would realize that they could not get higher. Only by descending to the 2nd floor the players could get access to a ladder that would take them to the 5th floor. This leads to some thinking and more difficult progress systems than just advancing each level. Another special situation in this design is when the duos have to split up and climb stairs separately, and need to press buttons simultaneously to open a certain door. The last element that is mentionable was a glass elevator on the outside of the tower (only for rides down, not up) which gave views on all levels and challenges making sure the players could recapitulate on and retell their journey. This journey included elements of the monomyth, like metaphorical parts like crossing the threshold, the helpers, challenges and last but not least the revelation in the top of the tower.

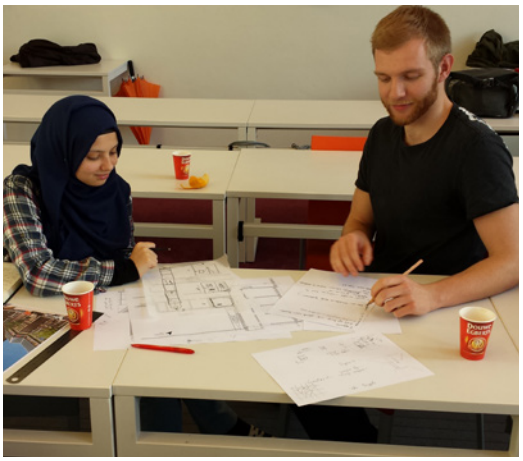
This design blended many elements that are present in game design. It incorporated the monomyth, challenges, retelling of stories, multilinear levels and unpredictable patterns. It does not relate to its context

or add something useful for the faculty but game and (given) environment are working together to a large extent in this design.

Reflection

It was difficult to get people for this workshop, even while it was announced widely throughout the faculty using posters. In the end eleven people proved enough however and positive reactions were given afterwards; both on the content of the lectures and the setup of the workshop. It proved effective to split up the workshop in three parts, each with short lectures and an assignment. This kept the participants lively and engaged, instead of laid back and dulled by too much talk. The order of the parts was however defining in which designs the groups would eventually come up with; letting the groups start with the assignment of designing a game made it difficult for them to focus their design on story. This is recognizable in the designs because no real stories or contexts were included in to the designs; they were more games than narrative experiences with meaning. The setup of the assignments also made for more distracted designs, not settled in the context of the faculty or its students and employees. Making this a hard request would have limited the participants on the one hand, but it would have led to more realistic and functional architectural designs. As games, the designs certainly have succeeded and it is worthwhile to see the participants use elements that are researched and explained by myself and Rémy. While the ultimate design of my graduation probably will not be a tower at this point, some principles of these designs are certainly usable in my design process. Leaning on the positive remarks, I consider the goal of teaching and entertaining the participants as achieved as well.


GAME TOWER WORKSHOP
13 nov
10:30-16:00
€ 5 incl lunch
Room T
NO COMPUTER SKILLS REQUIRED
redesign the bk tower using game techniques
CHECK EVENT: GAMETOWERWORKSHOP



B. Interviews

Here a record of the taken interviews is included, in Dutch, except for the interview with the German Martin Nerurkar, which is done in English.

1. Arne Bezuijen

Level Designer bij TUDelft Signature Games, 11/11/2013 10:00 tot 11:00

Simon: Wat is je opleiding?
Arne: IO (industrieel ontwerpen), design for interaction specifiek als master.

S: Was deze master ook al digitaal?
A: Niet per se, het kan alle kanten op bij deze master. Het is vooral gericht op productinteractie, maar ik ben wel met een game afgestudeerd.

S: Wat voor game was dit?
A: Dat heet Teamup, dat is nu een product van mijn bedrijf. Het is een spel voor teamwork workshops. Hiermee kun je in groepjes samenspelen en problemen oplossen door samen te werken. Het kan met meerdere groepjes gespeeld worden en er is een mediator die kijkt hoe de teams de zaken oppakken. Daarnaast houdt het spel ook veel bij om ook het spel te ondersteunen.

S: Is dit een fysieke game?
A: Nee, je zit wel met elkaar om een tafel, dus de communicatie is wel fysiek, maar het spel speelt zich op de laptops die iedereen heeft. In een 3d omgeving loopt men dan rond en lossen ze problemen op. Er wordt weinig uitleg gegeven over de wereld en als team moeten ze erachter komen hoe ze verder kunnen komen. Het gebeurt vaak dat één speler iets uitgevonden heeft en het is dan de bedoeling dat hij dit doorspeelt aan zijn team.

S: Heb je hiervoor ergens anders gewerkt?
A: Ik werkte hier zelfs al voordat ik afstudeerde. Ik heb daarvoor ook bij Deltares gewerkt hier in Delft, waar ik heb geholpen om een serious game groepje op te zetten. Ik was hier terechtgekomen omdat ik voor mijn vader daar klusjes ging doen. De eerste game die ik bij Deltares heb gemaakt is Dijkpatrouille. Daarna heb ik bij Playlogic gewerkt, dat bedrijf is nu kopje onder. Daar heb ik aan Virtual Fighters meegewerkt als level designer.

