Animated Online Advertisement:

Investigating the Impact of Different Shading Styles on Recognition

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The authors declare that they are the sole authors of this thesis and that they have not used any sources other than those listed in the bibliography and identified as references. They further declare that they have not submitted this thesis at any other institution to obtain a degree.

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Abstract

Background. Since e-commerce has grown rapidly the focus and attention towards online advertisement are critical. Twitch.tv, one of the big streaming websites had in April 2020 an average of 2.48 million concurrent viewers. Bigger brands have taken notice and started to invest in advertisements during e-sports and other online streams. This thesis has conducted an experiment that analyses the recognition of animated advertisements with different shading styles during gameplay streaming.

Objectives. This thesis compared animated advertisements shaded in two different ways. The advertisements were shown during a clip from a game. One of the shadings was a toon-shading which was the same art style as the game. This was compared with Unreal Engine 4's standard shading (Default Lit with Surface as Material Domain). The aim was to find out which of the shading styles were more likely to be recognized.

Methods. An experiment was conducted where participants watched a clip of gameplay from Borderlands 2. At certain moments during the clip different advertisements would appear for a short time, one at a time. The advertisements had different shadings, toon-shading, or standard-shading. The goal was to find out which type of shading participants would recognize more than the other. The participants answered a survey after watching the clip where they chose from different images. The images were either images of the animated advertisement or mock images to test what the participant recognized.

Results. The data gathered from the survey showed that the standard shading in Unreal Engine 4 had a recognition rate of 75.0% whilst toon-shaded characters had 82.7%. This means that there was a difference of 7.7% in the rate of recognition between the shading styles. There were a total of 26 participants between the ages of 19 to 30.

Conclusions. The expected outcome was that the users would not recognize the cartoon styled advertisements since it would blend into the gameplay of Borderlands 2. The standard shaded advertisements would not blend in with the gameplay and should have a higher recognition rate. The result, however, proved that the expected outcome of the experiment was incorrect. There were a few other noteworthy findings that can be further researched.

Keywords: Online Advertising, Human-Computer Interaction, Visualization

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Contents

Chapter 1

Introduction

As of the 17th of March 2020, the internet has reached a population of 4.5 billion [13]. This is a substantial increase from 3.3 billion recorded in 2016. With an increase in the internet population, an increase in e-commerce has been seen as well. Between 2014 and 2019 the worldwide retail e-commerce sales have increased from 1336 billion U.S. dollars to 3535 billion U.S. dollars[5]. Since e-commerce has grown this rapidly the focus and attention towards online advertisement are critical.

Another rapidly growing market is the online streaming of games. One such example is the League of Legends 2019 World Championship. It reached almost 4 million viewers[3] which is approximately doubled from 2018[2]. Twitch.tv, one of the big streaming websites had in April 2020 an average of 2.48 million concurrent viewers[15]. The increase and growing market of e-sports and streaming have reached a point where bigger brands have taken notice and started to invest in advertisements. Riot Games, the League of Legends' developer, have had several sponsors[14], but they have been inconsistent in how they present the advertisements.

Advertisement online has been researched extensively. Efforts have been made to seamlessly put video advertisements in videos. An example of this was the research made by Yadati et al. that created CAVVA[16]. The idea was to use the 0-1 Non-linear Integer Programming paradigm to identify the advertisement's insert points and select suitable advertisements simultaneously. Mei et al. did similar experiments with their software VideoSense[10]. Other research has been made on website advertisements such as an experiment done by Hong et al.[4]. They experimented by creating a custom made website. Some titles on the website would be animated and participants were tasked to purchase different items. With eye-tracking, they concluded that animated titles had a longer duration of fixation by the participants as well as increasing the attention of the participant overall. These articles have helped when designing this experiment but none of these articles target the growing market of e-sport and streaming services. Thus this thesis has conducted an experiment that analyses the recognition of animated advertisements with different shading styles. This experiment aims to fill part of the gap in this research area.

This thesis used gameplay from Borderlands 2, due to its cartoony art style, to analyze the recognition of animated advertisement. Animated advertisements have shown to have a higher probability to be recognized [11]. The point of this experiment was to analyze different shading styles in animated advertisements and to

test how it affects recognition. The experiment was conducted online where participants were tasked to view a clip of Borderlands 2 during a game where two different shading styles of animated advertisements were shown. The advertisements were animated and either shaded in a "cartoony" style, with toon-shading, also known as cel-shading, which mimics the art style of the game, or Unreal Engine 4's standard shading (Default Lit with Surface as Material Domain). Each type of animation advertised its custom made brand that had its own custom made logo. The participants were then asked to answer a survey to identify what brand logos and animations they could recognize.

1.1   Research Question and Objectives

As stated above, a gap was identified when researching the area of advertisement in e-sport and streaming services. Part of that gap was that not a lot of research had been found in what shading of animated advertisements has a higher recognition rate. This led to a discussion that finally arrived at the research question in this thesis. An experiment was designed that aimed to answer the research question and thus fill part of the gap identified in the research area.

In conclusion, this thesis aims to fill part of the gap identified in the research area of online advertisements for e-sports and streaming services and will focus on the following research question:

- During gameplay streaming, do different shading styles applied to animated advertisements influence viewer recognition? In particular, is an advertisement with a shading style similar to the game it appears, recognized less compared to an advertisement with a different shading style?

To ensure that the thesis answered this question a few objectives had to be completed:

- Create and record animated advertisements with two different shadings using Autodesk Maya, Unreal Engine 4, and Open Broadcaster Software.

- Create brand logos in Adobe Photoshop and record a clip of gameplay from Borderlands 2.

- Edit two clips of gameplay and add animated advertisements that pop up during its duration to simulate a stream experience.

- Ensure that the experiment is free of risk for any participant and create a survey that tests recognition.

