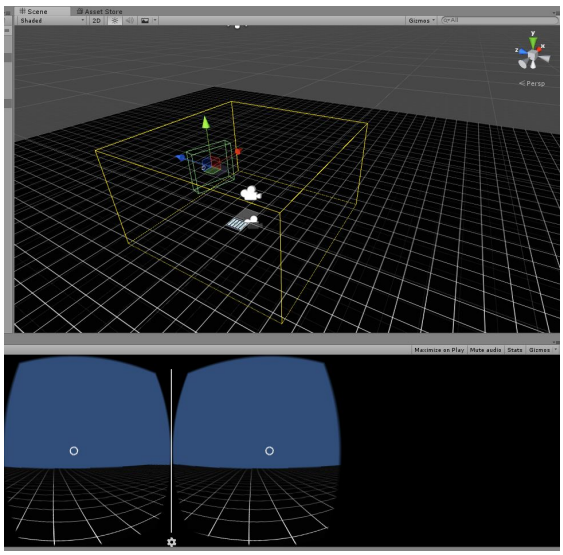

Figure 0.1: A screen-shot of the test interface design within unity, both in third person 'observer' and first person 'subject' views

An Attempt to Implement a Listening Test to Quantify the Impact of Diffuse Reverberation Level on Localization in Modern VR Applications

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CONTENTS

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1 INTRODUCTION

Over the last few years a new wave of Virtual Reality(VR) technology has has become available, often utilising mobile devices as the playback medium. Along with development of the visual component of these VR systems, spatial audio techniques beyond stereo panning and similar abstractions are often being used to create immersive '3 dimensional' sound experiences. In a previous report [**?**], faculties surrounding the localisation of sound sources within the auditory scene were described. It was suggested that early reflection were a key component used in sound source localisation, and literature suggested that appropriate simulation techniques would be required for accurate sound source localization in VR [**?**].

1.1 RESEARCH QUESTION

Does the level of artificial diffuse reverberation have an impact on a listeners capacity to localise a sound source in a VR environment, with the use of a simple early reflection simulation method? When utilising a reverberation tool that combines direct reflection simulation and artificial diffuse reverberation, is it possible to counteract the effects of early reflections on localization accuracy by masking the direct reflections with an overly loud diffuse field?

Null Hypothesis: Diffuse reverberation level has no impact on sound source localization error in VR environments.

The aim of this study is to determine if a tool that combines direct reflection and diffuse reverberation simulation, is appropriate from a sound source localisation perspective in VR applications. In this study the Google virtual reality software development kit (VRSDK) [**?**] for Unity was used for development of the listening test environment. The VRSDK version used was 1.0, and the version of unity used was 5.4.2f2.

1.2 REPORT OVERVIEW

Initially the experiment method will be discussed, and the behaviour of the GVRSDK room reverb algorithm will be explored. Following this, the experiment protocol will be given. Next, cursory experiment data will be analysed, and finally the experimental method will be reviewed and improvements suggested.

2 Experimental Method

In order to analyse the tools available for new VR systems, it was considered crucial to develop a test that incorporated such a tool with as little modification to the tool as possible. Time constraints were also a factor in realising such a test, as little prior mobile application development experience was directly available. Given such constraints, the Unity game engine system was chosen as a development platform. This was particularly beneficial as Unity has native Android and GVRSDK support [1].

The VR environment the user would see would consist of a single ground plane, with an ancillary menu of simple functions such as Reset function, visual distortion correct and other functions relating to the visual system. The single ground plane would appear to stretch out significantly far, to provide limited bias to room size. The reset function would allow a user to skip to the next round of the test, if they could not find the sound source. Test scores for the previous round of the test are also displayed, so that those administering the test could record the results without having to access the phone.

2.1 Google VR SDK Reverb Engine

2.2 Experiment Protocol

3 Results and Evaluation

3.1 experiment aims

3.2 experiment method

4 Experiment Review

5 Conclusion

[1] Though due to instability, the most recent versions of Unity and GVRSDK were not used in the development of this experiment

6 References

References