S: Aan welke projecten werk je nu?
A: Ik werk nu voornamelijk aan een spel voor een Phd-er om zijn onderzoek te ondersteunen. Dat is een spel over energie en hoe mensen daar in hun huis mee om kunnen gaan. Daarnaast ben ik bezig met mijn eigen bedrijfje, The Barn. Daarbij zijn we het spel Teamup nog verder aan het verbeteren en commercieel bruikbaar aan het maken.

S: [uitleg afstudeeropdracht] Hoe gaat het ontwerpproces van een level of 3d omgeving vaak voor jou?

A: Dat wisselt per project, ik denk wel veel mee over het algehele ontwerp van het spel, niet alleen de levels. Teamup was bijvoorbeeld een spel waarbij de focus erg op level design lag en het spel hier dus helemaal om draaide.

S: Met welke actie begin je bij een dergelijk proces?

A: Meestal beginnen we met wat willen we bereiken en daarna is divergeren. Verschillende oplossingen bedenken, soms alleen in tekst of steekwoorden. Als je dan een hoop ideeën hebt kun je weer convergeren en opties wegstrepen. Vrij vroeg in het proces bouwen we de wereld al digitaal met grayboxing (ongetextureerde levels) waardoor we situaties gelijk uit kunnen testen.

S: Zijn er theorieën of methoden die je vaak gebruikt bij het bouwen van een wereld?

A: Ik vind zelf belichting een heel krachtige tool. Licht kun je heel goed gebruiken om mensen ergens naar toe te leiden zonder dat ze het doorhebben. Door slim gebruik van licht te maken vallen bepaalde objecten gelijk op en richten spelers er ook hun aandacht op. Valve maakt hier flink gebruik van, bijvoorbeeld in het spel Left 4 Dead. In plaats van pijlen maken de designers lichten die de spelers door het level slepen. Er zijn veel spellen waarbij licht verkeerd gebruikt wordt of zelfs waarbij licht niet begrepen wordt. De lichtval van de zon wordt dan bijvoorbeeld helemaal verkeerd weergegeven. Een ander voorbeeld is lichtbronnen die geen oorsprong hebben; het is niet zo moeilijk om een lampje op te hangen wat de situatie veel realistischer doet overkomen. Dat soort dingen vallen mij erg op en kan ik mij behoorlijk aan storen.

Dit geldt ook voor ruimtelijke en architectuursituaties die niet realistisch zijn. Sommige spellen maken bijvoorbeeld situaties met veel te lange gangen, die echt niet voor kunnen komen in een echte wereld. In het ontwerp van goede spellen, zoals bij ruimteschepen in Eve Online, hebben ze architecten betrokken die het ontwerp realistischer maken en waar de immersie dus niet gebroken wordt door rare situaties. Het werkt ook vaak veel beter om texturen een beetje vies te maken want dit is veel realistischer dan een compleet witte wand. Een hele hoge glazen wand is ook niet geloofwaardig want spelers begrijpen dat dit niet echt kan en dit breekt de immersie. Als architect zou je je snel kunnen vergissen bij het ontwerpen van levels, want je hebt wel alle vrijheid maar dat wil niet zeggen dat je alles kunt maken.

Iets anders waar ik mee bezig ben is een essentieel verschil tussen het rondlopen in een spelwereld en een echte wereld. Als je in een spel rondloopt en je komt bij een splitsing waar het overduidelijk is dat de vervolgroute in het spel naar rechts is, dan zullen heel veel spelers naar links gaan. De spelers snappen dat de enige reden voor een route naar links een plek voor bonusmateriaal is en dat willen ze eerst bemachtigen. In de echte wereld gaan mensen alleen naar de plek van hun bestemming, het heeft geen zin om alle kanten op te gaan waar je niet heen hoeft. Dit is een essentieel verschil, maar levert wel problemen op in een spel als je spelers het idee wilt geven dat ze in een grotere wereld zijn dan dat ze zien. Als architect wil je juist dat het heel intuïtief is dat mensen naar rechts gaan en de route vervolgen en dat ze niet te veel over navigeren moeten hoeven nadenken.

S: Ben je bekend met de term emergence in games en ben je ook bewust hiermee bezig bij het ontwerp van spellen?

A: Zeker, dat wisselt wel heel erg per spel. Ik gebruik het vaak als tool bij situaties die ontstaan tijdens playtesting. De interessante momenten zijn als spelers oplossingen voor situaties bedenken waar ik als designer helemaal niet mee bezig was. Dat is ook een vorm van emergence. Als de nieuwe situatie ook bruikbaar is dan tweaken we het spel dat die situatie verbeterd mogelijk is. Dit is ook een doel van playtesting; situaties creëren waar we niet aan gedacht hadden. Een praktisch voorbeeld hiervan is een taak die spelers op moeten lossen in het spel Teamup. In de wereld is een wipbrug die omgekanteld moet worden. Met drie spelers kon een vierde speler omhoog gewipt worden en zo aan de overkant komen; dit was helemaal niet hoe we de taak bedacht hadden maar tijdens playtesting bleek dat het ook zo kon.

S: Ben je in je spellen ook bezig met verhaal of met verhaaltechnieken zoals numina?