- Gather results by having participants complete the experiment and answer the survey.

- Collect and analyze the results to compare with the research question and hypothesis.

1.2 Hypothesis and Expected Outcome

The hypothesis for the study is:

- The cartoon-shaded animated advertisements will blend in with the gameplay and be less recognized than the standard shaded animated advertisement.

The expected outcome for the experiment was that the users will not recognize the cartoon styled advertisements since it will blend into the gameplay of Borderlands 2. The standard shaded advertisements will not blend in with the gameplay and will have a higher recognition rate.

Chapter 2

Related Work

When designing the experiment for this thesis the research below has been taken into account. Online advertisement is an area that has undergone extensive research, an example is the efforts made to put advertisement videos in videos as stated in chapter 2. In this experiment, a video in video setting was used to simulate a stream experience.

Animated advertising on websites has also been investigated and researched. Liu et al.[9] conducted an experiment testing interaction effects of webpage complexity and banner animation. Using participants a test was made to compare fixation on low-complexity as well as high-complexity custom-made websites. In conclusion, the result showed that on both types of websites, the animated advertisements drew more fixation for a longer duration as well as having a higher chance to be remembered. The study of the effects of animation on commercials has also been researched. In an experiment done by Hong et al.[4] an experimental website was created. With eye-tracking different participants were tasked with purchasing a specific item. Some participants had non-animated titles on the products whilst some participants had one of their titles animated. This research concluded that the animated titles had a longer duration of fixation by the participants as well as increasing the attention of the participant overall. Their theory was that the participants got more attentive and therefore paid more attention to everything on the website in general.

A different experiment conducted by Seo et al.[11] analyzed e-sports by having participants look at a game during a battle scene whilst having advertisements on the sides of the screen. The advertisements were either animated or still, then a comparison was made with results where participants looked at the same game but during a non-battle scene with advertisements. This was also tracked using eye-tracking technology, comparing fixation count and fixation duration. Even though the game itself is animated the results still show that participants looked more at the animated advertisements than the still ones. This also applied during battle scenes. These articles prove that animation in an advertisement is more effective than still ones.

Zhang and Yuan[17] aimed to assess which advertisement element-related eye movement behaviors could predict advertising effectiveness. It was found that eye movements on product elements tend to positively related to the effectiveness of the ad, while the eye movements on brand elements tend to negatively. Eye-tracking used when researching advertisements can be effective and was considered when creating

this thesis. The school of Blekinge Institute of Technology owns different eye-tracking hardware and students are allowed to use it, unfortunately, it was unavailable for this experiment due to COVID-19.

In an experiment by Kim et al.[8] to test how the amount of advertising exposure affected recollection and purchase intention it was found that with increased advertising exposure, a positive effect followed.

An experiment that Roettl and Terlutter[12] carried out let participants play a "jump'n'run" video game in 2D and 3D with the objective to collect brands to advance to the next level. To measure recollection and recognition participants then wrote down and picked from a list of brands. This technique seems to be the standard when measuring recognition and the survey used in this thesis will be shaped similarly.

These articles were instrumental when designing this experiment. All the articles have been taken into account when completing this thesis.

Chapter 3

Method

The experiment in this thesis was designed to answer the research question. Since this question is focused on the recognition of shadings, two different shadings were created. One of the shadings created was specifically designed to mimic the art style of Borderlands 2 since the hypothesis was that the advertisements might blend in with the gameplay. This first shading was called toon-shading since it has a cartoon style to it. The other shading was decided to be a regular shading and so the standard shading of Unreal was used.

In streaming services, there is an industry-standard formula that most advertisements follow. The standard for these advertisements is to have a short animation for the product and then show a still image of the brand logo. Since the vast majority of animated advertisements in streams are designed this way it was decided to create similar advertisements in this experiment. Four of these advertisements were created for this experiment, two with standard shading and two with toon-shading. Two meshes were animated to be shaded and recorded. To guarantee that the only difference between the two advertisements was the shading, one mesh, and its' animation was recorded twice, once with each shading, see Figure 3.1. The other mesh was also recorded twice, once with each shading. To complete these four advertisements custom made brand logos were created to be used as still images after the animations. The logos were custom made so that no participants could recognize the logos from past experiences. Since this thesis focuses on streams a five-minute clip was recorded of gameplay from the game Borderlands 2 to simulate a stream experience. The gameplay was edited to have the advertisements pop up evenly distributed throughout the clip. The advertisements took up a small part of the screen when playing, see Figure 3.4. The advertisements had the animation play for four seconds and then a custom made brand logo showed for four seconds.

To test the recognition of participants it was decided to use a survey similar to an experiment by Roettl and Terlutter [12]. In their experiment, mock brand logos were used to test recognition. For this experiment, it was decided to use two mock meshes shaded with the two shadings discussed when testing recognition of the animations. All meshes can be seen in Figure 3.2, the four left meshes are mock meshes used for the survey. Mock custom made brand logos were also created to test recognition for the still logos in the clip. All logos can be seen in Figure 3.3, the bottom four logos are mock logos used for the survey.

3.1   Creating the Advertisements

In the experiment there were two meshes used, one was from made from scratch by one of the authors. The other mesh was downloaded from a web page that has 3D models [1] and this model had a royalty-free license. Both meshes were rigged and weight painted for animation in Autodesk Maya 2017[1]. Since limiting the factors of recognition is key in this experiment a deliberate choice was made to keep the same animation for both shadings on each mesh. This results in one animation per mesh that was used for both shadings in the advertisements. When both meshes had been animated and textured, done in Maya, they were exported with Mayas .fbx exporter and imported to Unreal Engine 4[2]. Two extra meshes were later downloaded from [1] to create mock advertisements for the survey.

