

# Deep Adaptation: How Generative Music Affects Engagement and Immersion in Interactive Experiences

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**Abstract**— This paper presents the results of a psychological experiment in which we measured the perceived level of immersion and time spent in the experience in a virtual reality experience under three music conditions: no music, linear music and machine-generated deep adaptive music. We found that deep adaptive music increased both the time spent in the interactive experience and significantly amplified the immersion of participants.

## I. INTRODUCTION

In interactive media, such as virtual reality (VR) experiences and games, the player has the ability to affect the world around them, triggering events and different emotional states at any time. It is often important to the game designer that the player feels immersed and engaged in these experiences. Previous research [1] indicates that music plays an important role in creating immersive experiences.

It is very common for interactive music composers to use adaptive music – music that changes through vertical layering and/or horizontal re-sequencing – to support different player behaviours. However, it's impossible for a human composer to conceive and produce every musical outcome. This means that even an adaptive soundtrack can quickly feel repetitive and break the player's engagement due to listener fatigue.

This is why we built Melodrive: an AI music generation engine that responds to very granular emotional cues in the experience and dynamically composes and produces music in realtime. We call this *deep adaptive music*.

In this paper we give details of a psychological experiment designed to understand whether deep adaptive music increases the level of immersion and engagement of a person exploring an interactive experience.

## II. METHOD

We created a simple VR space station scene in which there were two rooms connected by a corridor. Each room had its own emotional feel ('tender' and 'angry'), and there were no interactive objects in the scene.

Each of the 46 participants were randomly assigned to one of 3 music conditions for the experience: no music, linear music and Melodrive-generated music. The linear music condition had a fixed, looping soundtrack. The music by Melodrive was generated in realtime and adapted to the emotional feel in each room while the participants explored the space station. Both the linear music and the deep adaptive music had the same sound design (instrumentation, effects etc.).

Participants had no prior knowledge of what the experiment was designed to test, and were instructed to explore the scene for as long as they liked. They were timed during the experience as an overall measure of engagement, and afterwards were asked to fill out a questionnaire about immersion and music, based off de Oliveira et al.'s metrics [2].

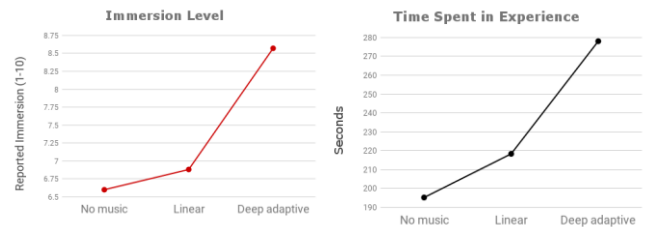


Figure 1. The overall immersion level and time spent in the experience.

## III. RESULTS

The time spent in the VR scene with the Melodrive-generated music was 42% more than that for the no-music condition and 27% more than that for linear music. Immersion levels with music generated by Melodrive were 30% higher than those perceived with no music, and 25% higher than linear music. There was no significant difference in time spent and level of immersion between no music and linear music (Figure 1).

90% of participants thought that that the music generated by Melodrive was a very important component that helped them to feel immersed. It was also found that the adaptive music generated by Melodrive fitted the VR scene 49% better than the linear soundtrack.

All the findings were statistically significant ( $p < 0.05$ ).

## IV. CONCLUSION

Melodrive and deep adaptive music has the ability to increase both the time spent in an interactive experience and to significantly amplify the immersion of participants.

## REFERENCES

- [1] Zhang, J., & Fu, X. (2015). The Influence of Background Music of Video Games on Immersion. *Journal of Psychology & Psychotherapy*, 5(4).
- [2] de Oliveira, R. P., de Oliveira, D. C. P., & Tavares, T. F. (2016). Measurement Methods for Phenomena Associated with Immersion, Engagement, Flow, and Presence in Digital Games. *Proceedings of SBGames 2016*.