A: In dat opzicht werken serious games wat anders dan entertainment games. Over het algemeen heb je in een serious game een vrij duidelijk doel wat niet geheim of spannend gemaakt wordt. Dit kan leuk zijn voor entertainment games maar bij serious games wil je mensen iets leren en dan kunnen ze eigenlijk niets missen. Ook de mensen die snel door een spel stampen moeten de essentie meekrijgen en er niet langs kunnen lopen zoals in sommige entertainment games het geval is. Het is soms moeilijk om serious games te balanceren en veel designers vergeten de lol factor in hun serious game te implementeren. Ik ben er zelf erg van dat serious games vermakelijk zijn, want als iets leuk is ben je ook eerder geneigd om iets te willen leren. Maar verhaalelementen in serious games zijn dus essentieel anders dan in entertainment games omdat ze als doel hebben de spelers iets te leren.

S: Welke elementen uit game design zouden volgens jou toegepast kunnen worden in de architectuur?

A: Nou wat ik me bedacht had, is dat gebouwen ook geplaytest kunnen worden. Heel vaak zie je nieuwbouw waarin blijkt dat er dingen misgegaan zijn in het ontwerp, zoals dingen die kapot gaan, niet werken of niet goed schoon te maken zijn. Bij een industrieel product maak een prototype waar je vrijwel alles kunt testen maar bij is een gebouw is dat een beetje moeilijk. Een fysiek gebouw kun je er maar eentje van neerzetten. Ik vroeg me af of het mogelijk is om met een game omgeving je gebouw te bouwen en je eindgebruikers er doorheen te laten lopen en het gebouw te laten testen. Ze kunnen dan hun dagelijkse routine simuleren en dan kijken waar ze tegenaan lopen. Zijn er eigenlijk al voorbeelden hiervan te vinden?

S: Ik ken geen digitale omgevingen die als testomgeving functioneren. Ik ken wel een architectenbureau uit Delft [Mecanoo] die een ziekenhuisvloer met kartonnen wanden laat nabouwen en zo verschillende situaties door artsen en zusters kan laten testen. In een game kun je eigenlijk vrij moeilijk fysieke situaties nabootsen.

A: Dat klopt, problemen zoals akoestiek zijn erg moeilijk na te bootsen in een game. Heel veel andere situaties zijn echter wel te realiseren, zoals een schoonmaaksysteem die je zou kunnen loslaten op verschillende gebouwontwerpen. Dit komt dan meer in de buurt van testsoftware of een simulatie. Dit zou ook kunnen werken voor luchtstromen en akoestiek, maar je kunt

gebruikers dit niet laten ervaren in een game ervaring. Op wayfinding en oriëntatie zou een spel wel erg goed kunnen werken. Je zet dan een speler in de ruimte en laat hem zelf de weg vinden. Je test dan je omgeving of hij werkt en komt erachter wat de gebruikers er van vinden.

S: Dit is eigenlijk een erg goed idee. Ik had als plan om een spelomgeving te gebruiken als presentatiemiddel voor mijn afstuderen, maar als ontwerp- en test tool kan het misschien nog beter gebruikt worden. Bedankt voor deze tip.

A: Ja, gewoon heel vroeg in je proces je gebouw maken met whiteboxing lijkt mij een hele interessante toevoeging voor het ontwerpproces van gebouwen.

S: Bedankt voor dit gesprek.

Most important points:
- *Balancing serious games*
- *Meaningful objects and lighting*
- *Choices in wayfinding*
- *Playtesting architecture*

2. Joris Dormans

Game wetenschapper en docent Hogeschool van Amsterdam, 2/12/2013 13:00 tot 14:00

Simon: Wat is je achtergrond met games?

Joris: Ik heb drie jaar lang architectuur gestudeerd en besloot daarna om geen architect te worden. Ik was toen al meer geïnteresseerd in virtuele werelden, maar nieuwe media opleidingen bestonden toen nog niet. Uiteindelijk na een andere studie ben ik wel bij games terechtgekomen en de combinatie van technologie en creativiteit die bij architectuur zo belangrijk was komt hier nog steeds in terug. Hedendaagse game-opleidingen kunnen ook een voorbeeld nemen aan architectuuropleidingen op dit gebied want architectuur heeft al een langere traditie van deze overlap van disciplines. [na uitleg van playtesten van architectuur] Het maken van prototypes, of testomgevingen, is niet uniek aan games en komt zelfs uit de architectuurwereld. Bij het ontwerpen van gebouwen worden heel veel modellen en deelproducten gemaakt waar situaties mee getest worden, bij games lijken deze deelproducten veel meer op het uiteindelijke product en dit is natuurlijk wel een groot voordeel.

S: Welke onderwerpen met betrekking tot games houden je momenteel bezig?

J: Enerzijds houd ik me bezig met game mechanics; hoe zitten spelregels in elkaar, hoe zorg je dat een spel leuk wordt. Naar mijn inzien moeten de game mechanics eerst goed in elkaar zitten en dan rollen vanzelf onderdelen als het level design eruit. Als je met een spel bezig bent en je hebt een goede spel mechaniek bedacht, merk je al gauw dat er snel veel levels te bedenken zijn. Anderzijds ben ik bezig met procedural content generation en dat is breder dan alleen over levels. Ik ben ooit met procedural content generation begonnen omdat ik generieke spelmethodes wilde vinden. Als je namelijk generieke methoden en patronen kan vinden dan zou de computer die ook kunnen gebruiken om levels te ontwerpen. Computers blinken echter

niet heel erg uit in creativiteit, maar zouden met deze patronen heel veel werk uit handen nemen voor game ontwerpers. Game ontwerpers maken vaak games op een trial and error basis omdat veel game ontwerpers vaak eigenlijk niet zo goed weten hoe ze het proces moeten aanpakken. Ik wil ze graag helpen door generieke methoden te vinden die het proces versnellen en beter maken.

