The effect of environmental factors on the human behavior in game like environments

ROBIN SVENSSON
The effect of environmental factors on the human behavior in game like environments

Miljöfaktorer påverkan på människors beslutsfattande i spelmiljöer

I de flesta moderna TV-spel, är de artificiella spelkaraktärernas beteenden förutbestämda. Oavsett hur många gånger en spelare utnyttjar en svaghet, så repareras denna aldrig. För att skapa realistisk artificiell intelligens i spel, krävs det förståelse om hur människor resonerar i spelmiljöer och hur de kommer fram till sina beslut. Detta projekt undersöker hur miljöfaktorer påverkar spelares beslut när det gäller att slutföra en viss uppgift i ett kontrollerat spelliknande scenario. Projektets empiriska tillvägagångssätt med experiment, bekräftar att det definitivt existerar miljöfaktorer som har konsekvenser för det mänskliga beslutsfattandet i spelmiljöer. Denna kunskap kan bidra till en bättre spelupplevelse och nya genrer av spel.

Robin Svensson

Degree Project in Computer Science, DD143X
Supervisor is Pawel Herman
Examiner is Örjan Ekeberg

CSC - School of Computer Science and Communication
KTH - The Royal Institute of Technology
2016-05-10
Abstract

In most modern video games, character behavior is scripted. No matter how many times the player exploits a weakness, that weakness is never repaired. To create realistic artificial intelligence in games, it is important to understand how people reason in game like environments and how they arrive at their decisions. This project examines if environmental factors affect player’s decisions, when it comes to completing a specific task in a controlled game like scenario. The project’s empirical approach with experiments, confirms that definitely some environmental factors have implications on the human decision making in gaming environments. This knowledge could lead to a better gaming experience and new genres of games.
## Contents

1 Introduction 3  
1.1 Problem statement 3  
1.2 Scope & limitations 3  
1.2.1 Earlier research to benefit from 4  
1.3 Goal 4  
1.4 Purpose 4  

2 Background 4  
2.1 Virtual environments 4  
2.2 Situational awareness 5  
2.3 Sound in the environment 5  

3 Method 6  
3.1 The choice of method 6  
3.2 Procedure of the experiments 6  
3.3 The questionnaire 9  
3.4 Evaluation method 10  

4 Results 11  
4.1 Area decision quotas 11  
4.2 Path lengths 11  
4.3 Questionnaire 11  

5 Discussion & conclusion 14  
5.1 Virtual environments 14  
5.2 Visuals in the environment 14  
5.2.1 Path lengths 14  
5.2.2 The will to explore 15  
5.3 Sound in the environment 15  
5.3.1 Further questioning 16  
5.4 Quality of the experiments - Questionnaire 16  
5.5 Situational awareness in games 16  
5.5.1 Awareness of information 17  
5.5.2 Comprehension of its meaning 17  
5.5.3 Projection of future status 18  
5.6 Conclusion 18  

6 References 19
1 Introduction

The game industry is competitive, and it is growing fast. It is expected by consumers that updates of game technologies such as graphics, physics, design etc. occur continuously (Games industry forecast n.d.). It is therefore important for the game industry to reason about features in games, that can convince the consumers to buy them. One way to improve the gaming experience would be to work on the artificial intelligence (AI) in future games. Making more advanced artificial components such as AI, could somehow improve the actual game-play in both competitive and satisfying domains. One way to improve AI in games would be to observe the human behavior, and how humans react to different situations in game like environments. This project will therefore attempt to find more knowledge about human behaviors in the fields of psychology and game environments. The knowledge that is obtained from this project could then be used to understand how non-player characters’ (NPCs) intelligence and behaviors could be improved. It is important in this project to examine the human behavior itself, and how humans use senses such as vision and sound to understand certain situations. Getting more understanding about human behaviors, could give the game industry an opportunity to offer a more realistic and improved entertainment experience to their consumers.

The project will take advantage of earlier knowledge from the fields of psychology, such as situational awareness and sound psychology. The project will be worked out through an empirical approach consisting of experimentation. The experiments will be used to observe recruited participants and how they act in a controlled game like environment.

