

ANX Dread: A virtual reality experience to explore anxiety during task completion

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Introduction

Rooted in a growing concern for anxiety in young people, this project aims to explore the application of virtual reality in support of furthering studies regarding managing stress and anxiety. Virtual Reality has shown to be helpful as an assistance technology for users with various physical and mental conditions [1, 2], and recent work in the psychological domain shows great promise [3, 4]. Specifically, our system was designed to explore users' reactions to simple tasks in simulated stressful and fictional settings with respect to specific game elements.

This project was created as a part of the 'Computing for the Interactive Arts' (CIA) minor. This cross disciplinary minor focuses on creating a collaborative, cross-disciplinary environment in which Art and Design students integrate coding and algorithmic thinking in creative works and in which Engineering students apply the principles and methodology of design thinking to visual applications. The project presented here is a part of the 2018-19 CIA capstone project built by five students with various academic backgrounds.

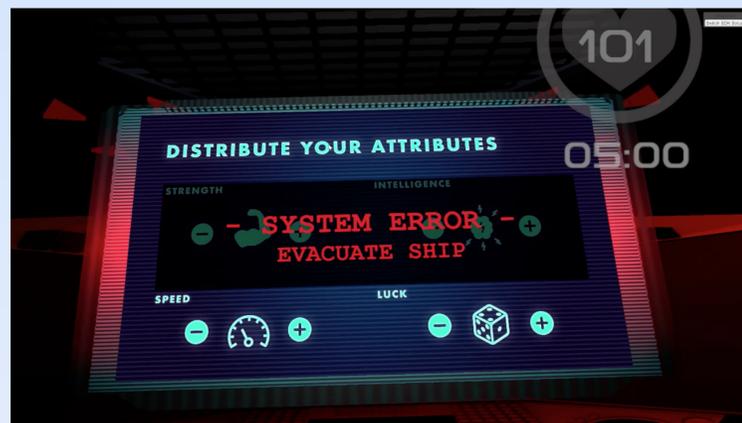


Figure 1: The first time user is notified the ship is breaking down and they need to evacuate.

Experience

The goal of the ANX Dread virtual reality experience is to explore users' reactions to stress and anxiety associated with task completion. The project includes a virtual reality experience in which the user must escape a broken spaceship by completing simple tasks in the digital world.

Implementation

ANX Dread was developed in the Unity 3D environment using the HTC Vive VR system. Resources in making the project include free and purchased models found in the Unity store and the web and original content developed by the team.

A heart rate monitor was incorporated into the experience to integrate biofeedback, i.e. heart rate information during the experience.

The sensor was integrated into the system using an Arduino Uno, and a pulse sensor developed by Yuri Gitman. The pulse sensor came with an Arduino library that could handle all of the data collected from the Arduino. One of the pre-written scripts was modified for this project to print the current beats per minute (BPM) to the serial port that the Arduino is connected to in order to send feedback into the Unity VR experience.



Figure 2: [Left] One of the tasks is a maze the player must navigate to escape the ship. [Right] Another task requires the player to fix a broken door by tracing a specific path on its circuit board.

Results

We had 60% of users report feelings of heart rate increase. From each participant's data collected we consistently saw an increase in heart rate from the user's given resting heart rate. Average heart rate for crash portion: 96.67 | puzzle portion: 96.39 | maze portion: 97.12 | hallway portion: 99.07. A majority of the users rated the following experiences as most anxiety inducing: *Maze* and *Other Experiences* (including: *heart rate monitor*, *heart-beat sound*, *timer display*, *sound effects*, and *particle effects*, such as *steam cloud* and *sparks*).

We found the *Maze* component to be significantly more anxiety inducing than most other components. A one-way ANOVA between subjects was conducted to compare the effects of the VR experience on anxiety in participant (N = 28) self rated anxiety levels. Comparing, the various tasks in the experience against one another, the maze condition stands out. There was a significant difference in mean anxiety between the maze condition and the other conditions. See Figure 5 for data.

The *Other Experiences* (*Heart Rate Monitor*, *Time*, *Sounds*, *Particle Effects*) components had a mean self-reported anxiety level of 3.46 out of 5. While we can not statistically say it was significantly higher than other portions of the experience, it did have the second highest mean fairly close behind the *Maze*.

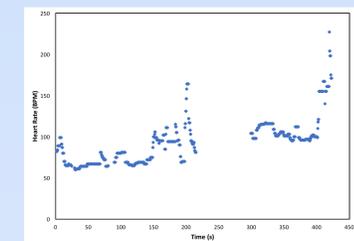


Figure 4: Heart rate feedback for a single participant.

	M	SD
Other Experience	3.4642	1.3188

Figure 5: Mean and Standard Deviation for level of anxiety felt for each condition given by self-reporting participants

Conclusions and Future Work

The ultimate goal of the project is to help develop an experience to help users manage their stress and anxiety. Future work includes developing a better understanding of the role the heart-rate monitor plays in user experience and guided activities related to calming a users senses.

References

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- [4] Davor Gasparevic. Improving productivity with vr meditation apps. ScienceNews: Magazine for the Society for Science the Public.