3.1.1   Setup and Recording Animations

In Unreal Engine, a scene was set up to show the mesh animations. When creating this scene the intention was to have a background that would not take attention away from the animated mesh. When watching the clip it was noticed that the game has a blue tone to it so a light blue background was chosen as seen in Figure 3.1. The meshes in the advertisements were recorded twice with different types of shading. The first shading used was the standard-shading that Unreal Engine offers. In Unreal Engine, the materials have an option called shading model. The shading model controls how the material reflects incoming light. This means that it determines how the material's input data will be used to create the final look. It also has an option called Material Domain. Certain material attributes are only available in certain domains. An example is vertex normals which are only valid on a surface. The standard shading has Default Lit as its shading model and Surface as the option on Material Domain. This gives the material access to certain parameters. The parameters available and used are Base Color, Metallic, Specular, Normal, and Roughness. The Metallic, Specular, and Roughness are all set to default. This means that the materials will not behave like metal since the default value of Metallic is 0. The default value of Roughness and Specular is 0.5. The other shading used was toon-shading. The toon-shading, also known as cel-shading was achieved by implementing a post-process effect that adds black outlines on the meshes. Post-processing is commonly used in 3D rendering. The scene is first rendered to a buffer in the memory of the video card before being rendered to the display. To implement toon-shading in Unreal Engine a new material needs to be created and changed from Surface to Post Process in the Material Domain category. This allows the material access to the G-buffer in Unreal Engine's rendering pipeline. In the deferred rendering or deferred shading pipeline, the scene is being rendered twice. The first pass stores geometrical information in the G-buffer which is then used in the second rendering pass. The toon-shading is mainly implemented after Unreal Engine's tutorial on cel-shading[7], but with some new additions. To easily be able to adjust and adapt, parameters have been added to change the thickness of all lines. This means that the thickness no

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[1]https://www.autodesk.com/products/maya/overview?support=ADVANCEDplc=MAYAterm=1-YEARquantity=1

[2]https://www.unrealengine.com/en-US/

longer needs to be "hard-coded" in the material. An option for each object to apply the shading where ever they are in the scene has also been added. This is instead of using "Post Process Volume", a bounding box which specifies an area where the effects will be applied.
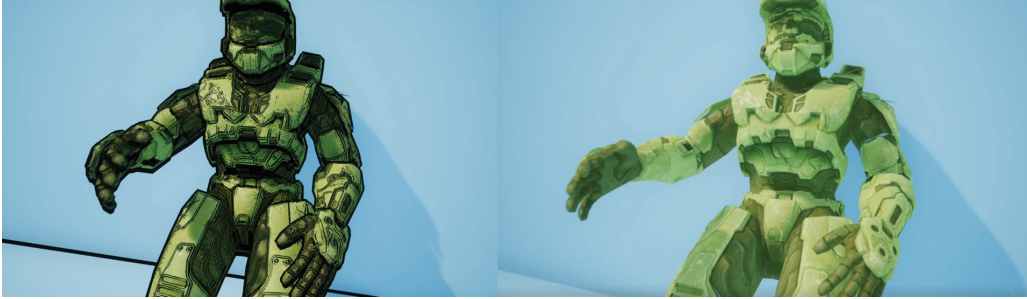

Figure 3.1: Example of an animation in progress in the Unreal scene. The left is has the toon-shading applied and the right has the standard shading.

The animations were recorded using Open Broadcaster Software (OBS)[3]. When recording variables of recognition were taken into account. The same viewpoint and lighting were used for all recordings. Both meshes were recorded twice with the only difference being the shading. Each recording was cut down to exactly four seconds to later be used in the experiment clip as advertisements.

Figure 3.2: All characters. The top characters have standard shading while bottom characters have toon-shading. The four characters on the right are mock characters.

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[3]https://obsproject.com/

3.1.2   Completing the Advertisements

A short animated advertisement for most companies is a commercial for a specific product. This usually ends with the logo of the brand to show consumers which brand sells that product. Since this has become the industry standard this experiment sought to mimic that formula. Thus brand logos were created in Adobe Photoshop[4]. A total of eight different brand logos were created, four of them that were used after the animations, and four were used as mock brand logos in the survey. When creating the brand logos a deliberate choice was made to keep all of the logos on a greyscale to lower variables of recognition. This can be seen in Figure 3.3 where the top four logos are the ones used in the clip and the bottom four logos were used as mock logos in the survey. The two animations with two shadings each that were created earlier got assigned one of the four brand logos each. There were now four advertisements completed with an animation playing for four seconds and a brand logo showing up for four seconds directly after. The only thing missing now was gameplay to put the advertisement during.
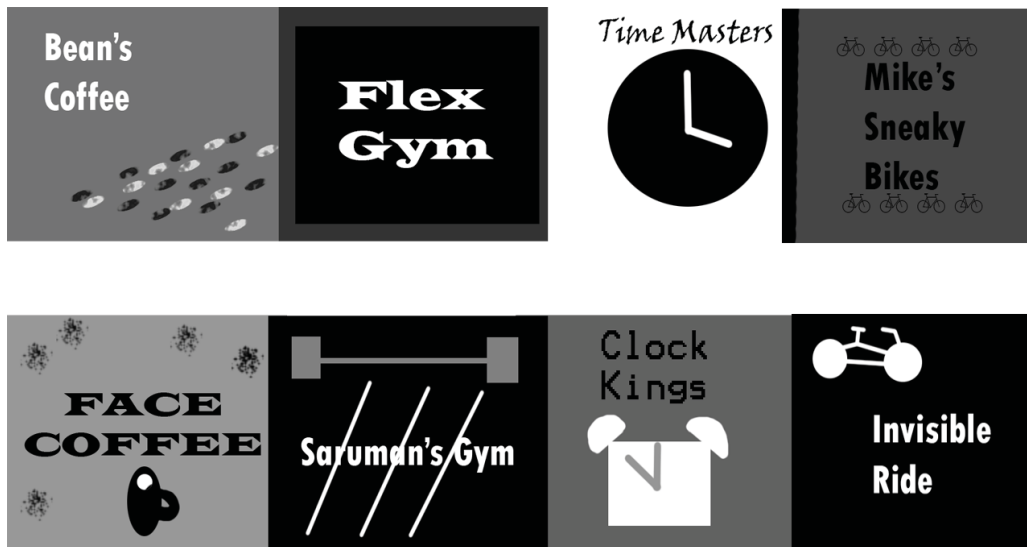
Figure 3.3: All logos. Bottom four are mock logos.