1.1 Problem statement

Do environmental factors, in terms of sound and vision, affect player’s decisions when given a specific task in a controlled game like scenario?

1.2 Scope & limitations

This project focuses on how people interpret hearing and vision in game like environments, any others of the human senses are not being considered. The project has been performed through experiments with two small scenarios for human participants’. The participants were separated into two groups, and they were confronted with one identical task to fulfill in a point and click based game. The two scenarios differed in the aspects of environmental context and visual representation. The differences were thought to bring answers about their affect on the participants decision making process. The participants filled in a questionnaire after each session. The questionnaires were thought to provide more data, and to get some knowledge about the quality of the experiments. The results are discussed in addition to the knowledge obtained from the literature search. The choice of an empirical approach was made to get quantifiable data, that could determine if decision making is due to environmental factors or not.
1.2.1 Earlier research to benefit from

Unfortunately there has been little success in finding related work that this project can benefit from. There exist other threads of work that remind of the project, but they are not specifically beneficial. The closest correlated work is within a domain of psychology, called situational awareness which is explained in the background section.

1.3 Goal

The goal of the project is to find out if environmental factors have an affect on the human decision making process in game like environments. The project attempts to obtain quantifiable data from small experiments.

1.4 Purpose

The purpose of the project is to get more understanding about human behaviors in game like environments. The knowledge achieved from the project is meant to contribute to more realistic AIs in future games. The project hopes to contribute to improved games and a better experience for the gaming audience.

2 Background

2.1 Virtual environments

The conditions that surround someone or something are called an environment. A specific environment can create different emotions between individuals, a scary environment might not necessarily have to be scary for everyone. When individuals interpret an environment, they make perceptions based on personal factors (Jullisson, Karlsson, and Gärling 2005). The environment is defined as the conditions that surround one particular person or object, even people can be considered as the environment. Since the environment has the power to create emotions within the interpreter, it also has an affect on the decision making process (Kahneman and Klein 2009). The decision making process in environments is built up by three key components, the perceiver, the object and the situation. The perceiver is the individual that is perceiving the object, a perceiver will be heavily influenced by his personal characteristics such as, past experience, cognitive biases (Stanovich and West 2008), age and individual differences (Bruin, Parker, and Fischhoff 2007). The object refers to any person, item or event that can have an impact on the perceiver. Lastly the situation is the relation between the perceiver and the object. The situation might be the circumstances under which the perceiver is fulfilling a given task.

A virtual environment is a re-creation of the physical world, not necessarily always truthful to reality. Virtual environments differ from the real world, it can be created exactly as the developer wants to. Although, the decision making process in an in-game environment consists of the same key components as in the real world. The perceiver being the player, the object being the goal and the situation is the virtual environment.
2.2 Situational awareness

Situational awareness or situation awareness (SA) is the perception of environmental elements with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed (Billings 1995). SA has received considerable attention in the military community for the last decade because of its recognized linkage to effective combat decision making in the tactical environment. The study is concerned with understanding of the environment which is critical to decision making (Lundberg 2015). Being able to analyze an environment fast, in order to understand the context of the situation can be critical sometimes (Sarter and Woods 1991). Soldiers are trained in synthetic environments to improve their SA abilities, because this type of training is thought to make them perform better in battle. The synthetic environments that soldiers are practicing in, are recreations of real-life situations. Almost like a virtual environment but with parameters that fit into the real world. Soldiers with good SA are good at sorting out necessary information about the environment, in order to fulfill the mission. This means that there are only a few elements in the environment that might be of importance for the specific goal (Endsley 1995). SA’s success in studying and training soldiers in controlled synthetic environments, is useful for this project when arguing about human behaviors in game like environments.