S: Zijn er enkele generieke patronen en modules of kijkwijzes daarop die bij zouden kunnen dragen aan architectuur?

J: Designpatronen komen natuurlijk voor een groot deel uit de architectuur zelf, zoals van Alexander. Veel software ontwerpers willen patronen kunnen gebruiken om generieke problemen op een effectieve manier op te lossen. Games en software zijn echter dynamische systemen en een gebouw is een stuk minder dynamisch, of zelfs helemaal niet. Een game past zich constant aan de speler, zelfs als er geen procedurele content aan te pas komt. Ik denk dat op het gebied van architectuur daar een hoop te winnen valt. Op een bepaalde universiteit in de VS hadden mensen een open ruimte tussen twee gebouwen met gras bezaaid en liet men de mensen zelf paden vormen om naar hun doel te komen. Na een jaar hadden ze de ontstane paden geplaveid, omdat dit blijkbaar de beste routes bleken te zijn. Dit is een veel dynamischer methode om architectuur en de openbare ruimte te benaderen. Ik niet helemaal voor me hoe dit ook in gebouwen toegepast kan worden, maar ik zou het wel heel interessant vinden als je game mechanics in architectuur kan toepassen zodat de ruimte zich aanpast aan de activiteiten die er plaatsvinden. Games bieden flexibiliteit en passen zich onmerkbaar voor de speler aan en als architectuur hier wat van kan leren zou dit misschien heel mooi kunnen zijn. In een digitale omgeving is het natuurlijk veel makkelijker om de omgeving aan te passen, maar dit fenomeen kan op een subtielere wijze volgens mij ook heel goed op architectuur worden toegepast. Dit zou bijvoorbeeld al met licht gedaan kunnen worden.

S: [geeft voorbeeld van interactie met lamellen die open gaan door er naar te kijken, d.m.v. een kinect]

J: Dit is een enkele interactie, een gimmick als ik het zo mag noemen. Wat een game anders maakt is dat het dit soort interacties integreert in een systeem wat als geheel dynamisch gedrag heeft. Als die techniek zoals die je net noemt geïntegreerd zou kunnen worden in een systeem in een gebouw wat echt een geheugen ontwikkelt en over een groter tijdspad leert van interacties van meerdere personen dan zou dit wat toe kunnen voegen aan dit gebouw. Games zijn ook wel state machines; de staten van objecten worden bepaald door distributie van resources. Als een interactie met een onderdeel van een gebouw nou de verdeling van ‘resources’ aanpast en er statusveranderingen optreden, dan zou dat systeem als geheel zich ook anders kunnen gedragen. Je past dan met een kleine interactie de economie van het systeem in het gebouw blijvend aan en dit heeft effect op hoe het gebouw werkt. Op deze manier kunnen gimmicks op een groter geheel structuur aan brengen die betekenisvol is. De interactie wordt op deze manier een interface naar het gebouw als geheel.

S: Hoe zijn basis game elementen als beloningen en regels verwerkt in een dergelijk systeem?

J: Er zijn lange termijndoelen die gesteld zouden kunnen worden. Bij het voorbeeld van de lamellen zou bijvoorbeeld gemeten kunnen worden hoeveel licht er in een ruimte is en mensen

belonen met een gewenste hoeveelheid als je op de juiste manier interacteren. De beste beloning is altijd om meer interactie, meer mogelijkheid tot spelen te geven. Dat zou je ook in een gebouw kunnen toepassen. Als je té gerichte doelen in een gebouw zou stoppen dan zou dit het gebruik te veel vernauwen en definiëren. Het zou juist leuk zijn als de ontwerpers van een gebouw juist verbaasd zijn over wat voor gebruik er is ontstaan in het gebouw. Om deze emergence te bereiken heb je juist game technieken nodig zoals ik die net omschreef [state machines] die kunnen ervoor zorgen dat het systeem zich in oneindig veel staten kan aanpassen naar het gebruik van de mensen. Het interactief maken van een gebouw is dan enerzijds de opgave, maar daarnaast moet het gebouw een systeem krijgen dat alle interacties verbindt. Deze emergence is te vergelijken met de huidige trend in interactive storytelling. Een tijd geleden maakte men games met uitgebreide verhaalvertakkingen, maar deze methode was niet ideaal voor interactieve verhalen omdat het te veel vertakkingen opleverde en hierdoor de kwaliteit en effectiviteit afnam. Met een spel als systeem dat een heleboel combinaties en mogelijkheden biedt is dan veel beter. Er is een voorbeeld van een poezieboek waarin je de regels onafhankelijk kan omslaan, zodat je elke combinatie van regels kunt krijgen en iedere keer een ander gedicht hebt. De maker hiervan heeft tien gedichten geschreven, maar het toegepaste systeem levert een veel groter aantal aan gedichten op. Dit is een recombinatie van elementen. De nuances in een systeem wat variabele staten heeft is veel groter dan een lineaire structuur van een verhaal waar ik me op een bepaald moment bevind. Games zijn vanaf oudsher heel erg goed om rijkere ervaringen over te brengen dan alleen een lineair of splitsend verhaal.

