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**School of Computing and Mathematical Sciences**

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Adaptive Soundtracks in Video Games

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**ABSTRACT**

Many game studios still use linear soundtracks despite other music composing methods being out there, resulting in methods such as generative music not having widespread attention around the game industry. This is a problem because linear soundtracks aren’t as dynamic or efficient at transitioning compared to other methods, and listening to the same loop over time starts to become repetitive and less effective against the player’s emotions.

To approach this problem, a prototype video-game with a beginning to end is to be designed and developed which supports multiple methods of composing soundtracks, one of those methods has to be linear and the other being an experimental choice of either adaptive or generative music. Using a between-groups method, participants will invited to play through the prototype after they have filled out a consent form which explains the tasks they’ll be completing. One group will get to play the game as it plays linear soundtracks, while the other group will play it with the experimental method of playing music. Personal monitor devices will be used to discover each player’s emotions, such as using a heartrate display, and each participant’s session will be audio-recorded for looking back at results.

Judging by reviewed literatures, it is foreseen that the results of this project can be mixed. With generative music likely to be the experimental method of this project for its ability to create endless music, it is known to limit how much control human composers have over it. This can pose the risk that possibly music will not come out as well as expected which will throw off participants in the emotional experience. At the same time, with the lack of studios to ever touch generative music, perhaps it deserves a second chance.

# ADAPTIVE SOUNDTRACKS IN Videogames

## Introduction

Emotions are emitted from a living-being as a reaction from certain events. It fuels the mind with an urgency to act towards a desired goal. They come in different forms distinct from each other, and all take place in one’s mental state. Often times, emotions experienced from games are usually because of a goal in the virtual world the player is trying to achieve. Video games are a great source of emotions, due to the many forms of media that go into them such as character designs or visual scenery, but a very impactful form of media that effects player emotions is sound and music. Soundtracks are popular enough in human emotions that players are willing to purchase soundtracks separate from the game to listen to freely, releasing emotions of either positive or negative. (Thiparpakul, Mokekhaow, & Supabanpot, 2021)

Music is intended to have an effect on the audience’s emotions throughout video-games, playing a fundamental role in the experience. (Plut & Pasquier, 2019) Despite the creative potential in composing, many games choose to use linear music. When the player hears the average range of 1-4 hours of video-game soundtracks being repeated over again, it tends to become tedious and loses the effect of immersing the player. This is because most games choose to do a linear approach in music composure. (Pute & Pasquier, 2020) Development teams see it as a financial risk coming out their comfort zone to try something other than linear music, as it can come out to be worse than what they usually approach. This is especially the deal with generative music where it comes back to the problem linear music creates, being repetitive. (Pute & Pasquier, 2020) A composer for No Man’s Sky claims that generative music even produced worse music, which could further put off other composers from wanting to experiment with this form of music. Aside from funding however, the lack of use in generative music is also partially because it doesn’t have widespread attention. Some people in studios might not know about the existence computer-generated music. (Pute & Pasquier, 2020) With the listed reasons on why generative music is hardly touched by composers, it could perhaps be that not enough examples of it being used in games makes it seem like a risky choice to implement and experiment.

By having background music in video games, it can change how players play the game they’re playing by affecting their emotions so they feel more immersed within the experience. Because of the impact that music has on the player’s emotions, modern games are relying on music more as part of supporting the player playing. Even adjusting the tempo of music can make a difference. (Thiparpakul, Mokekhaow, & Supabanpot, 2021) If changing the tempo of music can effects the emotions of someone compared to how it would sound otherwise, then using adaptive soundtracks perhaps can prove to have a positive outcome in video games compared to the linear music most studios feel comfortable producing for target audience.  
  
This project aims to make soundtracks in video-games become more dynamic and less repetitive for the user to listen to, so that the time that they feel immersed within the experience can expand more compared to using linear soundtracks. By increasing the time that a player can feel immersed in a game from its soundtracks, it can not only assist them in performing better, but also make video games achieve a better level of realism where music can relate more with the player’s current situation.