2.3 Sound in the environment

An important feature for humans is the interpretation of sound. Hearing allows us to communicate with each other by receiving sounds and interpreting speech. Hearing also gives information vital to survival. For instance, by alerting us to an approaching car, it enables us to get out of harm’s way. Like the visual system, our hearing system picks up several qualities in the signals it detects (for example, a sound’s location, its loudness, and its pitch). It separates complex sounds into their component tones or frequencies so that we can follow different voices or instruments as we listen to conversations or to music (Hearing n.d.). Music and ambient sounds have been a part of the gaming industry since the beginning. An appealing game design rarely comes without fantastic music to make the gaming experience even better. The psychology of sound increased attention in the late 1960s and early 1970s, as a social problem that created interest in the psychological society (Audition: Hearing n.d.). Since then groups of psychologists have been contributing to studies that view sound in the context of the larger social and cognitive environment. This ecological approach focuses on the effect of the meaning of the sound and the psychological properties of the situation rather than on the role of the physical parameters of the sound alone (Jones and Chapman 1984). Ambient sound in the environment gives context to the perceiver by participating as a situational factor. Ambient sound and music are to be considered as a partial environment on its own, or as an additional dimension of the given situation or environment. Sound has the power to change the perceiver’s interpretation by creating additional context to the environment. For example, this is similar to how colorful backgrounds can affect the human mind on how to interpret individual objects (Rotton et al. 1978).
3 Method

This project has been conducted with an empirical approach using experimentation. For the experiments, 54 participants were recruited through friends and connections. The participants were in the ages between 15 to 30 years. It was considered to be impossible during the recruitment process to take into account the participant’s gender. The gender of the participants may have implications on the final results in the experiments, but it could not be taken into consideration due to the limited time that was planned for this project. This is a limitation of the project but it does not qualify to lay under the limitations section because of its minor affect on the problem statement. The choice of age was made to simplify the recruitment process of the participants, with the reason that there exist many players in this age. It was, thus, easier to find participants for the experiments. The experiments were made online through Skype, Facebook, Google forms and a customized website containing the experiment itself. The experience level of the participants varied since the skill level was not considered important for this very project.

3.1 The choice of method

The reason for choosing an empirical approach as the methodology for the project was because of the research question’s philosophical character. There have been a lot of thoughts and ideas during the creation and planning of the project, which have lead to unwanted dilation of the project. To pinpoint the ideas and to follow a single threaded line through the project, it was considered most preferable to make experiments in a controlled environment. It was easier to design the project by doing so, since it was possible to create customized questions that could answer the research question. The literature search gave an intuition about what would be important to study and observe during the experimentation. The experiments together with a questionnaire, were thought to provide enough data to come up with a logical and legitimate conclusion.

3.2 Procedure of the experiments

The experiments consisted of a point and click based game, where interactions from the participants were recorded as paths in form of strings. These paths were evaluated after all experiments had been completed. The participants were divided into two separate groups where they played the game in a specific scenario. The scenario that was chosen for the first group (G1), was different from the second group (G2)'s. The scenario that was chosen for G1, had an environment with more details and atmosphere. Whereas, G2 played a visually simplified version of the same game. The both groups were asked to find a person called Ellie, this was the main objective for the participants. The participants would then make binary decisions in a maximum of 5 different rooms. To instruct the participants, subtitles were added to describe each room and their possible actions. Sound was provided in the game to give the participants an intuition of where to find the objective. The participants were not given any information about the scenario beforehand. The first room in the scenarios, was a simple entrance room with two doors. There was sound output in this room, that sounded like soldiers talking on a military radio. The sound in
the entrance was set on low volume with 80% of the sound output on the left speaker. The difference in the visual style of the two scenarios can be seen in figure 1, which shows room 2 of the experiment. This is the hallway that the participant went into if he decided to go towards the sound. If he instead went in the other direction, he would have ended up in a room showing an environment outside. The only action that the player had in this particular room, was to return inside. The reason to the two choices was to see if the participant rather wanted to approach the sound or to move around it. The sound incremented and changed stereo settings on the speaker depending on direction and how close the player was to the objective.

Figure 1: Area: Hallway, top: scenario 1, bottom: scenario 2

The project did not take into consideration the time it took for the players to arrive at their decisions. The focus was instead on features that could explain the participants behavior and patterns when they made decisions in the scenarios. For example, there was a room included in the game (figure 2) that practically
did nothing for the participant, but giving an option to search the room. The environment for G1 in this room represented a messy bedroom with items laid astray on the floor, whereas the room in the scenario for G2 was quite simplistic. The main purpose of adding this very room to the game was to see if details like contextual objects had implications on the decision making process.