3.2   Creating the Clip

To test the research question it was decided to use gameplay from Borderlands 2. This was because the game has an art style similar to that of the toon-shading. The advertisements created were designed to mimic the industry standard of streaming services. Using OBS Open Broadcaster Software a five-minute clip was recorded of gameplay from Borderlands 2. The gameplay chosen was normal gameplay of Borderlands 2 where the player takes out a few camps of enemies to simulate a streaming

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[4]https://www.adobe.com/se/products/photoshop.html

experience.

The advertisements were played at 1:00, 2:00, 3:00, and 4:00 minutes into the clip. The order of the advertisements was decided to be every other toon-shaded and every other standard-shaded advertisement. To collect valid data a book was used, written by Cunningham et al.[6]. In this book, the authors describe something called the "Order effect" where the definition is "Order effects refer to differences in research participants' responses that result from the order (e.g., first, second, third) in which the experimental materials are presented to them". The problem with the order effect in this experiment would be that the order in which the advertisements are presented may affect the outcome of the survey. To void the order effect in this experiment two different clips were created, where the order of the advertisements was swapped around. All editing of the clips was done in Lightworks System Software[5]. Now that two clips were completed with advertisements the experiment could start.

3.3   Ethical Investigation

Since the experiment was done with human participants an internal ethical investigation was made. When investigating several factors were considered. The clip was designed so that there were minimal risks of causing an epileptic seizure. In the invitation letter, it was described that participants who had a history of epileptic seizures or sensitivity to motion sickness should not participate. No participants under the age of 18 were allowed to participate. Participants were informed that they had the option to cancel the study at any time without giving any reason. The information that the participants provided was private only the authors could see it. The information provided was also anonymous and aggregated. This was all presented in the invitation letter and with that, in place, the ethical investigation was concluded.

3.4   Survey

The survey for the participants was done in Google Forms. The survey started with an invitation letter which informed the participants of the basics of the experiment. Each participant then had to confirm their participation in a consent form. The next part of the survey was to watch the clip, 13 out of the 26 participants watched one clip while the other 13 watched the other clip. This was the same clip with advertisements in a different order. Each clip ended with a password that was needed to proceed in the survey to make sure every participant watched the entire clip. The clip was automatically started in full screen and participants were asked to make sure to watch the clip only once. This was because the survey was about recognition so watching the clip again would compromise the results. Participants were also instructed to watch the clip on a computer with audio for the full experience of the clip and also not to be distracted by other sounds. In Figure 3.4 Borderlands 2 gameplay can be seen with an advertisement with toon-shading. The standard shading can be seen in Figure 3.5.

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[5]https://www.lwks.com/

The questions that followed in the survey of this experiment were based on an experiment done by Roettl and Terlutter[12] as referenced in chapter 2. This experiment was done differently however so naturally the survey was designed with that in mind. Roettl and Terlutter forced the participants to chose between the real advertisements and mock advertisements, in one question at a time. This is known as a two-alternative forced-choice. This experiment instead allowed the participants to have access to all of the options from the start. The reason for this is that if the survey had been designed like Roettl and Terlutter, and the same mesh appeared twice, the second time with different shading, the participants might get confused since they had already seen that mesh. That could then lead to them going back and rechecking their answers. This experiment allowed the participants to select "I don't remember any", which Roettl and Terlutter had as an option as well.

The first question of the survey was the participant's gender with the options male, female, or prefer not to say. The second question was the participant's age. In the invitation letter, it was stated that the participants had to be at least 18 years old to be allowed to participate. The third question asked participants to describe their level of experience with first-person shooter games on a scale of 1-5. In the fourth question, the participants were tasked with checking boxes of the logos that they could recognize from the clip. There were eight logos to chose from and four of them were correct while four were mock logos. The participants had the option to check all eight boxes or check a box that said "I don't remember any". In the fifth, last question, there were images of the meshes that were animated in the advertisements. There was a total of eight images and participants could check that they saw them all but only four were actually in the clip while four of them were mock meshes. Here the participants also had the option to answer "I don't remember any".

