Zenscape Progress Team Report

Team Name: Zenscape
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Project Goal:

Provide an enjoyable and immersive VR experience where users perform tasks that induce cognitive load, problem solving, and multitasking. Tasks will be set in an environment filled with varying levels of auditory, visual, and other sensory distractors. The goal is to help users train to improve cognitive performance and task management.

Implementation Vehicle:

We are using an Arduino Uno R3 microcontroller paired with Virtual Reality (Unity) to illustrate our goal. The Arduino will be interfaced with a pulse sensor that is mounted in a ring the user can wrap around their finger. This sensor will be used to monitor the heart rate of the user and feed the data into our program so that we can provide feedback for how it increases or decreases based on the virtual experience and their surrounding environment. The virtual reality component will be used to immerse the user into an office space environment where they will be challenged with tasks. The user will have to perform tasks while being distracted by various visual and audio events. The immersion into the environment is important to elicit the proper response from the user so that we can receive accurate feedback from the pulse sensor. These distractions should affect the user which will be indicated by the user's heart rate which we are measuring via the pulse sensor and Arduino microcontroller.

The choice to incorporate heart rate biometrics into our project is a deliberate one. According to the research we have conducted, higher heart rates are often associated with increased stress and cognitive load. We believe that using biometrics such as the heart rate can provide real-time feedback on task performance. Users can see how well they are managing tasks in relation to their physiological state. This feedback loop can motivate users to improve their cognitive performance and task management skills.

Elements of MVP:

Our MVP will aim to have several key features that will help us achieve our outlined goal. First, we expect that the Unity Virtual Reality Experience will include five total environments. The first environment will be the Menu Screen, which will offer users a user-friendly interface for customization and level selection. The menu will provide options for adjusting settings, choosing difficulty levels, and ensuring a tailored experience. The second environment will be used to record Biometric baseline measurements. By establishing a baseline heart rate with our Arduino pulse sensor, we can compare data with future playthroughs and level performance. The final three environments will be for task completion and gameplay, which is where the bulk of our development will be done.

For the gameplay, we plan to implement three levels with increasing difficulties. Users will have the option to choose from low to high intensity, with each environment progressively challenging their abilities.

The tasks in these environments should challenge users' overall task management skills. For the MVP, we discussed implementing a Phone Call and File Sorting task, although these tasks are subject to change. The Phone Call Task would involve using buttons on a phone in the office to respond appropriately to incoming calls with an action (such as transfer, answer, or decline) within a limited time frame. The File Sorting task would involve categorizing files cluttered on the office desk, where each file contains information or documents related to different categories or themes. The task is to match as many of the files into their appropriate folders as possible within a limited time frame. We plan to expand upon our task ideas more before the next report, but the ideal MVP will create an environment where the user has to juggle various cognitive office tasks within a set time limit. The pressure of the tasks and deadlines should increase with each difficulty increase.

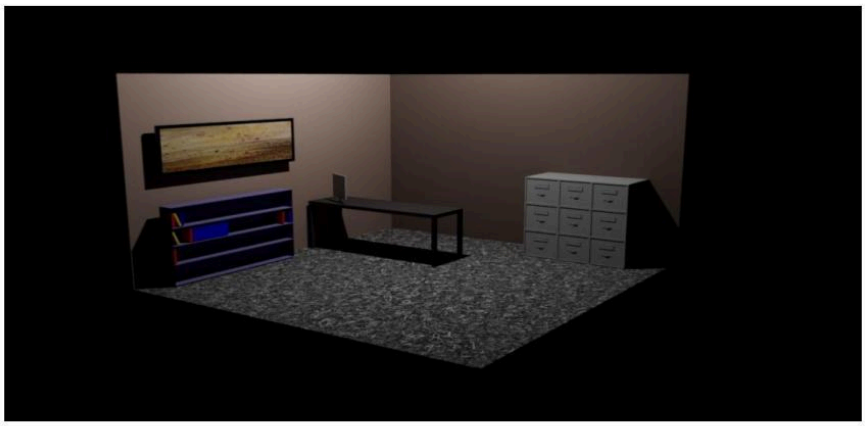
The final element of our MVP is including auditory and visual stimuli to distract the user from the tasks at hand. For auditory stimuli, we want to incorporate a large range of sound, such as background noise, conversations, and unexpected or sudden sounds in the office. For visual distractions, we want to include changes in lighting and the movement or addition of items to the office environment. The inclusion of auditory and visual stimuli should add realism, randomness, and distraction to the environment to enhance the user's cognitive load. There should also be an increase in sensory complexity with each difficulty increase.

Combining all of these key features, we hope to create a virtual space where users can test their cognitive performance under increasing levels of complexity.

Progress:

So far, we have outlined our goal and dove into research. Our research topics include virtual reality development, artistic design, Arduino development, and the relation between cognitive load and heart rate. We have also set up our VR Unity environment, our Discord channel for communication, our GitHub organization for version control & development, and our Atlassian/JIRA board for sprint planning using Agile and Scrum methodologies.

On the development side, for VR and physical computing, we are working on connecting both an Oculus Meta 2 Quest and the Arduino to Unity in order to use both tools effectively in our project. We are also preparing to start blocking out the game loop and logic in order to make sure our experience has a solid infrastructure. Most of our progress for this report has been research and planning, so hopefully by the next report these goals will have been met and our project will start to come to life.



Zenscape Environment 1 Office Space Progress

For our progress on our environment, our design artist has begun blocking out an office space for our first level. This concept for this scene is an office that has essential objects that an employee would use such as a filing cabinet, desk, monitor, bookshelf, and painting on a wall.

Artistic Direction:

Artistically, our goal for this project is to create an experience that users will enjoy while also learning about exterior elements that could be detrimental to their overall focus and productivity. We can achieve this by creating an engaging environment through detailed 3D models, unique gameplay mechanics, and crisp sound design. The environment should feel like an organic space, so we have gathered references from real office environments and fictional ones to ensure that there isn't a moment where our users feel pulled out of their worlds. Through the unison of these ideals we can ensure that our game not only be optimized and detailed, but also engaging and fun to pick up and play.

Taking inspiration from similar game experiences, our environment will be crafted in a way that will utilize color palettes to indicate utility and interaction. Neutral colors would indicate objects that are static and meant for show, whilst those in high contrast will indicate interactive elements that users could use for clues for our puzzles or tasks. Objects that stay consistent throughout each level would include furniture such as desks, filing cabinets, chairs, etc… Crafting a unique office space for each room would mean adding elements that make users feel like this is not just an isolated space, such as family portraits, books on bookshelves, plaques and paintings on walls, etc… The waiting room would include magazines on side tables, relevant graphics framed on walls, and big windows to allow natural light to give a warmer feeling for guests in the office. Although, we are not limited simply to visual elements. Sound design will be crucial to our levels, making each item sound crisp to pick up and put down, while also having background noise relevant to an office space. Sounds like this would include phones ringing, paper printing, and intercom static.