Immersive Gaming Experiences for Blind Players

Nikhil Baveja

Abstract

This project aims to study the evolution of multisensory input solutions and their impact on accessibility in videogames, Virtual Reality and other entertainment technologies. Input systems like controllers, remotes and gamepads are recent inventions that are constantly going through design developments. Features like motion controls, body-tracking and tactile feedback have opened up new possible interactions for users who may struggle with traditional interfaces, thereby expanding the number of people who can enjoy these experiences for recreation, education or socialising. An appropriate design method will be used to experiment with upcoming multisensory technologies to strategize how they can be incorporated in modern entertainment systems to provide accessible solutions to people with a spectrum of sensory or cognitive impairments.

Introduction and Background

The objective of this project is to understand the needs and desires of blind players in regards to modern electronic games. The global video game market size was estimated at USD 195.65 billion and there are more than 3 Billion people who play videogames today. However, despite being such a popular medium, it is not very accessible for people with sensory impairments, for example Blind users. Computer games play an important role in the development of mental structures as they enhance learning, improve creativity and problem-solving skills, stimulate motivation and resolve communication issues. Unfortunately, due to their obvious physical and cognitive limitations and because video games rely primarily on graphical information, visually impaired people are unable to play most of the computer games available on the market today. The current range of games accessible to blind people rely heavily on auditory stimuli with blind players expressing disatisfaction with the lack of real-time action elements.

Echo-Location Test

Haptic-Feedback Maze

Dowsing Test
(Sound and Haptic Based)

Study Methodology

A primary desk research was undertaken to find out the existing offerings in the market for visually impaired players. Most of the games made specially for blind people only include audio-based games where you speak to choose actions. According to most interviews and surveys, Blind players have expressed dissattisfaction with the lack of challenge and real-time action elements in these games. It was established that multisensory inputs for accessibility are not being incorporated in mainstream videogames.

Next, Expert Interviews were carried out with professionals who have experience working with Blind users on inclusive technology projects. Most of the experts interviewed have visual impairments themselves, and gave deep insights into the challenges that come with designing for blind people, the current state of entertainment for visually impaired individuals, and other important considerations.

After Interviewing 6 experts and based on the input and suggestions from the Primary and Secondary research, 4 game-tests were created to test the inclusion of Multi-sensory feedback to help with Navigation without the need of any visual elements.

The tests were completed by 1 Legally Blind Participant and 9 Blind-folded Sighted Individuals.

Testing and Evaluation

To gain Qualitative data, 4 different tests were created, which included either Sound Cues or Vibrational Cues to help the player find an object in a room. 2 of the Tests use Grid-Based Movement and the other 2 use 360 degree Free-movement in the environment. The tests aim to compare Sound-cues to Vibrational cues to find which is more helpful for Navigation in 2D or 3D environments.

Research and Results

After testing the 10 participants, out of which 9 were blindfolded sighted-individuals participants, ranging from those who play videogames regularly to those who never play games, and one legally Blind individual, it was found that the legally blind participant finished all the tests in 30-50% less time than the sighted participants, on average. This is seen to especially true for the tests that relied on vibrations to find the object rather than sound.
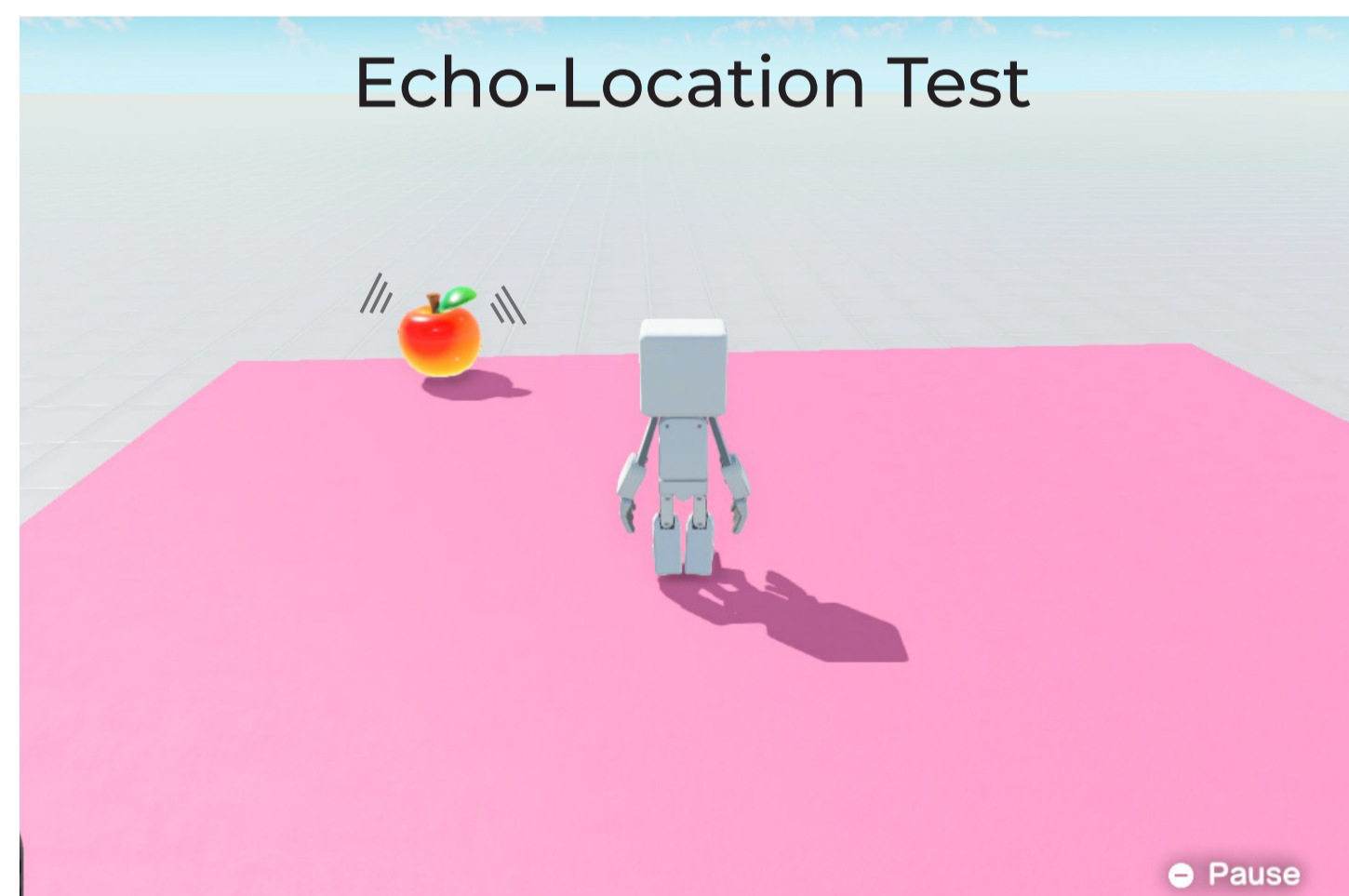
Even with the sound based versions of the game, the legally blind participant was faster than the sighted ones. However, all participants expressed, that the haptic-feedback cues were more helpful than the audio-based feedback in finding the object.

This is indicative of the hypothesis that sensory-substitution inputs can be more easily percieved by blind players than sighted players due to their heightened auditory and tactile senses.

Conclusions and Future Work

In summation, the experiments indicate that there is great potetial for sensory subtitution to make more immersive gaming experiences for visually impaired players.
In further iterations of the tests, I would like to improve the echo-location and audio based systems, or find a way for them to work in harmony with the tactile feedback to make more challening and immersive experiences.