Figure 3.4: Borderlands 2 with toon-shaded advertisement

Figure 3.5: Borderlands 2 with standard shaded ad

Chapter 4

Results and Analysis

The data gathered from the survey came from a total of 26 participants that had signed up and agreed for participation. The participants consisted of twenty males and six females, ranging from the age of 19 to 30. Figure 4.1 shows the participants' experience with the first-person shooter genre. 12 out of 26 choose the highest experience available. There were thirteen participants for each version of the experiment. The visual experiment had each participant watch a clip of gameplay from Borderlands 2 before answering a survey. The results from the survey consist of the comparison between the recognition of different shading styles on animated characters using the same texture and same animation. Experiments such as the one made by Seo et al.[11] has concluded that still advertisements don't receive as much attention as animated advertisements. Therefore the results of a comparison between logo recognition and animated character recognition will be presented as well, even though it was not a part of the research question.
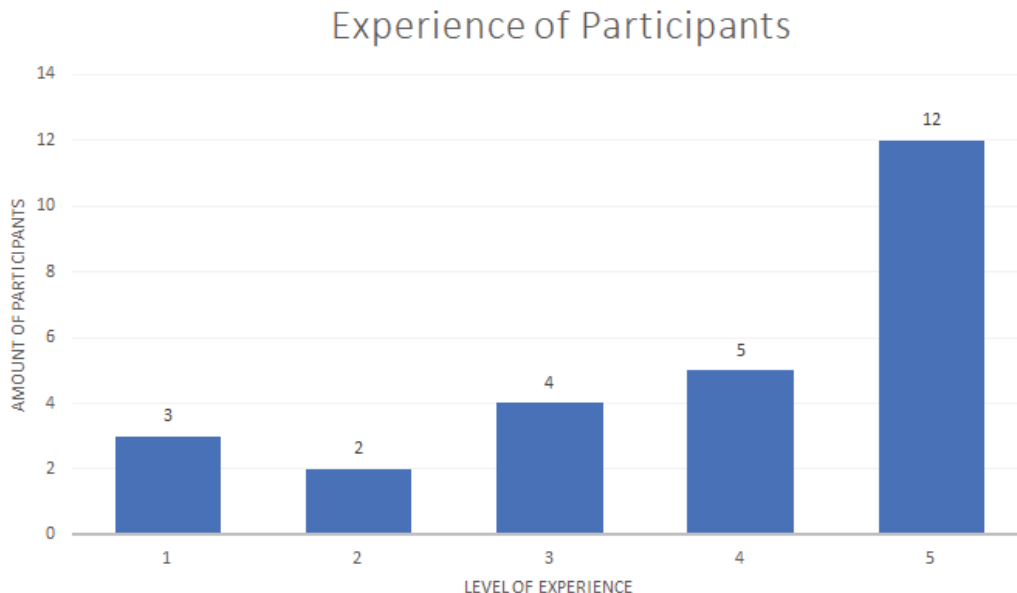
Figure 4.1: Scale of the experience in first-person shooters of participants. Highest, 5, is extremely experienced and lowest, 1, is not at all experienced.

4.1 Shading Comparison

Figure 4.2 shows a comparison between participants' recognition of animated characters with different shading. Figure 4.2 shows that the characters shaded with Unreal Engine's standard shading had a recognition rate of 75.0% whilst toon-shaded characters had 82.7%. According to the results, there was a difference of 7.7% in the recognition between the different shading styles with the higher belonging to the toon-shading.
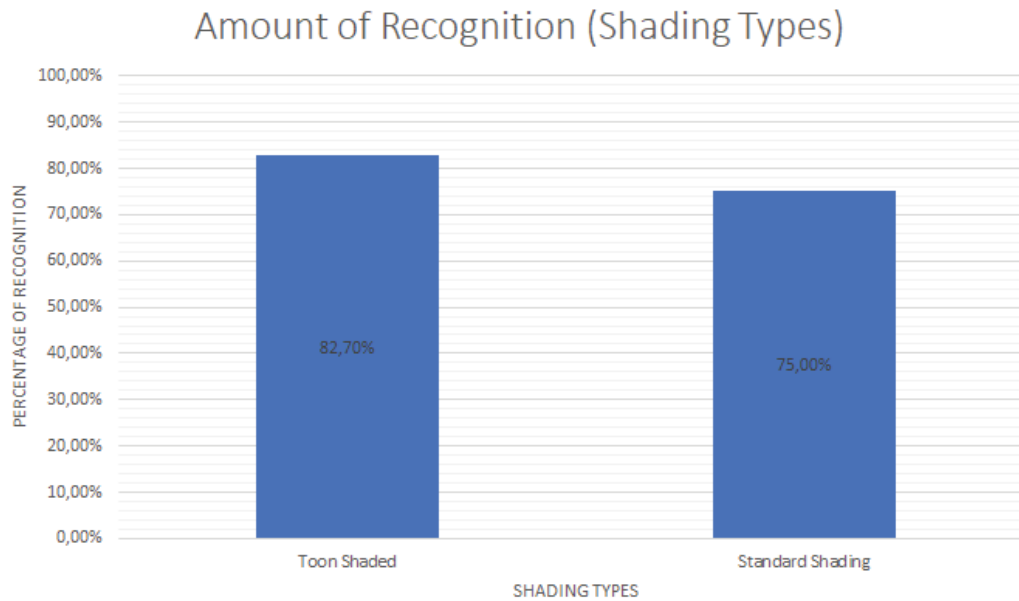
Figure 4.2: Comparison between standard and toon-shading.

