‘Trapped’: An Interactive Gamified Audiovisual Installation

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Abstract: “Trapped” is a site-specific gamified audiovisual installation that aims to unify sonically the player and virtual environment by implementing the sonic pathfinder method into the underlying concept and interactivity process, so the player is no longer navigate only with his/her visual cognition but also through the auditory perception that employed to determine the location of the enemy object. These involve the investigation of the artistic and interactive elements of computer game using the three-dimensional game engine (unity3D) and three-dimensional sound engine (google resonance audio) to create a virtual 3D environment of the gamified audiovisual installation.

1 INTRODUCTION

Trapped is developed to investigate how the auditory perception can be used as an alternative method for the player in navigating the virtual 3D environment within the context of the gamified audiovisual (GA) installation. Although there already been a few existed GA works that share similar interests, most of them are in the forms of music composition and performance, and nearly none have further investigated or elaborated the sonic interactivities (hearing) at the center of the artistic and creative development.

Upon this notion, we made a 'revolutionary' decision by presenting the enemy character through the embodiment of the sonic objects that can only be located by listening to its sound direction. To realize this idea a 3D sound engine used to replicate the spatial character of the real sonic environment so the player will experience the spatial sound sensation that travels in multi-direction in conjunction with the random locations of the enemies within the virtual 3D environment.

The environmental design is divided into three different stages. Each level is created based upon the “general” hearing capability since, in most of our daily activities, the accuracy of the eye has overshadowed the importance of the ear yet it is the ear which is in constant vigil in monitoring our environment (Hickson&Newton,1981). Gamification concept, spatial sound, as well as the interactivity concept of the computer game is discussed to establish a solid foundation in exploring the sonic element in correlation on how does the player-perceived it. However, the explanation of auditory perception, methodology, and techniques, as well as multimodal interactivity that fall under the context of phycology and psychoacoustic, are beyond the scope of this paper. Trapped is the first artistic outcome of ongoing research that focuses on the gamified audiovisual area, where the performative and musical element will further investigated on the upcoming research development.

2 RELATED WORKS

2.1 Putney “K” for Game-Audio

Ricardo Climent composed and designed interactive media work *Putney “K” for Game-Audio* with the underlying concept of the navigation of the intersections between the real, the virtual and the augmented through the medium of sound, aiming to construct a new “extended reality” (Climent, 2014).

This concept was further developed as a collaborative work that produced two outcomes: 1) Putney K for live game audio and, 2) AR_VR_Putney an interactive media composition. The classic virtual synthesizer of 1969 VCS3 is created using a graphical game engine and featured in both results. The concept of sonic pathfinder is evolved in Putney K for live game audio through incorporated of the live performance of an original EMS VCS3 analog synthesizer by played Mark Pilkington, and the

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virtual game-audio version played live by Climent. AR_VR_Putney is an interactive media composition that employed as the language and grammar for extended realities; *a term which explores augmented with virtual reality through sound* (Climent, Pilkington and Mesárošová, 2016), which intended to be presented alongside the original concert version in the separate venue at the same event. AR_VR_Putney created through collaboration with architect Alena Mesárošová and visual artist Manuel Ferrer Hernández.

2.2 GAPPP – Gamified Audiovisual Performance and Performance Practice

Artistic based research leads by Marko Ciciliani that aims to investigate the aesthetic and performative effect of elements from computer games in the context of audiovisual composition (Ciciliani, & Luneburg, 2018) through series interviews of the related works. Within this first phase of research, the researcher is focused on the exploration of the game element in the context of audiovisual composition and their perception by the audience, in which the impact of the game system on performers and how their experience translates to an audience will be the objective of the second phase.

At the time of this paper, Ciciliani had composed three gamified audiovisual compositions as the artistic outcomes of the research: 1)"Kilgore" for two performers and a game system, 2) Atomic Etudes", a game-based work for Monome and SuperCollider and, 3) Tympanic Touch" by Marko Ciciliani, a multisensory work for two performers and a game system.

3 IMPLEMENTATION

3.1 Narrative Concept

Regardless sophistication of VR and AR technology, the multidimensional environment of computer game and our physical world is a definite two dissimilar reality; *whatever happens to the player's avatar in Gameworld, nothing harmful will occur to the player*. According to (Simon, 2004), when we compose a narrative, especially a narrative based on memory, we usually try to represent "how things came to be what they are," and the end is prefigured in the beginning.

Simon's notion revealed the possibility of empirical communication between the player and computer game through the stimulation of a particular memory, which certainly alongside with the cognitive input of game controller in any forms.