S: Van deze theorie van games als systeem kan architectuur dus ook net zo goed leren van algemene speltheorieën en niet alleen van digitale spellen.

J: Dat klopt, deze theorieën gaan ook heel erg over spellen zoals schaken.

S: Hoe zou procedureel game ontwerp architectuur kunnen verbeteren?

J: In feite bestaat dat al; de cut-up methodes die de Dadaïsten al gebruikten bijvoorbeeld. Die pakten een paar willekeurige dingen bij elkaar en maakten daar iets mee. Dat is heel goed voor de creativiteit. Computers zijn heel goed in het maken van bizarre combinaties waar mensen met hun creativiteit interessante dingen van kunnen maken. Deze methode kan zo heel goed tot nieuwe inzichten leiden; als mensen zijn we niet heel goed in het willekeurig bij elkaar leggen van dingen. Met procedurele methodes kun je ook heel snel meters maken, zodat je sneller verder in het ontwerpproces zit. Je kunt op die manier ook veel sneller zien of een bepaald idee werkt of niet.

S: Wordt deze methode al veel gebruikt bij het maken van games?

J: Nee nog niet heel veel. Generatie van game onderdelen is nog een heel academische tak van sport, er zijn wel enkele games waarbij het wordt toegepast. Op het vlak van gameplaykritische dingen wordt het maar mondjesmaat toegepast. Er wordt momenteel wel veel achtergrond terrein gegenereerd en daaruit worden bepaalde objecten gekozen die in een level komen. Objecten in de voorgrond staan en belangrijke gameplay elementen worden altijd nog wel met de hand gemaakt. Dit geldt ook voor de belangrijkste onderdelen van architectuur volgens mij; die zouden momenteel ook nog erg lastig door generieke methoden ontworpen kunnen worden. Voor esthetische onderdelen zou het misschien al wel kunnen.

In games is het een bepaalde kwaliteit dat iedere ervaring door procedureel toepassen van elementen anders kan zijn. Bij een lineair spel als Tomb Raider is elke ervaring hetzelfde en zal je aan het einde van het spel niet echt het gevoel hebben dat je zelf een unieke spelervaring hebt gehad. Je bent dan al honderd keer dood gegaan en elke keer als je dood gaat krijg je opnieuw een kans om precies dezelfde uitdaging te halen. Eigenlijk geeft dit een gevoel van valsspelen. Met procedurele generatie krijg je elke keer een andere wereld als je dood bent gegaan. Als je als speler dan een unieke reeks uitdagingen hebt voltooid geeft dit een veel voldaner gevoel.

S: Ik heb wel eens van een spelletje gehoord dat dit systeem toepast; elke keer als je daarin dood gaat dan speel je vervolgens een nazaat van je vorige karakter en is de wereld steeds weer ander gegenereerd.

J: Ja dat ken ik ook, het heet Rogue Legacy. Een equivalent hiervoor vinden in architectuur is echter heel moeilijk omdat je een architectuurervaring altijd met meerdere mensen deelt; het is nooit uniek.

S: [uitleg ontwerpkeuze van winkelcentrum] Bij een winkelcentrum zou de ervaring bij ieder bezoek wel anders kunnen zijn. Dit zou bijvoorbeeld met esthetische middelen gedaan kunnen worden, zoals licht en ornamenten. Natuurlijk zou het sterker zijn met architectonische elementen maar ik denk dat dat soort cruciale onderdelen nog net zo moeilijk procedureel en generiek zijn toe te passen als in games. Volgende vraag: zijn er nog bronnen die je me aan kan bevelen?

J: Wat je zou moeten zoeken is literatuur of artikelen die beschrijven welke statussen er zijn voor de beleving van een ruimte. Daar is nog erg weinig over geschreven en in die zin is het een heel interessant onderwerp om zelf over te schrijven. Ook in games wordt de progressie van de held meer beschreven met karakter en rollenspeltechnieken, maar het lijkt me ook interessant om de progressie met ruimtelijke elementen uit te drukken. Er is tegenwoordig een opkomst van gardening games, zoals het spel Waking Mars. Dat is een sidescrolling game op Mars waar je leven aantreft wat overleeft in ecosystemen. Door deze ecosystemen aan te passen, door eigenlijk te tuinieren, pas je de omgeving blijvend aan en vind je je weg door de game. De progressie in dit spel wordt aangegeven door de invloed die je uitoefent op die ecosystemen; elke ruimte breng je tot leven. Eigenlijk door progressie in ruimte te onderzoeken zou je niet alleen het architectuurdiscipline verder kunnen helpen, maar ook de games. In games is de omgeving momenteel namelijk vaker een beperking voor een speler dan dat het een uitdrukking voor de speler is. Wat de speler doet heeft vaak weinig invloed op de omgeving terwijl de omgeving wel veel invloed heeft op de speler. [Waking Mars is dus een uitzondering.]

S: Minecraft is eigenlijk wel een dergelijk spel. Ik vind het echter zelf meer een modeling tool met wat gameplay elementen, dan een volwaardig spel.