## Research aim and objectives

**Project aim:** To find ways at improving video game soundtracks so that the player may feel more immersed during gameplay.

**Objective 1.** Discover what methods can be used inside a game engine to improve soundtracks through other related researches. Generative music is of interest from prior research.

**Objective 2.** Design a software prototype through Unity engine that is suitable for participants to opt in the study with. Make sure the prototype use of different methods to playing soundtracks. Ex: There can be a setting to play linear soundtracks throughout gameplay, and another to use an experimental generative method.

**Objective 3.** Develop the prototype based on the design using Unity engine. Create any assets needed for developing the software prototype. Learn how to implement either generative music or adaptive soundtracks into the Unity project. Third-party assets are to be treated as a last-resort if any difficulties approach.

**Objective 4.** Have participants play through the prototype and collect answers for primary data. Using a between-groups study method, some participants will try the game which uses one method of playing soundtracks, whereas the other group gets to play the game as it uses another method. One of these methods is to be linear, and the other being a experimental method such as adaptive or generative soundtracks.

**Objective 5.** Use the collected primary data to see if the experimental method of playing soundtracks has better results compared to the other method.

## Research Approach

Objective one is the first step which simply involves discovering and reading through literature for discovering the current state-of-the-art in the project title. As a short phase, this takes two weeks to complete. In both weeks, a set of literatures would be collected and the week would be spent reading through them to pick up information that would be useful towards the research. This is the only objective complete as it is mandatory for initiating the research.

Objective two begins the start of the prototype design. It will be figured out through a storyboard on how the prototype is to work towards the participant’s comfort and collecting data from them using personal monitoring devices. This point in time, it will be decided which monitoring devices could suit best in discovering the player’s emotions to make sure that results produced from participant’s are accurate and assist in the project. The purpose of the prototype is to be a game with beginning to end that is accompanied by soundtracks. As a between-groups study, two methods of soundtrack production are going to be chosen, with one of them being linear and the other being the experimental method. The idea is to see how participants performed and felt from both groups, comparing how well the experimental method works to those who listened with linear soundtracks.

Objective three is the development process of the prototype design. It will be developed through Unity as it is the most familiar game engine which allows for cutting through time. The deliverable in this stage will be a windows build as research will take place on the University of Greenwich campus which makes use of Windows computers. As a prototype, it needs to be developed in a short amount of time to make sure it works fine, otherwise there could be the risk of not completing the project in time.

Objective four is the stage where participants come in. Each participant will be requested to play through the prototype from beginning to end while equipped with the decided personal monitoring devices. It will be avoided asking the participant questions during gameplay, unless there is a reasonable point in time during participation. Before each participant plays, it is suggested to find out if they play video-games often as they may be unusually more/less effected during research. Primary data will mainly come from the displays that are outputted from the personal monitoring devices, which will be noted onto a word document as a deliverable.