The last of the environments in both of the scenarios was the objective room, which also was the sound source. The participants were confronted with some information in this room, namely that they were carrying 2 bullets and a gun in the inventory. The view contained 3 soldiers that not yet had spotted the participants (figure 3). They were questioned if they would like to engage or fall back. This was the last option the participants were able to do in the game, since it either resulted in finding Ellie or failing the mission. The participants would find Ellie if they decided to not engage, which was thought to be the most logical decision to make because of the low ammunition count. If the
participants instead decided to engage, it would result in failing the mission. The information that was given to the participants in the room, was expected to tell if inventory and items play a role in the decision making process, since it might have implications on the situation in the environment.

![Figure 3: Area: Engage or not, scenario 1, Illustration by Eddie Del Rio](image)

It was decided that both of the two groups were going to be given the same task: to simplify the process of quantifying the data. It was thought to be important that the only difference for both groups G1 and G2, was the appearance of the environment. The possible actions in both of the scenarios had to be identical. It would assist the process to analyze if environmental factors had implications on the human behavior and decision making.

3.3 The questionnaire

In addition to the experiments a questionnaire with 4 questions was given to the participants after each experiment. The questionnaire was identical for the groups G1 and G2, and is listed with motivations here:

- **Question 1:** Did you take your time to make the decisions?
  - Motivation: Check if the participants choices were made with thought or intuition.

- **Question 2:** If you managed to find Ellie in the scenario, would you have made the same decision if you had more bullets or a better weapon?
  - Motivation: Check if equipment have implications on the participants decisions.

- **Question 3:** Do you think you would have made other choices in another themed environment?
  - Motivation: Check the participants personal opinion about environmental aspects.

- **Question 4:** Do you think that the instructions at any time were misleading?
  - Motivation: Briefly check the quality of the experiment.
3.4 Evaluation method

The path strings obtained from the experiments are a bit inconsistent, since the length of the path submitted by each player differs. Take this example in figure 4. The figure displays a map of all the possible rooms that the participants could go through. Participant A made a route with a length of 9 steps, whereas participant B only did 3 steps in his session. Therefore the decision that the participants made at the first appearance in a room will be the data that are used for evaluation. It is of importance that some players did not necessarily explore every room in the game.

![Figure 4: An example of how the path lengths differ in the experiments.](image)

Each room will obtain a quotation value depending on what direction they chose in each room. This is represented in a graph in the results to get an image of how big the difference in the two scenarios is. The quota for each room is very simple to calculate and is done as follows

$$R_{opt} = \frac{P_{opt}}{P_{tot}}$$

Where $R_{opt}$ is the percentage of participants that selected opt left or right in room $R$. $P_{opt}$ symbolizes the participants that selected the same option in the room $R$, $P_{tot}$ is the total number of participants that made an option in the room $R$.

Here is an example of the recorded path strings from the experiments:

$$S[1] : \text{entrance : L}\mid \text{hallway : L}\mid \text{bedroom : R}\mid \text{search : L}\mid \text{hallway : L}$$

$$\text{bedroom : L}\mid \text{hallway : L}\mid \text{bedroom : R}\mid \text{search : R}\mid \text{hallway : R}\mid \text{objective : R}$$

This string is longer than the majority and is containing 11 steps. It is a representative example that shows a participant playing the game.
4 Results

4.1 Area decision quotas

Figure 5: This graph shows the quotations $R_{opt}$ between selections in each of the scenarios. The horizontal axis displays $R$ and the vertical axis shows $R_{opt}$.

4.2 Path lengths

The average length of the paths in scenario 1 was 6.19, whereas it in scenario 2 was 5.00. The paths were therefore 24% longer in scenario 1 than in scenario 2. The path length set for G1 being:

$$S_{g1} = [7, 5, 7, 9, 7, 5, 7, 9, 5, 3, 5, 7, 7, 5, 5, 7, 5, 5, 5, 3, 7, 9, 5, 5, 9]$$

with the standard deviation 1.69 and variance 2.85, whereas the path length set for G2 being the following:

$$S_{g2} = [5, 3, 3, 5, 9, 3, 3, 5, 7, 5, 5, 5, 5, 3, 3, 5, 7, 5, 5, 7, 5, 3, 5, 9, 7]$$

with the standard deviation 1.75 and variance 3.08.