4.2 Logo, Animated Character Comparison

The fourth questions in the survey asked about the brand logos. Figure 4.3 shows the amount of recognition the logos received from the participants. A large majority of the participants were able to recognize the correct logos. The fifth question asked was about animated characters. Figure 4.4 shows the amount of recognition received from the participants including a false recognition of "Mock 1" which did not appear during the clip showed. Figure 4.5 shows the total amount of correct recognition received by each of the animated characters as well as the brand logos. The animated characters received 82 amount of recognition in total while the brand logos had one more, therefore 83. The incorrect answer, due to the mock image, has not been added to the total amount of recognition.
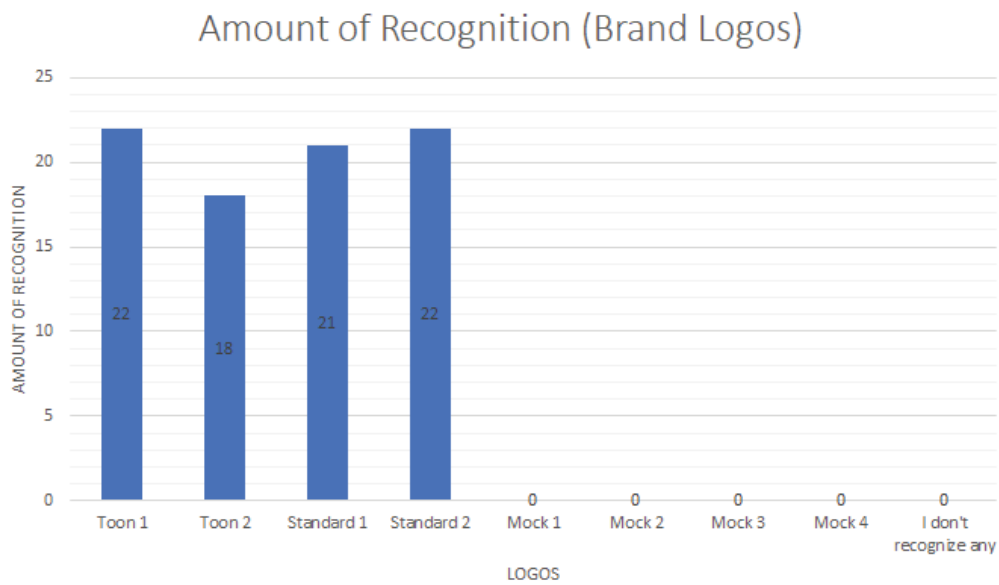
Figure 4.3: Logo recognition.
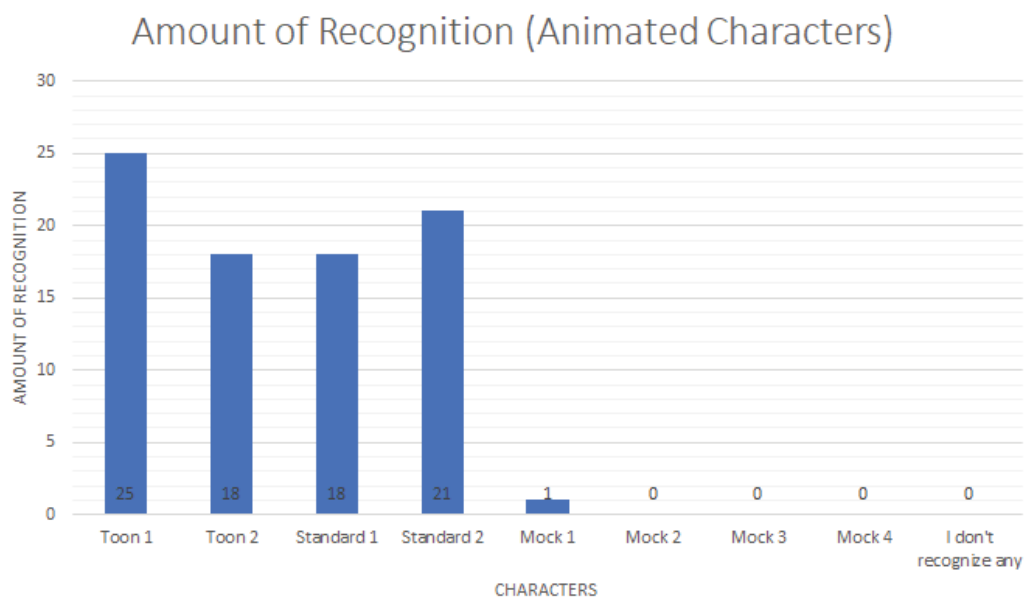
Figure 4.4: Animated character recognition.
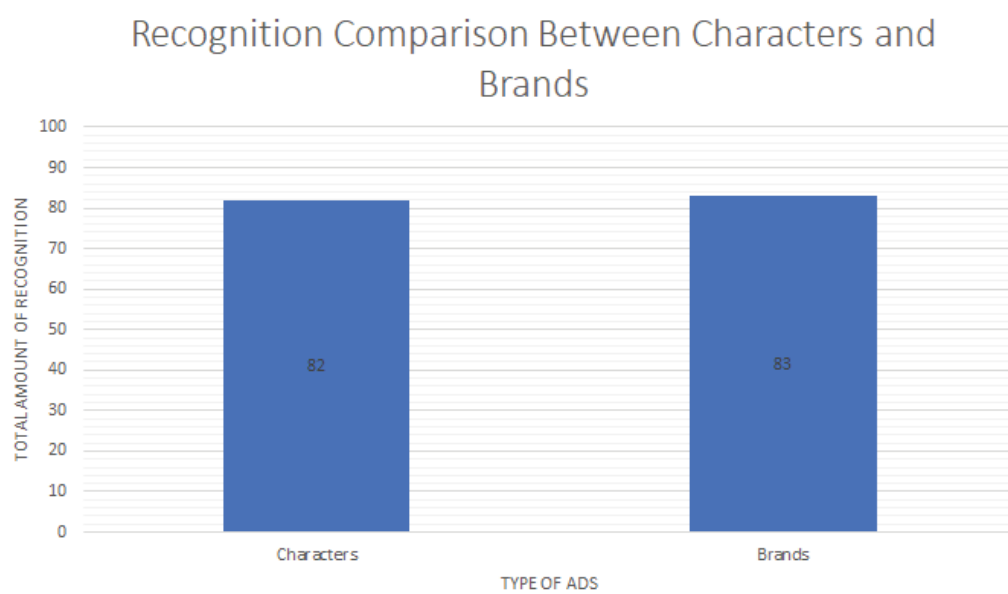
Figure 4.5: Comparison between brands and animated character.

