Analysing Music to change Gameplay

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ABSTRACT

Context: Game Music frequently gets muted and the players play their own music while playing. If the player can choose the music for the game and have it effect the gameplay, it might help link the two disjointed ideas together.

Aim: To build a simple game that uses user provided music to change the gameplay in impactful ways and create a meaningful link between music and gameplay.

Method: The development will first include the production of a simple game application before then adding audio analysis tools to the project allowing for the choice of song. After this is completed, testing will begin. This will include a qualitative experiment with multiple people through multiple testing phases, to see if they notice their choice of music affecting gameplay and/or syncing up with their music by having them score out of 10. While also asking the participants about whether they would prefer the traditional style where music is made for the game. The participants should try multiple songs before completing the survey.

Results: The Expectations are to receive high scores and positive feedback from the anonymous survey. While also expecting to get dramatically different feedback depending on the genre/songs chosen.

Conclusion: Creating a solid bond between music and gameplay is crucial to the players experience when playing any game, and by linking the two directly through player choice it could create a much more engaging version of the game.

1. INTRODUCTION

Music for games has always tried to help immerse the player into the game world and assist in the world building/gameplay. Rarely is music at the forefront of the game and of high importance to the player and can be seen as annoying or distracting. In many titles this leads to the issue of players muting in-game music in favour of their own choice of music. This creates a disconnected idea between player and developer, where the player is no longer playing the game as intended by the developer. This is not always an active decision by the player, sometimes the desire to multi-task or enjoy a certain song to get the player relaxed and, in the mood, to play can be large enough to get the player to lower the game volume and take them out of the immersion. Such as the anecdote in the article from Kotaku (Totilo, S. ,2020) where the writer discusses his direct attempt to not mute game music and enjoy the game as intended, as a whole package. But decided to change his ways though the utility of being able to catch up on podcasts whilst fully acknowledging that he did indeed love the game's score. With the writer himself finalising a section with "I continued to treat game music as an optional garnish. As I never had before, I sometimes chose to ignore it" they prove that even though they have great respect for the music in games due to their upbringing they still decided to start muting game audio.

Video game music tends to be a less important part of a game in the eyes of many people with most people looking at graphics and gameplay as the important factors and have music as an extra addition on the side that is not essential and can be given up. Video game music is usually written directly to enhance the world building and includes some thematic additions that could be taken from the world the game is set in or can be used to assist in building some sort of tension or excitement during parts of the game. But in games such as esports titles or competitive multiplayer games, immersion is not the main aim with the music. Here the music is usually a way to avoid silence as the most important parts are the gameplay and important audio effects that are directly linked to gameplay. This is when people tend to mute the game audio and play their own music to help them get excited for the game or they just mute the music to hear the more important sounds more clearly.

There are already a lot of games that already have their gameplay designed around music, the obvious examples would be rhythm games such as OSU, or music games such as Guitar Hero and Beat Saber. All these games allow people to make their own levels and put their own songs in to the game and play along to them. The issue here is that the player needs to manually create their levels and these games use music as a game itself instead of a game that uses music to improve itself. A game that builds itself around music is the recently released game BPM: Bullets Per Minute (Awe Interactive, 2020) which is a rogue-like first person shooter but with the limitation that the player can only shoot on the beat of the song. This provides a new link between gameplay and the music as keeping in rhythm to fire the shot is an important part. The flaw here is that all the levels are built to work with those specific songs and the game plays around five songs that are at roughly the same tempo.

1.1 Research Question

Will players find a game more engaging if they can choose their own music and have the game sync with the music?

This project intends to build an application that directly tackles the issue outlined earlier by allowing the player to choose their song of choice and then change the gameplay of a basic game around the features within the song chosen and will hopefully make the game more directly linked to the music and make the game more fun to play.

2. BACKGROUND

2.1 Music Analysis

Music analysis at the basic level is just a search for features in a song or piece of music. This can be features such as: tempo, modulation and structure. Usually done by looking into some sort of pattern finding to deduce some overall values based on the data found. This could be a rhythm pattern which would show a possible musical structure, or it might show the tempo by finding a pattern in the percussion line related to time. Audio analysis can also be done by isolating different parts of the audio from each other to try and pick out each part on their own. This could be done by limiting the notes to a specific set of notes which gives a better picture of the key.

In order to analyse the audio, the computer needs to look at the audio as a series of waves and pick out patterns at certain frequencies and amplitudes, this is done by frequently sampling the wave and picking out values like the frequency, and amplitude at these points. With frequency quite commonly relating to the pitch and amplitude to the energy/volume. With this it can allow computers to pick out certain frequencies that correlate to certain pitches that are known within traditional music notation, such as Middle C being 262Hz which gives the computer the ability to start identifying pitches. With music there is rarely only ever a single note playing at once, so these frequencies are added together creating much more complicated waves that need to be separated in order to find each pitch, or an AI can be trained to recognise specific chords within a piece of music but this still has the difficulties of percussion and other musical decorations confusing the AI. This is how a basic Pitch detection technique works. The Fourier Analysis works by decomposing audio signals into a bunch of smaller sin waves which are at a specific frequency and amplitude. A lot of more complicated methods include variations of this method or build upon it.

