

Can modern Computer Games be created to be accessible for the Blind and Visually Impaired?

Abstract:

The purpose of this project is to gauge whether modern computer games can be designed with specific functions to create an accessible experience for those of whom who suffer from visual impairment or blindness. The game designed for this project (**Bunker**) was created to be a horror/adventure game, which solely relies on binaural audio and sound-based commands for navigation.

Over the duration of the project, advancements and errors occurred throughout and ultimately, affected the desired outcome of the first Prototype. Although *Prototype_1* did not deliver its full potential, **Bunker** managed achieve accessibility for blind and visually impaired Players, as well as raising awareness for games of this style.



Figure 1: Audiokinetic Wwise



Figure 2: REAPER Audio



Figure 3: Unreal Engine 4

Introduction:

Gaming today focuses on creating the best graphics, and the streamline experience for the average, able-bodied Player. However, the gaming industry has not developed into adapting the experience for people with access needs, such as audio orientated gaming for the blind and visual impaired. (Rumelt, 2018) states that "The World Health Organization (WHO) estimated that 285 million people (4%) out of the 7.2 billion world population had either low vision (246 million) or blindness (49 million) in 2014" – this shows that a large quantity of people are unable to experience modern-forms of entertainment due to their disability. Modern-day computer games could be an effective option to broaden the target audience.

The purpose of this project is to build a computer game that is accessible for blind and visually impaired people by using 3D sound techniques (binaural audio). The game will be required to meet and/or exceed expectations to achieve accessibility. Finally, the purpose of the game is to direct gamers towards computer games which are designed for people with specific conditions, to raise awareness of these types of games and, to build a community that benefits equality in the gaming industry.

Methodology:

The methodology for completing this project had three major steps:

Firstly - Game Design:

The first stage required using research and organisation to experiment with functionality when trialling the game components.

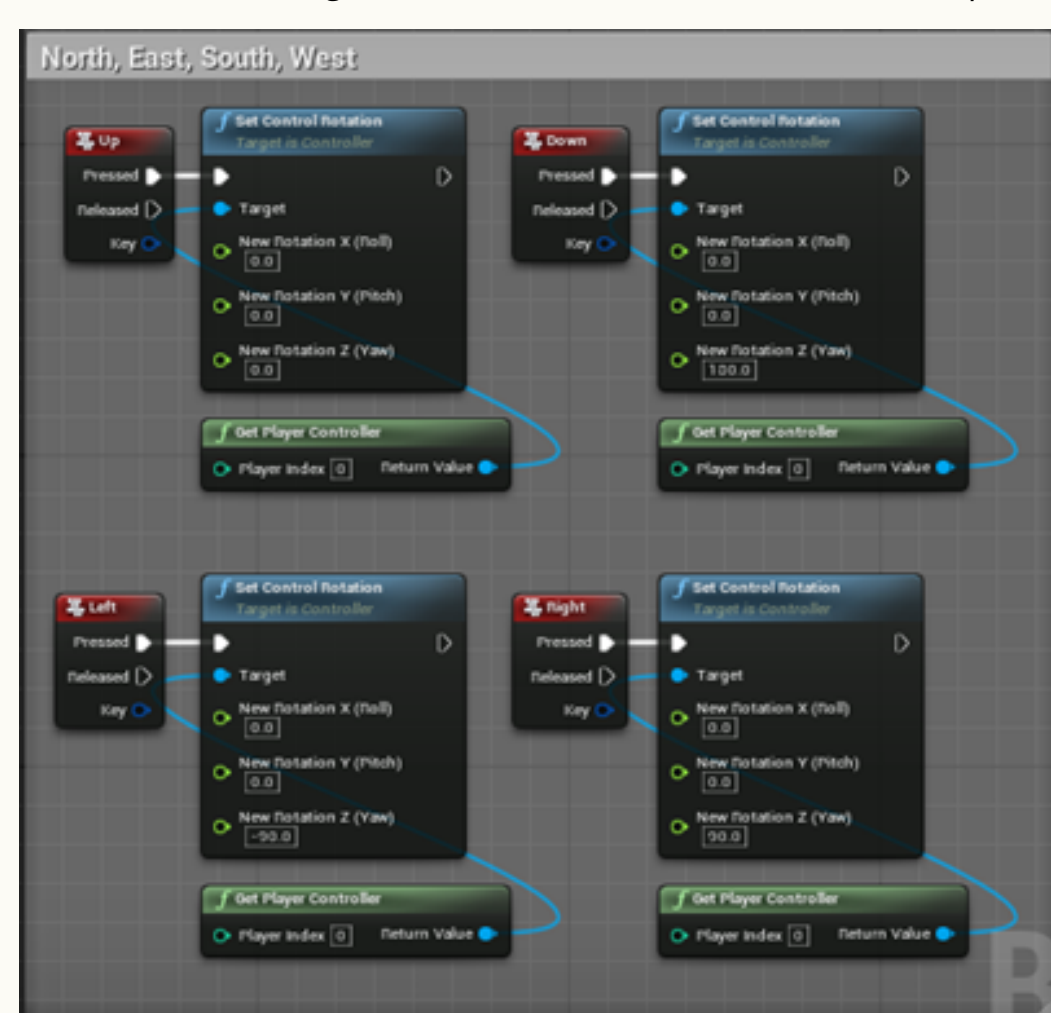
Secondly - Finalising the Prototype:

Using the prior research and secondary opinions to rectify remaining issues associated with UE4 or Wwise not allowing **Bunker** to be cook or package correctly.

Thirdly - Testing:

A survey was conducted to assess the publics in-game experience and their personal opinion on accessibility.

Figure 5: North, East, South, West - UE4 Blueprint



Aims & Objectives:

The aims and objectives for this project are as follows:

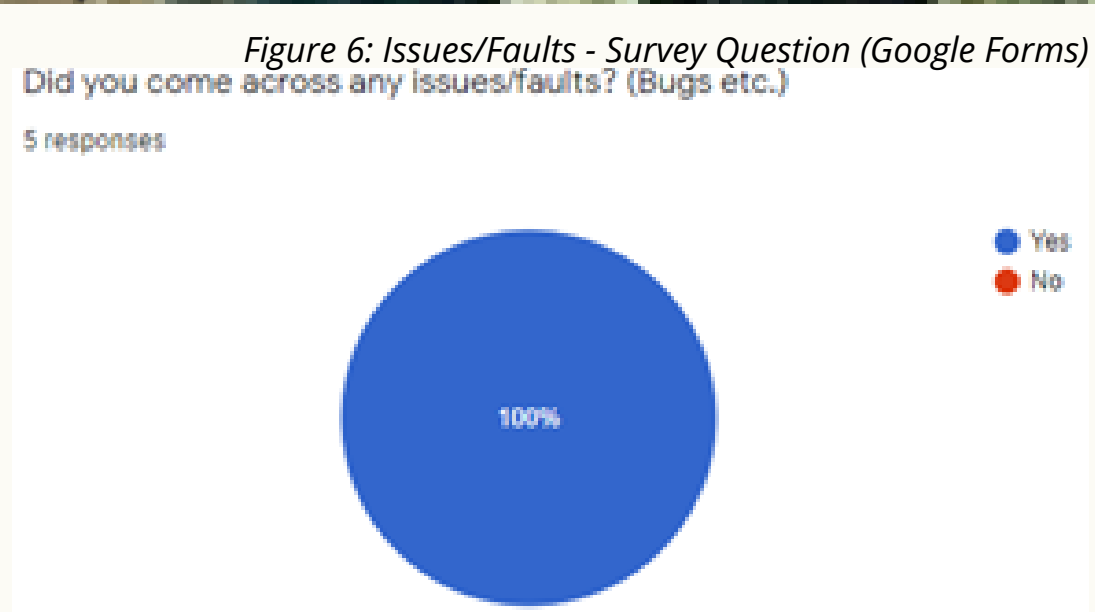
- Accurately implement 3D Sound (binaural recording/audio) and dialogue-based commands.
- Achieve accessibility for blind and visually impaired gamers (via custom UE4 blueprints/functions)
- Effective story/plot to compliment the genre of the game.
- Raise awareness.
- Basic PC controls.