Chapter 5

Discussion

The research question "During gameplay streaming, do different shading styles applied to animated advertisements influence viewer recognition? In particular, is an advertisement with a shading style similar to the game it appears, recognized less compared to an advertisement with a different shading style?" was decided after realizing a limited amount of research had been made in this particular area. When designing the experiment for this a lot of attention went into the process of designing it so that the only variable that was different between the advertisements was the shading. This process involved stripping down the number of meshes used for animation, using fewer textures for the meshes, and limiting the number of animations. A technique that was considered was using eye-tracking when conducting this experiment. The hardware was unfortunately not accessible for this thesis.

The result gathered from this experiment answers the research question with a 75.0% recognition rate on standard-shading while recognition of toon-shaded advertisements landed at 82.7%. Due to Covid-19, there was no possible way to control the environment of the participants since all experiments were done from their own homes so it could be argued that the result may just be a matter of coincidence.

The difference in recognition from standard-shading compared to toon-shading was 7.7%, this suggests that the toon-shaded advertisements were easier to recognize. This is the opposite of what the hypothesis for this thesis would suggest. Since the toon-shaded advertisements were similar to the art style of Borderlands 2 it was expected that these advertisements would blend into the gameplay and not be recognized as much as the standard-shaded advertisements. However, this result proves the opposite to be true. This leads to the question if toon-shaded advertisements are always recognized more than standard-shaded advertisements regardless of the gameplay. The art style of Borderlands 2 is somewhat unique when it comes to games since most games now focus more on looking realistic. This is easier to do because of the advancement in technology. The result in this thesis could suggest that toon-shaded advertisements might have an even higher chance to draw visual attention while showing gameplay of a more realistic looking game. If the experiment was designed differently it could be argued that the result would be higher in favor of toon-shaded advertisements. However, this experiment was designed this way with a game like Borderlands 2 where the toon-shaded advertisement does not differ too much from the art style of the game. Despite that, the result points towards a toon-shaded advertisement being easier to recognize.

5.1   Other Findings

The fact that animated advertisement is easier to recall, has higher recognition and demands higher visual attention compared to a still advertisement that has been proven many times. One example of this is the experiment[11] described in chapter 2. In this experiment, the still advertisements had four seconds of screen time, same as any of the animated advertisements. Both the animated advertisements and the still logos had overall the same amount of recognition. This was unexpected considering research pointing towards the opposite result. However, this experiment was not designed to assess this. This could be interesting from the viewpoint of a company investing in advertisements. A possible explanation to the logos having high recognition is of course that the animated advertisement played before the still advertisement showed up, therefore attention was already drawn towards that place on the screen. This is the most probable scenario, but the fact that the still advertisements had the same amount of recognition is still interesting. This provides reason to believe that putting a logo after an animated advertisement might make consumers recognize the logo. This might be desirable since most brands sell more products than one advertisement can show.

Another possible explanation that has been tested is the theory that participants get more aroused when seeing movement. Thus animated advertisements can cause arousal which makes participants pay more attention to everything in general. This is at least the theory that Hong et al. concluded in their experiment [4], where they proved that animation cause participants to have increased attention overall. This would also explain why participants in this experiment recognize still logos at an equal ratio as the animated advertisements.

5.2   Affecting Variables

Several factors can have affected the data gathered from the survey, but could not be controlled, such as:

- Each participant has their own setup at home with screen size and brightness options.

- Time of day might affect, for instance, if done late at night, the participant could be tired.

This is due to the unfortunate outbreak of Covid-19 and there was no safe way to control these variables.

Chapter 6

Conclusions and Future Work

6.1 Conclusion

The market for online advertisement has always been large and therefore a lot of research has already been made in the area. Some efforts have been made to put video advertisements in a video for example CAVVA [16], another example is Mei et al.[10]. However, none of these methods work with the streaming services that are growing today. In the area of advertisement for streaming services, little research has been made. This experiment sought to fill part of that gap which can be considered relevant due to its rapid increase in attention as seen in e-sport scenes. For games such as League of Legends which doubled its viewers from the year 2018 to the year 2019 [3][2] and for streaming services, in April 2020 Twitch.tv had an average of 2.48 million concurrent viewers[15].

This experiment was carried out in a less than ideal way due to Covid-19 as mentioned and other problems arose when dealing with different software. Software that usually can be provided by the school of Blekinge Institute of Technology could not be accessed due to the school being closed so there was some improvisation needed. However, the overall response to the experiment was positive and all the hindrance was dealt with. To answer the research question the results point towards the cartoon styled advertisement having a higher recognition rate by 7.7%. This means that the hypothesis can be concluded as incorrect which leads to the question if toon-shaded advertisements always have a higher recognition. Comparing art styles, shading and other variables could be further researched to shine a light on what advertisements would be most effective. This could help streaming services and companies interested in investing in advertisements be more effective in the future.

An interesting result of the experiment was the fact that still advertisements had the same amount of recognition as animated advertisements. This was not expected and is not supported by most research that instead of points towards the opposite. An example of this is the research that Hong et al. conducted[4]. The experiment was not designed to assess this and the animations were placed right before the logos so a case can be made that the animations are the actual reason for high recognition on the logos.

6.2   Future Work

In this study, results have shown that participants were more likely to recognize toon-shaded advertisements compared to Unreal Engine 4's standard shading. This result does not support the hypothesis. An experiment that could be made is trying the same experiment on a game with a different art style. Another possible way to execute this experiment would be with eye-tracking. Further testing would also include larger participant scale, different background color, controlled environment (setup) to lead to more reliable results. The brand logos could also be shown without following the animated advertisements to test the recognition differences between them. The results gathered in this study can be used for commercial purposes to improve advertisement revenue, other e-commerce related things or to understand more about the human interception/recognition. Additionally with these results, further examining how different shading techniques affect recognition can be made.

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Appendix A
Supplemental Information

A.1   Thesis Project Survey

Thesis Project Invitation

You have been invited to participate in a study on visual techniques applied to gameplay streaming.