4.3 Questionnaire

The results from the questionnaire can be seen on the two following pages. Figure 6 displays results gathered from participants in scenario 1, and figure 7 from participants in scenario 2. The answers that was collected from the questionnaire, shows that there exist differences between the participants in the two groups G1 and G2. The time that the participants took to come up with their decisions was the same for both of the groups. 33.3% of the participants from G2 claim that another themed environment would have a big impact on their decisions. Only 3.7% of the participants from G1 have the same statement. The participants from both groups claim that the experiments was of decent quality.
Did you take your time to make the decisions? (27 svar)

(If you managed to find Ellie in the scenario). Would you have made the same decision if you had more bullets or a better weapon? (27 svar)

Do you think you would have made other choices in another themed environment? (27 svar)

Do you think that the instructions at any time was misleading? (27 svar)

Figure 6: Survey results for scenario 1
Figure 7: Survey results for scenario 2
5 Discussion & conclusion

5.1 Virtual environments

A virtual environment is similar to the real world, a place of time and space. It is easy for people to be dragged into a movie or a good book, this gets people away from reality every once in a while. The behavior is also seen in games, people tend to forget about the real world sometimes (Kramer et al. 2008). The simple structure of a game is to reach a destination or to fulfill a task under some predetermined circumstances. How hard it is to fulfill the given task, depends on the environment and the situation. The situation might be being shoot at by several enemies, or finding a key to open a certain door in a dark and spooky room (What Makes a Great Game? The Key Elements of Successful Games n.d.). No matter what the circumstances might be, they all play a role in the decision making process (Billings 1995). In this project, there have been experiments testing human behaviors in a controlled game like environment. The experiments have shown that people act carefully in game like environments. The reason to this belief is that in the experiments, there was a room with sound output sounding like soldiers talking on a radio, which seemed to make the participants to avoid the the room. The participants tended to be selecting alternative paths in the environment. This might be a behavior of strategy or survival, which gives the assumption that there are similarities between human psychology in games and the real world. It might be regarded as a valorous statement, but by interpreting the results of the experiments in this project, it seems to be the case. The behavior was seen in both of the scenarios, but with more clarity in scenario 1.

5.2 Visuals in the environment

Differences in visual details have been used in this project to make observations on players behavior in gaming environments. There have been two characteristics seen in the experiments, which gives the belief that human decision making in games is due to some environmental factors. An explanation of the two observed characteristics is explained under this section. The reason seems to be that more visual details create interest and motivation for players to play the game. These might be the details that attract the player’s attention (Kramer et al. 2008).

5.2.1 Path lengths

According to the results, the average length of the paths is 24% longer in scenario 1 than in scenario 2. It is worth pointing out that the actual length was not much longer between the two scenarios, namely 6.2 versus 5. The fact that the average length is longer in the more detailed gaming environment gives a small belief that visual details and objects create interest and a will of exploration within players. To prove that this belief is correct, it is needed to make further experimentation with bigger environments than the ones used in this small project. However, the experiments in this project give the assumption that visual detail in the environment catches players attention more than a less detailed environment.
5.2.2 The will to explore

In figure 5 in the results section, there is a graph showing the percentage of people who choose to go left or right in each of the important rooms of the experiment. By comparing the variable $R_{opt}$ for $S_1(\text{bedroom})_{left}$ and $S_2(\text{bedroom})_{left}$, it is clear that the value of $S_1(\text{bedroom})_{left}$ is much greater than $S_2(\text{bedroom})_{left}$. What this means is that a lot more participants choose to search the bedroom for clues in scenario 1. The difference is that 82% decided to search the room in the highly detailed environment, whereas only 61% decided to search the room in the simplified version. There is a difference of 21%, which gives further reason to believe that the visual representation of the environment matters for the decision making process.