Figure 4: SWOT Diagram

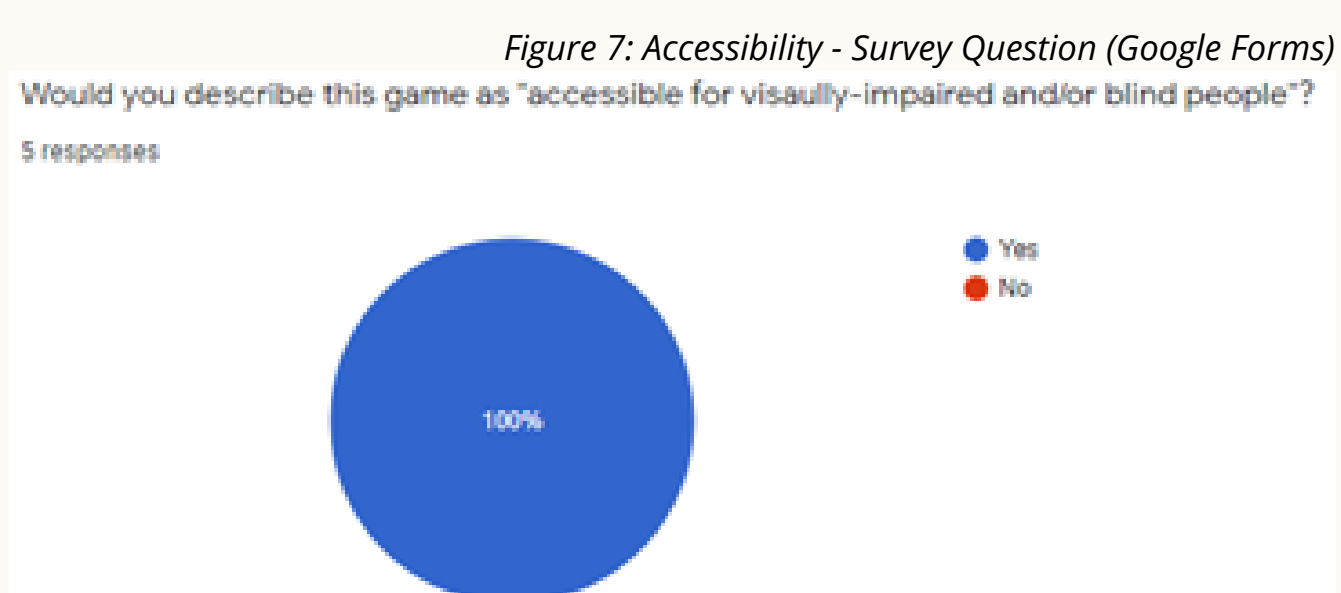
Strengths	Weaknesses
<ul style="list-style-type: none"> • Creative Writing/Story Telling • Sound Recording/Designing 	<ul style="list-style-type: none"> • Coding/Game Design (Inexperience with Unreal Engine 4 & Wwise Audio).
Opportunities	Threats
<ul style="list-style-type: none"> • Gap in the market for games of this style. • Raise awareness for games targeted towards people with visual impairment or blindness. 	<ul style="list-style-type: none"> • Coding Malfunctions • Implementing Binaural Audio incorrectly (Making the game unsuccessful).

Results:

The results gathered presented a detailed insight into the advantages and disadvantages which arose throughout the project. For example, the common error which occurred for all survey participants (shown in Figure 6).



However, the results regarding accessibility proved that **Bunker** accurately and effectively executed the task required to assist the target audience (shown in Figure 7).



Conclusion:

Based on the research defined in the background, and explored throughout the three methodologies and results portions of this project, a first prototype of a game-demo, accessible for the blind and visually impaired was achieved and developed.

Although, *Prototype_1* does not currently function as originally anticipated and did not meet the prior expectations regarding the completion of binaural audio. However, the game-demo succeeded in answering the research question: **Can Modern Computer Games be created to be Accessible for the Blind and Visually Impaired?**



Figure 8: Enjoyment Factor - Survey Question (Google Forms)

Acknowledgments

Thank you to the Closed Group for participating in the survey and offering detailed feedback; your responses will be taken into great consideration upon the construction of *Prototype_2*.

A special thank you to Chris Barlow for the support and guidance throughout the entirety of the project, and constant inspiration for the game and its cause.

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