This project will be using an audio analysis plugin that can be found online with a very probable choice being a few of the Vamp plugins (Vamp Plugins, 2020). This is due to how matured these plugins are and that to get good results out of this application a solid base audio analysis software is required. These plugins will probably need to include ones that can identify where the beats in the song are and ones that can identify the intensity/energy of the song at frequent points.

2.2 Why Muting is a problem.

The reason players muting audio is an issue is due to the removal of the player from the designed game experience. The music tends to directly relate to the visuals on screen. A musically quiet portion usually accompanies a very quiet scene with very little happening. If this correlation is not there, the player is not being fully engaged in the game and the player's attention is being divided which is not what should happen during gameplay. This can make the intense and climatic scenes of a game be dramatically undervalued or unappreciated because the actual musical score is not accompanying the visuals creating the full package or a piece of music that contradicts the design intentions by the developer is being listen to which changes the overall tone of the scene.

Furthermore, music is often used to help alert the player to certain gameplay elements that are about to happen in a game such as a boss fight. This is usually done by building up the music to create excitement and engage the player in the boss fight, or when tension is being built in gameplay the music will follow by imitating how a movie would develop the same ideas. With this key information being removed, the players experience is dramatically tarnished as they are not getting audio information that they should be which can affect the players performance as the player is no longer fully invested.

3. METHOD

3.1 Design

The first part of design should be designing the game that the application will work with. During this phase, it should be decided what parts of the game can be adapted by features found in the song given by the user. This could include values such as Beats per minute, key and intensity/Energy which could change aspects such as enemy fire rate and spawn different enemy types in time with the music. The way of generating score should be decided to allow for better testing.

The method of audio of analysis should then be decided. This will probably include an online library that can be used as plug-in so that a script can be created that allows them to analyse the song and get the features easily. A possible choice for this is a selection of the Vamp Plugins that are accessible online and can easily be used with an application called Sonic Visualiser which can visualise what data the plugin is getting which would be very useful during production and testing. The next step will then be to decide how the user gets their song of choice analysed and whether new Game screens will be needed to talk the player through how to set up the analysis.

3.2 Implementation

The game should be the first part to be implemented so that there is a baseline project to work with. This should be written in a way that the gameplay features decided earlier can easily be changed with values implemented at the audio analysing stage. Player scoring should also be implemented to check that gameplay is working correctly. This will either be built from the ground up or an open source game will be found that can have the audio analysis tools built into it. If using an open source game, it must be edited in preparation for the audio plugin and must be fully understood before proceeding.

The library/plugin that was chosen should now be applied to the application and linked to the game. This includes the use of the values to change how the game works. The values from the plugins will be checked using a visualiser to ensure that everything is working correctly. A "Read Me" file should also be created in order to explain how to run the program and get the analysis of the song working using the user's choice.

3.2 Testing and Evaluation

The next step is to do a round of testing that will receive some baseline values and to check that everything is working correctly. This will give a good idea of how the program performs under certain environments to put the later results into context. After doing this, it should be decided whether the songs given by users should be limited to specific genres like pop music or Electronic Dance Music when getting tested by other users. This will only be done if the application struggles with certain genres to where the game doesn't function correctly. This can be further narrowed by limiting to specific songs if required.

The next stage will have the project be tested by other players. This user testing will be done online where people will be asked a series of questions about the project and comparing it to having set music for the game. Or whether it felt more immersive when the game follows your music. Score can also be used as a metric to determine performance as if the players are more focused on the game, their reaction times may improve which would improve their scores.

User testing will take place in two phases, the first phase will have the users test a mostly finished build and then giving their opinions and if they noticed any bugs or major issues. After receiving their feedback, the program will be changed/fixed before the second round of testing, which will be a much larger group of participants from different backgrounds who will be asked a similar set of questions.

After testing has concluded the evaluation shall begin. This will include looking through the results received and see what pointers can be taken from them. This will be information such as: how the audio analysis performed and if genres were not limited, how the values differ between genres. Or whether people found having their own music playing increased their overall attention and enjoyment of the game. And if it did not, what could be improved? An example of possible improvement could be by using more accurate ways of detecting how the player reacts. Such as heartbeat monitors while they are playing to test their engagement to the game which could give another quantitative value that could be used during results.

4. Summary

The link between music and games can sometimes be weak and by making a direct link between the two it might make a mundane game a lot more interesting and immersive. If the project is a success, then it makes show that players want more interaction with the musical audio within games. Or at very least, enjoy another interesting way to listen to their favourite songs.

That is what this project aims to tackle. It aims to have the ability to give players the ability to listen to their own songs while still hearing the important details and link parts of their song directly to the gameplay so that it doesn't become an unimportant part of the audio landscape. All the while maintaining or more importantly improving the fun of the game.

5. REFERENCES

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