Therefore, the narrative concept of trapped is *"sonic unification,"* i.e., to *"unify" sonically* the player and the Gameworld by implementing the auditory stimulation and sonic pathfinding at the center of interactivity process.

3.2 Storyline Concept

The concept of paracusia or auditory hallucination is employed to develop the narrative concept further, which ultimately composed a storyline idea as follows: '*E*' is the main game character that suffers from paracusia which incapable of distinguishing between the real and imaginary sound.

She trapped inside an imaginary world (maze-like) that consist of three-game stages with a different auditory obstacle (enemy) on each stage. To identify the enemy location, she must listen to its sound direction and colliding herself to the object to destroy it, by doing that, she earns the rewards to get into the next stage. The game-stages design and perceptual appearance of the enemy have been adapted according to the narrative concept and will be discussed further on the next sections of the paper.

3.3 Perceptual Appearance of The Enemy Object

In a general computer game, the enemy object is presented through the commons antagonist character that can visually be identified by the player. However, due to the implementation of sonic pathfinding, the common perception of space (visual) in a computer game is no longer relevant with the narrative concept of Trapped that mostly comprehended in the auditory context. The notion to redefining the perceptual appearance of the enemy object is required, in order to initiate the *perception-shifting* from visual to the auditory.

Therefore, the game enemy will no longer emerge as the common antagonistic character (visual), but instead through an embodiment of a sonic object that emitting sounds to stimulate the episodic memory of the player. This memory refers to collections of past personal experiences that occurred at a particular time and place which allow an individual to figuratively travel back in time to remember the event that took place at that particular time and place (Schacter, Gilbert, Wegner, 2009, p. 185–6). However, due to differences in hearing ability of each an individual, we decided to not transforms the enemy appearance

at once, but rather gradually in three phases according to the three game-stages.

3.4 Environmental Design

In order to actualize the sonic unification concept, the environmental design is splitting into the three main stages that based on the game narrative and the player hearing capability.

These stage divisions are comprehending as a transition phase from the visual space perception of our world into the Trapped' space perception that dominated by auditory perception. The visual design kept to a minimum but still engaging for the player, below is the breakdown for each stage:

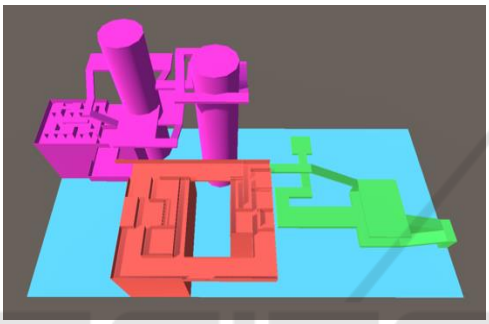

Figure 1. The three game-stages.

3.4.1 First Stage

Stage 1 (Green coloured) concept is to introduce how the game works through basic gameplay, therefore, the jumping features are still disabled in order to simplify interactivity control. The scene has both narrow and comprehensive platform, including a ramp for the player to traverse. The Objective in this stage is to find several enemies that generate sound by listening to its sound direction; the enemy in this level is *visible* and easy to find as the transition phase for the player as mentioned previously.

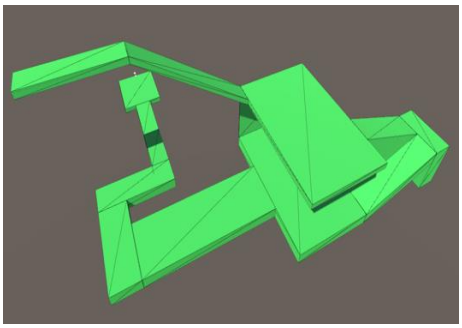

Figure 2. First stage.

3.4.2 Second Stage

Once all enemies in the stage found, the player then moves to Stage 2 (Orange). In this stage, the player introduced to a maze-like interior. This type of environment challenge player in memorizing rooms and sound sources. The enemies in this stage have little visual aid while still generating sound. There are two areas connected with the bridge in this stage. The first area consists of small rooms and a bit of window for the player to re-orient their heading. The second area is a bit wider but still feels claustrophobic. Player need to listen carefully as the enemy might be on the other side of the room.

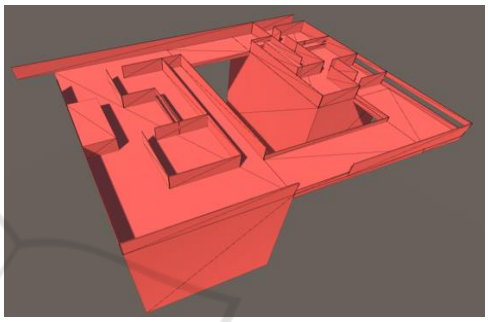

Figure 3. Second stage.