There might be at least two possibilities contributing to this behavior. Either that the minimalistic version is confusing the player because of the lack of context, or that it might simply be a lack of interest in the player for playing the game. However, it is clear that there is a significant difference according to the numbers. Visual detail had an affect on the decisions of the participants, which means that visual representation is an environmental factor that matters for decision making in games. The visual representation of an environment is a big word. Unfortunately, there has been no attempt to observe individual visual elements in this project. As seen in the field of SA, military officers are good at determining certain things in the environment that is important for the mission (Endsley 1995). It is therefore believed that it is most beneficial to make individual experimentation for certain genres of games with similar objectives. By doing so, it might be able to cluster characteristics in the visual environment that is important for games in the same genre. That would make it easier for game designers in the future, when they are creating a specific game.

5.3 Sound in the environment

In each scenario session, the players were given sounds of soldiers talking on a military radio. The paths that were collected from the players in the sessions, show signs that the players were trying to avoid the sound. Humans are skilled in interpreting sounds and reflecting over it in regards to earlier experience (Information about Hearing, Communication, and Understanding n.d.). It seems that sound is a dimension of detail in the environment, and that sound has a way of explaining context to the observer about the environment. Sound could be acting as guiding vectors for the observer, and it might also create context. According to some of the players, the sounds provided in the experiments, not only gave an intuition of the destinations direction, but also made them more cautious. The behavior could be connected to humans reaction to danger. This is an interesting standpoint in the project and it shows great promise, that sound might play a role in human behaviors in game like environments. Humans seem to live out their feelings on a realistic level in video games. It is easy to believe that people act without thought when it comes to games, that the outcomes do not matter as much in real life. But as a matter of fact, this project shows that it might not be the case.
Sound plays a role as one of the defensive mechanisms for humans, and it is of interest to understand how sounds affect humans in games. Sound is interpreted in different ways and it might therefore be beneficial to make experimentation on how people act to sounds in different game genres. This kind of experimentation was outside of the scope of this project. It should be beneficial to explore this area if an extension of the project is made. People may not interpret sounds in the same way if it is represented in two different scenarios. The interpretation may differ depending on the situation and visuals in the environment. When creating future models, it is necessary to understand what context different sounds create for individuals. This is clear though, that sound had an affect on the participants of the experimentation in this project.

5.3.1 Further questioning

After the experimentation phase, it was decided to make further work on how sound was interpreted in the environment by the participants. Therefore a loose interview session with 10 of the participants from the experiment session was arranged. The answers from the interview session are difficult to quantify and present properly in the results section. They are briefly discussed here in the discussion. The 10 selected participants were asked about their behavior and what implications the sound might have had on them. One player states that he rather explores what he calls safe areas before approaching a sound like this. 7 out the 10 selected participants had similar reasoning when they were asked about their strategy. It is therefore safe to introduce the idea that the sound in the scenarios had an implication on the players decisions.

5.4 Quality of the experiments - Questionnaire

In figure 6 and 7 there are results from the questionnaires. The participants did not seem to be confused about the experiments, which means that the instructions were somewhat clear. The participants also seemed to take their time when making the decisions. This makes the paths from the experiments a little bit more trustworthy. It is though important to remember that the experiments were made in a small scale with less than 100 participants. This could bring some suspicion, but the experiments still tend to show that decisions made by humans when gaming are due to environmental factors.

One interesting result from the questionnaire is that the participants from scenario 2, claim that they are very likely to make other decisions in another themed environment. The participants from scenario 1 seem to be a little bit unclear on this topic. On the other hand, the participants from scenario 1 claim that they would rather use the weapon if they had more bullets. The participants from scenario 2 would not do the same. The difference in the answers of the questionnaire, must mean that the environment matters when it comes to decision making.

5.5 situational awareness in games

When listening to the answers of the participants about their behavior, more connections were made to SA. As already cleared out in this report, SA states
that the actor or player in the environment is aware of the surroundings around them. They make their interpretations in regards to their surroundings (Lundberg 2015). When reasoning about SA, sound can be seen as another dimension that provides the actor with a further explanation of the current situation. The environment has its own ability to describe itself and its content to the observer, visually and in terms of sound. When the observer starts interpreting the environment or area, it is believed in SA that he accesses his own database in form of memories and hence forming his individual interpretation of the current situation. The experiments have shown that the potentially same process occurs when the observer is confronted with a game like environment. The observer or player then decides on a proper path in the game like environment according to his interpretations and what seems most logic and most advantageous for the specific environment. According to SA, the evaluation occurs in advance to earlier knowledge and experience.