J: Klopt, maar het is wel een heel toegankelijk spel. Ik ben momenteel bezig met een role playing game waarbij dan ook verhaal en uitdagingen meer verwerkt zijn. Hierbij wordt de wereld ook dynamisch aangepakt en zijn de interacties die speler kan doen de interface voor het aanpassen van de wereld. In een gebouw zouden diezelfde interacties de interface voor het aanpassen van het gebouw kunnen zijn.

S: Ik heb recentelijk een filmpje gezien waarin een gebouw zich direct en vloeiend aanpast op de activiteit van de gebruiker. Als iemand een wastafel nodig heeft, dan vormt die zich; net als een bed of een tafel.

J: Dat is interessant, maar dan komt het gevaar dat het niet meer natuurlijk is. Een gebouw moet niet vooruit gaan denken wat de mensen willen, het blijft namelijk een gebruiksvoorwerp; een tool. Er is een theorie over interfaces, dat je windows en mirrors als interfaces hebt. Bij de windows wordt je als gebruiker helemaal opgenomen door de transparantie van de interface, alles werkt en interacteert heel natuurlijk. Dat werkt in de praktijk echter helemaal niet. Mensen willen graag met gebruiksvoorwerpen aan apparaten vertellen wat ze moeten doen. Aan de andere kant is de spiegel als interface, hierbij ben je heel bewust dat je met een interface bezig bent en is de interface meer een tool. Volgens mij gaat de tablet het ook nooit helemaal maken, omdat een toetsenbord nog altijd veel beter werkt dan een tablet met toetsenafbeeldingen en swype opties en dergelijke. Hoe duidelijker de relatie tussen de persoon en de interface, hoe beter de interactie. Een gebouw zou net zo goed zich moeten aanpassen aan de intenties van de gebruiker door middel van een directe interface; niet dat de gebruikers van een gebouw zich moeten plooien aan het gebouw. Om nog verder te denken over interfaces; praten met een computer of een menu besturen met de xbox kinect is ontzettend omslachtig. Een muis en toetsenbord of een controller werkt dan zoveel makkelijker.

S: Bij gebouwen komt de directheid van interface nu al terug in het feit dat mensen heel graag zelf ramen open willen kunnen zetten. Concluderend, een gebouw als game systeem is een van de belangrijkste punten uit dit gesprek waar ik wel iets mee kan.

J: Dat is inderdaad iets waar je misschien wel wat mee kan. Een gebouw als een systeem met ecosystemen en staten waarin objecten en personen verkeren, kan een interessant perspectief zijn. Er zijn hierbij twee dingen die belangrijk zijn om aandacht aan te besteden. Ten eerste, vind uit op welke dingen je in een gebouw invloed op kunt uitoefenen; wat is veranderbaar? En ten tweede, hoe kunnen die dingen door middel van status- en bronnenveranderingen het totale gebouwsysteem aanpassen. Bij monopoly is het bijvoorbeeld heel belangrijk om alle objecten en hun statussen, zoals welke straten, hoeveel huisjes, nauwkeurig in de gaten te houden. Hoe zou een gebouw een vergelijkbare economie bevatten; welke waardes zijn er toe te kennen aan objecten en statussen. Wat zijn nou precies de parameters waar je mee kunt spelen in een gebouw; misschien is dit de hoeveelheid licht, het aantal stoelen in een ruimte misschien. Wat zijn de objecten in een gebouw die te vergelijken zijn met speelstukken in een spel.

S: Om af te ronden, is er misschien nog iets anders wat je kunt bedenken als combinatie tussen spel en architectuur?

J: Je hebt ook nog omgevingsbelevingen. Op Hoog Catharijne zijn momenteel op plekken zinnen te horen die door Spinvis zijn ingesproken. Je zou ook op een dergelijke manier geluid en teksten kunnen gebruiken om ruimtelijke poëzie te maken. Je loopt dan gewoon door een ruimte heen en je hoort dingen; dit heeft een bijzonder en interessant effect. Ik heb ook ooit een audiotour gehad door oude gebouwen in het centrum va Amsterdam waarin een totaal onzinverhaal werd verteld, maar waarmee je wel naar ruimtes werd geleid waar je anders nooit zou komen. Het was een soort speurtocht waarbij je soms gewoon stond te kijken naar de klimaatinstallaties, die heel interessant werden door het verzonnen verhaal wat erbij verteld

werd. Hele grappige en originele manier van het beleven van gebouwen, misschien kun je daar ook nog wat mee. Het zijn dan wel geen architectonische middelen, maar de beleving van een gebouw wordt wel heel anders op deze manier. Een app op een telefoon zou ook kunnen, maar het gebruik van een apparaat zit de beleving van een gebouw heel snel in de weg dus dat werkt vaak minder goed. Ook interessant zijn Alternate Reality games voor architectuur. Een voorbeeld hiervan is het spel Ingress; in dit spel kun je landmarks in de stad aanwijzen en daarmee driehoekige oppervlakten maken. Het doel is om zoveel mogelijk spelers binnen jou driehoek te krijgen; dan krijg je punten. Het spel is slecht ontworpen, maar door dit spel ga je wel de stad op een hele andere manier beleven. Je gaat met opzet naar objecten in de stad lopen om deze driehoeken te kunnen maken. Als laatste zou je ook kunnen kijken naar playful interactions in de fysieke ruimte zoals ze in Eindhoven bij industrieel ontwerpen mee bezig zijn. Zij maken interacties met objecten en zoeken de grenzen op van meubels tot interactieve ruimtes.