We are looking for participants over 18 years of age.
Participants should have normal or corrected to normal vision as well as not suffer from color deficiency problems. It is also recommended not to participate if you have a history of epileptic seizures or sensitivity to motion sickness.

Participation is voluntary, and you can cancel the study at any time without giving any reasons.
The experiment contains one session and lasts no more than 15 min.

In this experiment you will be asked to watch a clip of gameplay from Borderlands 2. The clip is about 5 minutes long. After the clip has been watched there is a survey that is required to be filled out and answered as truthfully as possible.

By signing the consent form you agree to your personal data being processed within the framework of the thesis/study described. All data is collected anonymously. The results of all participants will be aggregated and no individual results that link to you personally will be reported in any form. After the experiment is conducted the results will be saved offline for analysis and deleted from google forms.

This study is conducted by students of the Blekinge Institute of Technology. If you have any questions, please contact any of us using the information below.

Contact information:

Student's name: Filip Grendler
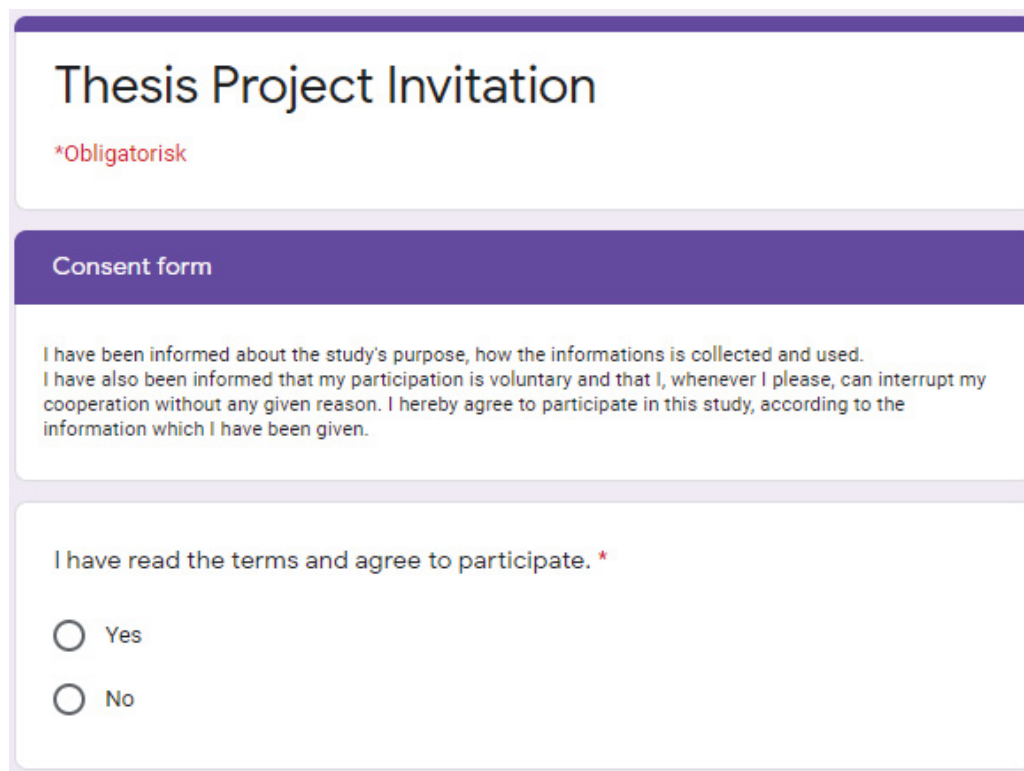
Blekinge Institute of Technology

Student's name: Nicolas Wallenskog

Blekinge Institute of Technology

Supervisor's name: Valeria Garro
Supervisor's email address: vgr@bth.se

Figure A.1: Thesis project invitation

Figure A.2: Consent form

Figure A.3: Thesis project clip

Figure A.4: Beginning questions

Figure A.5: Brand recognition part 1

☐ Logo 3   ☐ Logo 4

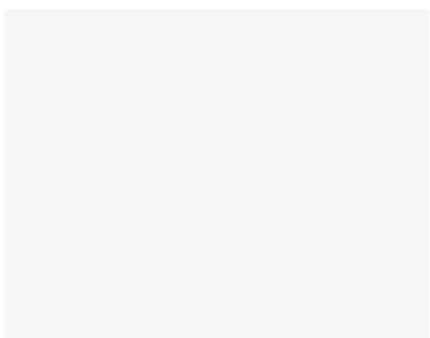☐ Logo 5   ☐ Logo 6

☐ Logo 7   ☐ Logo 8

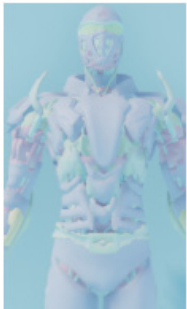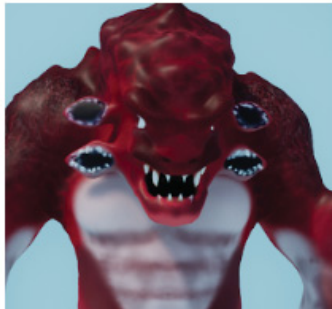☐ I don't remember any

Figure A.6: Brand recognition part 2

Figure A.7: Animation recognition part 1
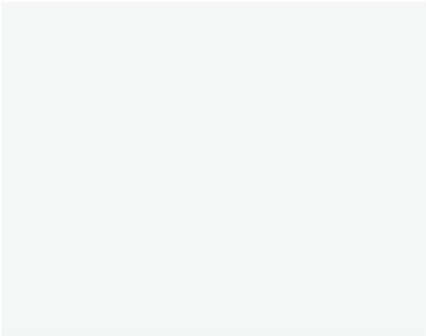
Figure A.8: Animation recognition part 2