3.4.3 Third Stage

Connected by a small bridge, the last stage is a combination of rooms and open area from the first stage. The researcher toned down the maze-like area from the stage 2 and reintroduce a larger, this time with verticality for the player to explore. The enemies in this stage is now *invisible* and player needs to rely on their hearing in order to find them. The reward for finishing this stage is where the player raised from the last platform, uncovering the whole stage for them to see.

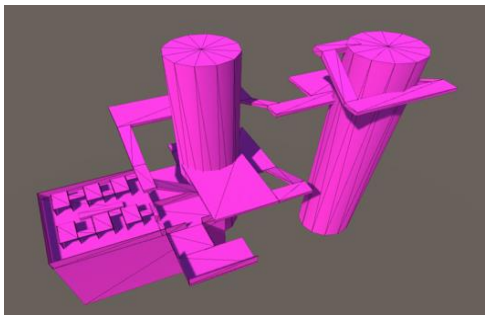

Figure 4. Third stage.

3.5 Audio Components

The audio component is collections of sound that employed to actualize the change of perception on the enemy objects and interactive process from visual to auditory perception. This component is categorized into three different segments according to their functionality as follows:

3.5.1 Enemy Sound

This component consists of fifteen different sounds that will be emitting through fifteen different enemy objects. The sound materials are created using the results of field recording and the audio-mixing process and categorized into two types of moods based on the eight basic of human emotion proposed by (Plutchik, 1997): 1) *Joy*—feeling happy, happiness, gladness, and, 2) *Sadness*— feeling sad, sorrow, grief. Next, we sorted out the human-related activities or events that might be relevant or imply to those moods, to define the kind of sound to use, as follows:

- **Joy**: laugh, birthday party, clapping, children playing, singing, concert ambiance, and game arena.
- **Sadness**: cry, sobbing, war, demonstration, riots, scream, yelling, and children' cry.

This component is a direct implication of the sonic pathfinding and perception shifting, in which the enemy is no longer presented in the visual domain.

3.5.2 Ambience

This component consists of the static sounds that distributed evenly into the three-game stages — the sound material created using the field recording results without any mixing process. There is no substantial interactivity role in its functionality, beside implies the illusion of reality for the player.

3.5.3 User Input Feedback

The third audio component perhaps is the most relevant with the audience's interaction in the game world. It does not "really" belong to the narrative concept but is necessary inclusion, due to its unique function for the game mechanic. Schütze (2013) states that experience has found that omission of these audio feedback cues can lead to confusion or discomfort on the part of the player. In the general computer game, user feedback sounds are usually the beeps and clicks that acknowledge the player's input actions.

Trapped only use a single sound for this component, i.e., the foot-step that corresponds to the player's movement in 3D Gameworld. This feedback component is like less required in conventional interactive installation (non-Gamified), but they are mandatory in gamified audiovisual installation.

3.6 Sonic Environment

3.6.1 Sound Formats

In general production of gamified audiovisual or interactive audio works, there are two standard audio formats that commonly in use. Two-dimensional (2D) sounds are sounds that are consistently produced through the speakers and have a specific level and phase relationship, set by predetermined data. The typical example of the 2D sound is audio CD and Cassette as well as any regular media such as radio, television or film. Three-dimensional (3D) sounds in gamified context are sounds that placed in 3D Gameworld that have volume attenuation based on the distance from the listener, in which a 3D audio engine governs the input and spatial parameters (distance, direction, elevation, etc.).

Based on the environmental design that conceived for the 3D environment, Trapped implement the high-quality binaural rendering (third order-*HRTF*) to render the audio components and adopting the first-person perspective techniques to determine the player position relevant to spatial location. This technique places the game camera in the position of the player as if they were in the world itself; the player looks through the camera as if they were looking at the world through their own eyes. All things in the world will be relative to this perspective, and as such, the audio must sound as it would if the player was actually in the game world (Schütze, 2013).

3.6.2 Sound Engine

In the computer game, the audio engine is a component that consists of algorithms related to the loading, modifying, and output of sound through the speaker system in both 2D or 3D format.

Google resonance audio (GRA) is a multiplatform 3D audio SDK that able to produces a realistic experience for AR, VR, gaming, and video. It's also capable of replicating the similar characteristic of the sonic environment like they occurred in the physical

world as long as acoustic measurement data is available.