S: In Delft zijn ze inderdaad ook bezig met deze thema's bij industrieel ontwerpen. Bedankt voor al deze tips en het interview.

Most important points:
- *The building as a game state machine*
- *The environment as the expression of the player/user*
- *The environment as mirror tool*
- *Making the experience of architecture different by using audiotours and ARGs*

3. Martin Nerurkar

German Architecture graduate and game developer, 4/12/2013 20:00 – 20:45 (Skype)

Simon: Nice of you to make some time to discuss my graduation project, I prepared some questions for you. First, what is you background?

Martin: I studied architecture which I finished in 2007. After that, I spent some time as a freelancer making 3D graphics for roughly a year. After that I devoted all my time to games, but even while studying architecture I was busy making games and writing about them.

S: What are you currently working on?

M: I am still doing freelance work and I started my own game studio not too long ago with a friend, which is called Sharkbomb studios. We have published two mobile games so far and at the moment we are busy figuring out what to do next.

S: [explains graduation and some examples of game elements that could be beneficial for architecture, like playtesting] What do you think are the biggest similarities between architecture and games?

M: Probably that they are both spatial in nature. There are very few games that do not have the notion of a space in some sense. Sports are obviously very spatial; you have fields, you have goals. Video games often provide representations of spaces, just like board games do. You could even say that card games have spaces, like the space of your hand and the deck on the table.

And simple word games like crossword puzzles provide spatial notions as well. The reason for this I think, is that we as people are good at seeing and understanding space, we need to navigate through space all the time. In games, spaces are a way to present complex information to people. Take board games for example: they have a lot of different things to keep track of, but they are all in one spot which makes it easy for people to cope with them. People do not need to keep abstract relationships in their minds because they are all shown with spatial elements.

S: Could it be that 'Zork', the written game, has no spatial elements?

M: Even that has a sense of space, it is not visually represented, but it is still there. It is presented textually and imagined in the minds of the players. Web browser games take place on the web, which is more abstract, but could also be argued as being a space. There is of course a broad definition of space in that sense.

S: Can you name some elements which you applied to games which you learnt from architecture?

M: I cannot think of any concrete methods, but what I did use from my education are experience based skills that are important to architects, but are applicable to any creative job actually. Like getting spatial sense, or be able to present and market your ideas. The ability to sell your idea to someone is one of the chief merits that I still use a lot nowadays. Making people understand why you design things the way you do is important because many decisions are so arbitrary; like where you place your windows. Just saying 'I like it that way' is not good enough for most of us. The position of the game designer is very similar to that of the architect: both should know a lot about many disciplines like art, technology, audio and coding. But with both you do not need to be an expert in any of those fields, you just need to keep things making sense and fit within the vision.

S: Which game elements do you think could be helpful for architectural design?

M: During my studies I used the Quake engine to build the Barcelona pavilion and let people move and shoot through the environment. I analyzed the movement lines of the people and the bots [artificial intelligences] to see if there were patterns. The situation however was a fighting simulation so the movement lines were not the same as the lines of a real visitor of the pavilion. So you might argue how useful this analysis was for architectural purposes. It is related to the goals people have in the environment and to truly test the building in a game setting, the goals should be the same as the goals of the real people visiting that building. That would however very likely be a boring game.

S: But what if elements of gameplay were projected on real life situations, like with gamification?

M: That is very interesting indeed. Games are very effective in rewarding players with spatial elements: giving people more content and interactions when they overcome the challenges. In that sense architecture could learn a lot from level designers, who design the spatial rewards in a game. It would be very difficult to apply these rewards to every kind of architecture however; it might be applicable to apply it to cultural and entertainment buildings, but if it were to be applied to for example apartment buildings it would have to be done in a much reduced way.

S: [explains graduation goals and choice of design of shopping mall] Could you think of any game elements that could be useful for a building like a mall?

M: I would like to react some more on your previous question actually. When I studied architecture, I spent a lot of time doing mod projects. I think the mod culture is something very awesome; the do it yourself, build it yourself kind of thinking. Just like with music and video, that people can make more easily themselves and share on YouTube, mods are the same thing. Architecture has a very hard and static nature. I think that a modular architecture that is more owned by the people who live there and is more easily modified according to what they need is something to strive for. The design of the architecture should be ready to be modded. All elements of the architectural design should communicate their function more clearly, so people know what they can change and what not. A big part of stimulating the modification of architecture is that communication; often people do not know what is changeable in a building, so they do not change anything. I think it is very sad that we live in premade buildings and the only things we change are the furniture and the stuff we put on walls. The way we are able to change our buildings at the moment is not connected to changing the function of the building. And I think it would be great if it could.

S: That is definitely and interesting perspective. How could this modifiable architecture be realized in a more practical sense do you think?

M: I'm not really sure. I think the first thing that needs to be designed is that communication part: when I live somewhere I want to know what I can change and what I can't. It is not so clear for everyone what the structural parts of a building are. For the rest, I need to think about it some more, I can't really give practical examples I guess.

