Seeing With Sound: Creating Audio Only Games

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EXTENDED ABSTRACT

Modern game space is rich in its visual fidelity. While "the game industry has been quick to exploit increased graphics capabilities to create often stunning virtual, visual environments, they remain leery of exploiting the potential of audio technology" Grimshaw and Schott (2007). Game space mirrors physical space in its lack of accessibility for blind and visually impaired people who engage with it. Often technologies designed to improve these shortcomings are devised as afterthoughts to substitute the original mechanisms. However, as most virtual spaces are already digitally modelled, spatial (binaural) audio systems can easily be employed to enhance the fidelity of the audio aspect of a game space without the need for extra peripherals. Mainstream game engines such as *Unreal Engine* already have systems for simple implementation of spatial audio, but generally it remains a supplementary experience to the visual.

Binaural audio is a method of sound recording and reproduction where two distinct audio channels are used to evoke a 360-degree sense of space through stereo playback with headphones, such as in transparent audio mode for AirPods Pro which boosts existing sounds in the environment. The same system can be simulated in game engines to spatialise sounds in the generated world. *A Blind Legend* (Dowino, 2015), *Papa Sangre* (Somethin' Else, 2010) and *Real Sound: Kaze no Regret* (Warp, 1997) are all non-visual audio mobile games. Using touch controls and headphones, *A Blind Legend* is an adventure game quest led by the player character's daughter. *Real Sound* uses the conventions of text adventure games converting them into an audio only experience, and *Papa Sangre* is a horror set in pure darkness. While all these methods of storytelling are fulfilling for certain audiences, they lack the interactivity of more mechanics-driven gameplay. There is no binary distinction between those who enjoy story and gameplay within virtual formats, however there is a need to create more non-visual interactive spaces. These must be enjoyable merely for their mechanical aspects as the focus on a digitally mediated life further expands due to the global pandemic.

Through testing and research of an experimental sound-based game, we aim to create a system which focuses on mechanics for audio navigation of virtual space. Through a functional prototype, we attempt to unearth what makes sound spatially understandable, Co-Designing the game in collaboration with SASL (Sight Advice South Lakes) through a series of workshops. These workshops will enable us to find appropriate control schemes, tangible sounds for separating objects, as well as understanding the limits of sound as a sense for comprehending interlaced sound channels. "Perception is not determined simply by the stimulus patterns; rather it is a dynamic searching for the best interpretation of the available data." Langton (1997).

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In this work we consider that immersion, especially within games need not be regarded only in relation to world building, but also mechanical engagement. Hence, we want to understand the experience of our games in order to highlight how spatial audio mechanisms can be made as usable, and rich as possible while remaining within the limits of our "Bandwidth of senses" Coulton (2017) and maximising levels of user immersion.

The game's design itself resembles classic games like *Pong* (Atari, 1972) or *Pac-Man* (Namco, 1980), however the visual aspects are hidden from users. Audio elements therefore become the sole mechanism for perceiving the game (rather than overbearing the testing with distracting soundscapes). Though this might reduce immersive qualities, it focuses testing on the limits of human audio recognition rather than combining many sensory experiences as with *Haptic Battle Pong* (Morris, Joshi & Salisbury, 2004). This creates a game that may be "easy to play with the graphical interface turned on" but with sound alone, it remains challenging due to "unfamiliarity with the interface modality" Nordvall (2014).

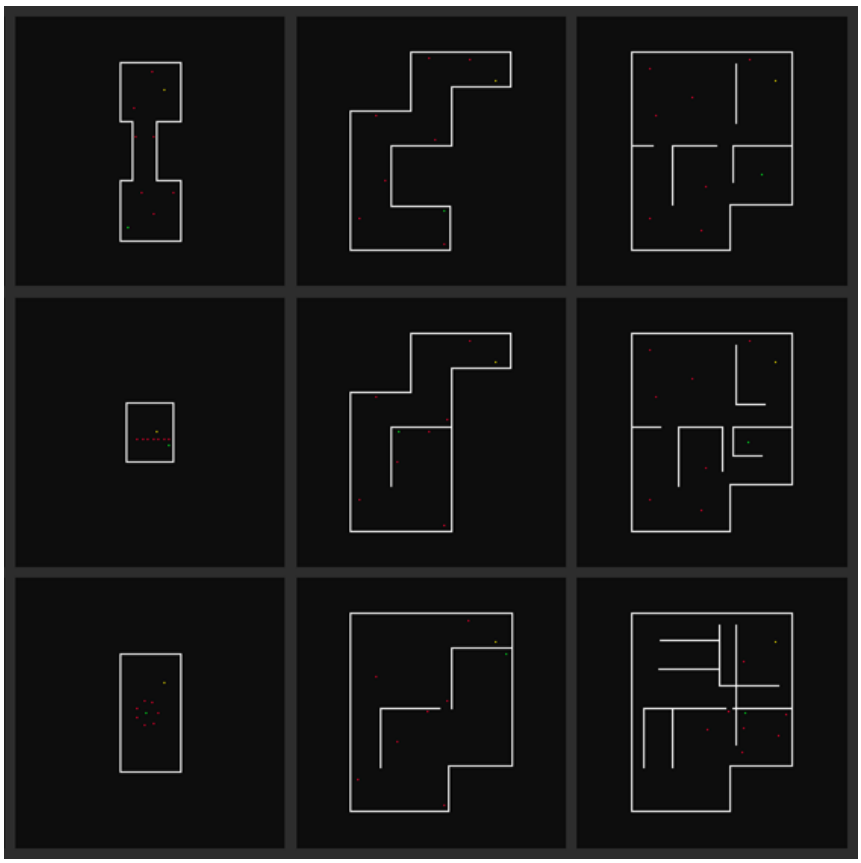

Figure 1: Binaural game test levels, yellow player, green level exits, red enemies and white walls.

By taking a holistic approach to game design, accessibility can be achieved from the outset, enabling richer experiences without diminishing world building or the originally intended experience. “Just as a large screen can be considered more immersive than a small screen, so can high quality sound create a stronger, more immersive experience than the use of low quality sound” v.d Hoogen, et al. (2009). *Demon Souls* (Bluepoint Games, 2020) employs Sony’s Tempest Engine to supply 3D audio to any headphones right from the controller with many users confirming the notion of spatial sound increasing immersion. While this bodes well for accessibility with midnight, dialogue boost and mono mix modes available, play entirely without sight remains non-viable.

Because “the amount of information conveyable through sound is limited” Röber and Masuch (2005), we want to test the functional viability of a variety of non-visual game experiences. Using research through design, a broad spectrum of people with varying visual impairments will be included in user testing. This will enable us to assess the effects of sight in relation to hearing bandwidth, tailoring the richness of the audio data for specific users. “Head rotation can be used to bring the source into a direction where the resolution of directional hearing is the best, to the front” Frauenberger and Noisternig (2003), meaning alternative controllers and control schemes will need to be tested to uncover the optimal balance between the simplicity of our interfaces, and the richness of interactive feedback. We aim to facilitate maximum accessibility in our prototypes, with the intent to improve the ease of engagement within game with “the gameplay experience depended on the player’s capacity to forget and erase its presence” Parisi (2015). Shifting from visual first design allows for the creation of digital, and physical space systems that work for people using primarily audio (or visual) spatial understanding, highlighting the potential to impact and change further assistive mechanisms within wider spaces. This enables the progression of virtual and physical environments to facilitate greater sensory access to them in the future. Our prototype games aim to explore existing techniques aimed at accessibility, dissecting their mechanisms to optimise accessible implementations for future digital environments, both non-visual and otherwise.

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