GRA will automatically calculates the spatial parameters such as Doppler, echo, and reverb according to their spatial location within the 3D Gameworld. GRA's input should be in monophonic, due to audio spatial positions is determined by the spatial camera location in the game world, i.e., relative to the current camera view and active perspective of the player.

The 3D sound engine *only implemented on the game enemy audio component* to recreate the immersive sonic environment of the real world so that the player could sense the enemy sonically as it is on the physical world. Though enemy objects are placed in random, they are passively stationer at the given coordinate and waiting to be found by the player.

Thus, the spatial parameter and binaural experience are determined by the player position that corresponds to the game camera. At the time of development, GRA is the most practical solution for sound spatialisation because it can be used directly inside the unity3D and powerful enough to actualize the spatial idea of Trapped.

3.6.3 Sonic Interaction

The latest generation of computer game technology has offered a new form of interactivity that never been achieved previously. Interactivity is an essential element in the computer game that presents an embodiment of the communication between the player and the virtual environment.

Lievrouw & Livingstone (2002) states, Interactivity can be defined into three interactivity form of an emerging communication system: user-to-user interactivity, user-to-documents interactivity, and user- to-system interactivity.

Following the general design of trapped, that aims to implement auditory perception at the centre of interactivity process. Trapped interactivity can be defined into two: 1) player-to-enemy interactivity (hearing) and, 2) player-to-environment interactivity. A noise cancelling headphone is used to listen to the enemy sound, whereas the 360 Xbox controller employed to interact with the game environment through a mapping value from the player's movement as follows: 1) left thumbstick—directions, 2) right thumbstick— camera rotation and, 3) left trigger—jump. These interactivities occur on the three-game stages and based on the narrative concept of environmental design, as explained previously. The term of *Gamified Sonic Interaction* (GSI) is used to define the player's interactivity on Trapped. The word of gamified is derived from Gamification concept which according (Robson et al., 2015) defined as a set of activities and processes to solve problems by using or applying the characteristics of game elements. Therefore, GSI is a multisensory interaction based on game design elements, where in this context is the Trapped' narrative concept.

4 CONCLUSIONS

This paper discusses the concept and technical approaches behind the creation of "Trapped" that focuses on the sonic interactivity between the player and the game-enemy. Trapped offers not only the immersive audiovisual but also storytelling narrative that constructs multisensory interaction that manifests perceptual, cognitive, and psychological experiences within the virtual 3D environment.

REFERENCES

Ciciliani, M., & Lüneburg, B. (2018). *Gamified Audiovisual Works – Composition, Perception, Performance. Emille,* the Journal of the Korean Electro-Acoustic Music Society.

Climent, R., (2015), *'Putney' for game-audio game-audio interactive composition* [online]. Available at: https://bit.ly/2EXbaku

eContact! 17.4 — *Analogue and Modular Synthesis: Resurgence and Evolution (February / février 2016)*. Montréal: Communauté électroacoustique canadienne / Canadian Electroacoustic Community.

Hickson, F., & Newton, V. (1981). *Sound localization: Part I: A brief history. The Journal of Laryngology & Otology*, 95(1), 29-40. doi:10.1017/S002221510009037X

Lievrouw, L. and Livingstone, S. (Eds.). (2002). Handbook of New Media: Social Shaping and Social Consequences. London: Sage.

Plutchik, Robert (1997-01-01). *The circumplex as a general model of the structure of emotions and personality*. American Psychological Association. pp. 17–45.

Robson, K., Plangger, K., Kietzmann, J., McCarthy, I. & Pitt, L. (2015). *"Is it all a game? Understanding the principles of gamification"*. Business Horizons.

Robson, K., Plangger, K., Kietzmann, J., McCarthy, I. & Pitt, L. (2015). *"Is it all a game? Understanding the principles of gamification"*. Business Horizons.

Schacter DL, Gilbert DT, Wegner DM (2009). *"Semantic and episodic memory."* Psychology. pp. 185–6.

SCHÜTZE, S. (2003). *The creation of an audio environment as part of a computer game world: The design for Jurassic Park – Operation Genesis on the XBOX™ as a broad concept for surround installation creation.* Organised Sound, 8(2), 171-180. doi:10.1017/S1355771803000074.

Simons, Jan., (2004), *Narrative, Games, and Theory*, the international journal of computer game research, volume 7, (issue 12007 ISSN:1604-7982) [online]. Available at: https://bit.ly/31fVMcA