S: Did you do a lot level design yourself for the games you made?

M: I would not say a lot, but still some. I was working as a level designer for 14 months and I did some level design for the mods I made. The last level design task is already four or five years old now.

S: What elements did you put in your level design which are inherent to the spatial design of games and which you would not see in real life spatial designs? And could these be of influence to architectural design?

M: That is a difficult question; the game I built levels for was a multiplayer game. That is a very different game than the game you play in everyday architecture. The 'games' you play in real life architecture are like 'I want to cook a meal', 'I want to take a shower', "I need to go to the toilet', these goals are very different that the arenas I used to build in my levels.

S: And what if you take goals like 'I want new shoes' or 'I want to buy a video game' that are more related to shopping and malls? How would you design a level that is about shopping?

M: Good question. I think you have to analyze and write down the rules of shopping I guess. Something like 'you have x money and you need y and you want to find the best bargain'. But there is room for a lot of different games in a mall. The getting of items is however not very

related to the space. People just want a list of all items that are available and I will find what I like. That is why internet shopping is popular these days.

S: And what if I add other functions to the mall, like a library, would that change the rules?

M: I don't think so. Going to a library is also about acquiring items. Going to library is most often about finding a specific book.

S: In games it is often about acquiring and achieving things, but in almost every case the path towards that is the most satisfying. In games players can lose, but in a mall you don't want to people to lose and not be able to buy their pair of shoes. But maybe game elements like going somewhere in the mall could reward you with something in another place in the mall, like a free ice-cream.

M: Absolutely agree on that one. Experiences are not that interesting when we are efficient. The random things that happen in life, like meeting somebody new or seeing the sunset are often the most rewarding. If we are efficient in life, these things will not happen. The thing is that people want to be efficient, because we are lazy. It is good for us as a species to optimize and spend less energy on tasks, so we can conserve that energy. But I agree that we need to force people out of that laziness sometimes. [And that can be done by stimulating random events and actions of people]

S: That is a very interesting perspective indeed. The most interesting parts of games are the events that we were not actively trying to achieve.

M: Games are subjective to that duality; a game itself is unnecessary and just there for the experience. There is a famous example that if you want to be efficient about playing golf, you pick up the ball, you go to the hole and you drop it. But we don't want to be efficient about a game that way. But within the bounds of a game we still want to be very efficient. That is weird if people play games for the experience. It really boils down to the attitude of the player, or shopper in your case. Recently I had a discussion about the difference between children's games and sports games. In sports you want to win, so the rules need to be very precise. The field has a prescribed size and there is a referee that checks on every rule, so that players can be as efficient as possible within these rules and field boundaries to win the game. Children's games are on the opposite of that; if they are about winning then they break. They just want to join in an activity together. Kids often use fantasy to create the boundaries of their games, but that is not necessary. Playing soccer and playing tag are bout about running around but are very different in the way they are played. It depends on the attitude what the goal of playing the game is. To play a game could be just for fun, or to win it, but for many people it is something in between these goals. And maybe this also counts for shopping. There is this cliché of men that they go shopping for efficiency; men go out to buy and women go out to shop. All of them are part of a shopping mall's audience so maybe you need to help them both with their goals.

S: To get to my last question, could you explain your ideas of archetypal spaces and maybe relate them to architecture?

M: Archetypal spaces are a theory of mine which I want to work out further, maybe by writing a book or something. Just like with character archetypes, I think there are spaces that are typical, familiar and easy to immerse in or with. The two main uses of the archetypical spaces are to trigger expectations and to play and break with those expectations. They are tools for understanding and to put things in a box when you are part of it. In architecture you have that too in a sense; when I am in a prison I know what I should do and expect there and vaguely how it is structured as well. This is closely related to the function of the space and in games these archetypes hang closely with the narrative of the game. But you could say that a prison is built for certain kind of narratives as well. That is why certain types of architecture are often used as archetypes in all narratives, not just in games. They set the mood and make expectations for the reader or player. A story would be very different if it happened in a church. The chosen types are very arbitrary of course, but I try to see it broader than the types used in architecture. I am trying to find mother categories if you could call them as such. [These are for example the wilderness and the maze]

S: Well I think this is it; I would like to thank you for your answers and tips.

M: Glad I could be of service.

Most important points:
- *Games and architecture are both very spatial in nature*
- *Providing spatial rewards*
- *Designing architecture that can easily be modified by the inhabitants*
- *Real life architecture is a dull game, it has different goals*
- *Playing a game/visiting architecture for efficiency or fun? (analyze the people that go the mall and aid or adjust their goals)*
- *Mother categories of archetypical spaces*

C. Reflection

Reflection on thesis

Reflecting on the writing of this thesis, I return to the vastness of sources of the entire game design field. This lead to a very long period of searching and combining sources. I did not want to miss an important source which could lead to a new insight for architecture and because of that the thesis and process became too big. The eventual time pressure led me to work more efficient, but it could still be questioned if an overarching research is just as valuable as an in-depth study of a specific game aspect, such as emergence could have been. It is funny to note that the interviews provided more thought and results for the process than the books did, probably because the interviews were focused on the overlapping of the two disciplines. This graduation is continued in the design of the Megastores Mall in The Hague. Results of that design will show if the elements of this thesis are applicable in the design of an actual building.