The experiments conducted in this project have been constructed with SA in mind. SA is defined as three levels when it comes to decision making, the levels are as follows: (1) awareness of information, (2) comprehension of its meaning, (3) projection of future status (Endsley 1995). Below is an explanation of how a psychological field used in the military can explain some behaviors in games. Any earlier research on SA discussing human behaviors in game like environments has not been found, so this project is believed to have a unique approach of SA.

5.5.1 Awareness of information

There have been tendencies, demonstrating that the visual representation of an environment has an affect on the human decision making in games. By analyzing the results from the experiments, it is safe to say that a more detailed environment has a larger impact on the behavior of the perceiver than a simplified environment. It seems that a more detailed environment has the ability to describe the context better in the scope of the objective. The visual representation of the environment is therefore important when describing the situation for the player, since it creates interest. The two scenarios showed interesting results regarding the visual representation, namely that the paths from the more detailed environment were general 24% longer than the ones in the simplified environment. The reason might simply be confusion or that the player got a better understanding of the situation. Either way, it is safe to say that it somehow affected the player in terms of the decisions he made.

5.5.2 Comprehension of its meaning

The experiments had a room that the participants were able to search for clues. The participants tended to understand the room better with more details and context, it should always be clever to search for clues in a suspicious room. The only time the player would not do this, would be if he was risking to be discovered by someone. The game was a point and clicked based game, which means that the area and its components are static and not event triggered. So, there was no reason to not search the room. It seems that the visual representation could not explain the meaning of the room good enough to the participants.
5.5.3 Projection of future status

Sound played a big role in the experiments, the main idea was to give the participants a clue of where to go. It was believed that the participants would go straight to this room first but that was rarely the case. Instead the participants were using this dimension of the environment to interpret the situation as dangerous. They instead projected that something would go bad if this room was approached. The paths that were tracked, show a clear pattern that most of the participants preferred to browse the area for alternative routes. The behavior seems similar in both of the scenarios, but it is still interesting that the average length of the paths is longer in the more detailed environment.

5.6 Conclusion

The purpose of this project was to investigate if human decision making is due to certain environmental factors. The project has shown that the visual representation of the environment has an effect on the human decision making process in games. It is also believed that sound and vision play a big role when it comes to decision making in games. The game environment’s representation gives important information to the perceiver depending on the situation and the given task. It is therefore critical to design objects and elements in the environment depending on the goal. Ambient sound in the environment is thought to be amplifying the context with further explanation of the current situation. Individual sounds can instead be seen as key objects or entities that the player can interact with. All of these elements create SA for the player and, hence, it is of use, to apply SA knowledge when designing game like environments.

The type of experimentation that has been conducted in this project shows great promise when it comes to the understanding of human decision making in game like environments. It seems like this type of experimentation gives results that can help us understand human behaviors in games on a higher level. The experiment shows valuable results and can be done in larger scales with help of SA knowledge. Understanding of how humans interact and behave in certain game like environments, can lead to more advanced AI that could be used as NPCs in future games. The field of neuroevolution (NE) is especially strong in domains where the state of the world is not fully known, and is considered to be a handy technique for improving the behavior of NPCs in games (Stanley and Bryant 2005). NE searches through the space of behaviors for a network that performs well at a given task (Stanley and Miikkulainen 2002). Therefore, by giving NE models a better understanding of what different components of an environment actually mean, could create a more realistic behavior.

It is now clear that environmental factors affect the human decision making process in game like environments. The visual representation of the environment creates certain characteristics in the decision making process. Sound seems to have a big impact on the human behavior, since it describes to the observer what there is to expect in the environment. Both sound and the visual representation of an environment are considered to be important factors in the game like environment, because of their implications on the human behavior.
References