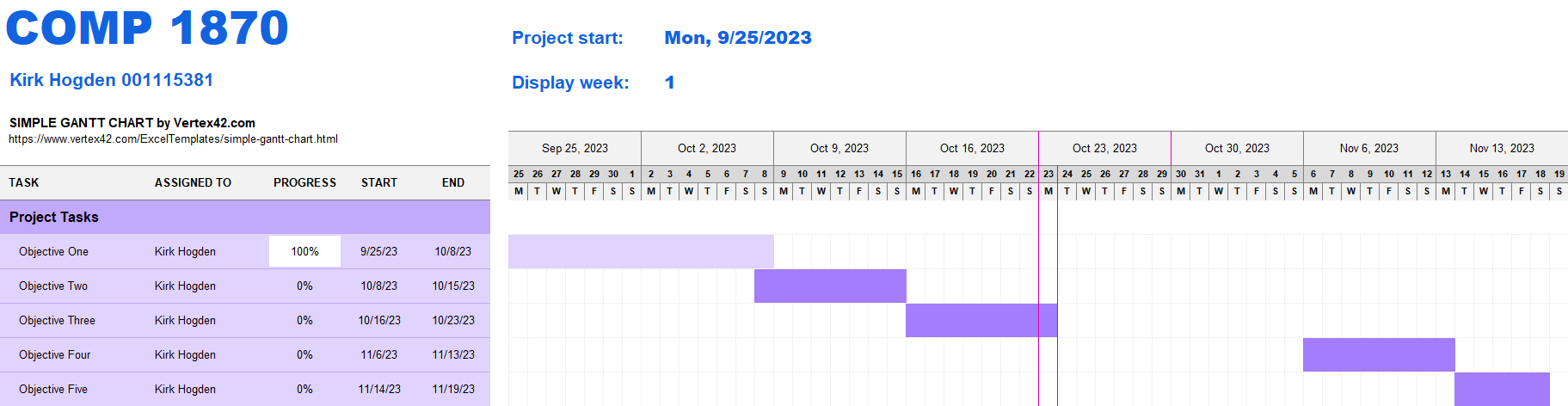
Objective five is the conclusion, where final results from the participants will be used to discover which method of soundtrack production better effects player emotions and increases gameplay performance. This will be done on a evaluation report word document which looks into the average answers from participants of both groups.

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| **Objective** | **Method** | **Deliverable** | **Duration** |
| Objective 1 | Research of collected literatures to discover different techniques in approaching soundtracks. | Literature review document | 2 weeks |
| Objective 2 | Design a software prototype for collecting primary data with. | Low fidelity storyboard | 1 week |
| Objective 3 | Develop prototype based on the design. | Software application | 1 week |
| Objective 4 | Get participants to play through prototype to gain primary data. Use personal monitoring devices such as a heart rate display to record data on each participant. | Word Document | 1 week |
| Objective 5 | Use primary data to see how effective the experiment proved to be. | Evaluation report document. | 5 days |

## Planning

A gantt chart was setup to make sure work on the project stays consistent. The template chosen on Microsoft Excel assists in automatically updating the gantt chart table with any changes made, saving a lot of time when reviewing the plan. An appropriate milestone would take place after objective two, as all research and designing will have been completed, leaving for the hands-on activities being left before evaluating final results. Another milestone will take place after objective four because collecting enough participants within the university campus may prove to be challenging, keeping in mind not everyone will be willing to take part or even decide halfway through that they no longer wish to assist in research.

In objective one, a literature review will be done to assist in creating the first deliverable. Objective two will involve sketches so they can be put together as slides for the storyboard which will be the second deliverable. Objective three will require gathering assets and creating a Unity engine project. To get the third deliverable fulfilled, it will have to be learned how to implement either adaptive soundtracks or generative music into a Unity project. Objective four will carry out a word document which will be updated after every participant session, the final update will result in the deliverable. As part of objective four, it is likely sessions will need voice recordings so they can be listened back on while filling out the word document. The deliverable from objective four will assist in making an evaluation on seeing which participant group produced better results, the final evaluation will be the deliverable for objective five.



## Legal, Social, Ethical and Professional Issues and Considerations

Research is aimed to take place during the University of Greenwich campus, as it will serve all the hardware necessary collecting primary data from participants. Opting into the case study is strictly for students of the university, and it will be much easier to find people willing to take part at this location.

The use of third-party assets is to be avoided during prototype development, however if they are then a credits menu should be included within the software. The owners of the third-party assets should be asked for their permission in which they’ll determine the final decision on whether those assets can be included for development.

During gameplay from each participant, some may feel embarrassed about how they perform. With the use of personal monitoring devices, others may not like having their body reactions being used as part of research nor having their voices being recorded for listening to. It should be assured for everyone taking part in the study that any information recorded is kept private and only used for research purposes.

Because some people may change their minds mid-point during participation, they should be allowed to opt out at any time. Overall, each participant will need to fill out a consent form, so they understand what they’re going to be doing and say they’re okay with it.

**REFERENCES**

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