VR Meditation Garden (CSCI 39545-79528)

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Abstract

Taking care of one's mental health is very important for an individual's well being. Something that a lot of people struggle with is anxiety, whether it be because of high stress or other reasons. Currently with a global pandemic taking place, people's anxiety levels have increased.

This is where our VR application comes into play. The application is designed to help people reduce their level of anxiety by being taken out of their stressful environment and into a different context. Peaceful nature-inspired scenery, soft music and nature sounds, and a warm color palette, are all aimed at producing a calming atmosphere.

Our application offers simple tasks for a user to perform that are known to be effective at reducing one's anxiety. The tasks within the theme of a Meditation Garden are organized into four zones – breathing exercises, animal petting zoo, food planting, and sand garden – allowing the user to choose which tasks/setting suits their current mood or preference.

Demo Playlist:

https://www.youtube.com/playlist?list=PLwzB8eSDZXWpp5S6PnwyKLUz-WzuQ5xJB

Keywords: Meditation, virtual reality, immersion, anxiety.

1 Introduction

In our current situation, many are faced with difficult circumstances. The inability to go outside or interact with friends & family, the way we used to, undoubtedly affects our mental state. A large portion of people have been stuck at home ever since quarantine began, which worsens health if people are not consistently maintaining a healthy routine at home.

However, one upside to quarantine for some has been more free time to indulge on hobbies and activities to gain peace of mind. Many people have been able to find what helps them relax and alleviate anxiety, which is extremely helpful when needing to get used to the new norm that is being stuck at home.

Immersive activities in nature, such as walking through parks, observing animals / birdwatching, or tending plants, have been shown to decrease stress and improve mental health (Tyrväinen, Ojala, et al). Furthermore, when an individual finds themselves not being able to relax and in the midst of an anxiety attack, controlling their breathing will help immensely.

For individuals who need a relaxing activity and calming environment, while remaining physically indoors, we seek to build a virtual garden VR experience, allowing users to meditate, relax, and enjoy themselves safely. They will be able to partake in activities that would bring them peace of mind in the real world. There are times when an office or school building will bring dogs or cats as therapy for workers and students. This is why a VR version of this with zoo animals could be extremely helpful. It would allow for players to feel like they are a petting zoo and bring them the comfort that being actually there would.

Gardening is also a very well known form of therapy. People are able to lose themselves in planting their favorite flowers or vegetation. It's an incredibly relaxing pass time, which is why creating a virtual experience of this could be extremely useful for those who don't have access to the space required to build an actual garden. A game that became popular during quarantine throughout social media was a game called "Animal Crossing" which sort of does a lot of these interactive activities like gardening and so on.

A calm environment for players to be able to meditate and do other activities that would help bring serenity to their minds is important. This is what the Sand Garden tries to do. It tries to imitate real world objects and environments that would bring peace to a person.

People find themselves having extreme anxiety and panic. Especially when things are changing drastically. Research shows that a very good way to slow down someone's heart rate is to find a breathing technique that is best for them. Many people find themselves just breathing in and out but it is important to have a rhythm and a pace in order to maintain a stable breathing pattern. The "4 7 8 breathing technique" is a way to be able to do this. A VR implementation of this would allow for people to have help with keeping track how long they have to breathe for and how.

2 Activities In the VR App

Our project is a VR simulation of a meditative garden, composed of varying activities separated into a few scenes. Each member has selected target activities designed to provide the user a relaxing experience.

2.1 Activity One - The 4-7-8 Breathing Technique (S. Bravo)

For people who deal with anxiety, a breathing exercise that is very well known is the "4 7 8 breathing technique". This technique is known to be effective when trying to reduce the level of stress and anxiety a person could be having. Furthermore, there are people who use it when they are having a panic attack. Since this project is focused on mental health and reducing levels of anxiety, it is crucial to have this technique embedded into the VR experience we are trying to create.

Currently for this activity we have the basis of the environment set up. There will be more things added to the design aspect and most importantly each thing will be added with the purpose of creating a relaxing atmosphere.

The bench located near the crop field has a very crucial purpose. It is supposed to be the trigger. This means that when the player gazes at the bench the breathing exercise will commence. However it has yet to be successfully implemented. There is also a choice on whether to use gazing as the action to initiate the text component or if perhaps movement would be better.

If we want the player to move then most likely a keyboard would be needed which is why I have shied away from it. I want the player to feel relaxed and maybe by adding something they have to control would deviate from the main purpose of this activity, which is to help alleviate their anxiety.

I have been able to create a countdown timer that implements the breathing technique we talked about. The countdown timer works in theory, however, it does not work in the google cardboard environment. What this means is that the code for the countdown timer is working effectively, but the code for the bench isn't.

The c# script file that is in charge of the bench is supposed to hide the text components until the player gazes at the bench itself. However, the file fails to do this and furthermore fails to show the countdown timer at all.

My current goal is to get the bench to act as a trigger for the countdown timer components. After I am able to successfully do this, I would like for the timer to be more appealing to the eye. Perhaps instead of it being shown as simple numbers, it could be represented in a little stopwatch image.

The colors the countdown timer would also change to something not only appealing to the eye but also a color closely associated with helping with anxiety. A color that is known for being calm is blue, so perhaps a shade of blue that doesn't clash with the rest of the environment would be the best choice.

Lastly, one more part that I would like to implement once all the other parts are completed is the anxiety health bar. I would like to create a mechanism that when the breathing exercise is completed three times the level of anxiety in the anxiety bar will decrease.

VR Meditation Garden: The 4-7-8 Breathing Technique

Midterm: https://www.youtube.com/watch?v=BnQT7SIFlp0

Final Demo: https://youtu.be/wUqe8ObjpKU

2.2 Activity Two - Petting Zoo (P. Du)

Owning a pet is a luxurious and demanding task that requires energy, time and patience. Most families however, are unable to own a pet due to financial means, time or a mixture of both. The ability to pet an animal and have it react to you by either making a sound or reacting in a "cute" manner can help as a way to release stress.

In this paper, the goal is to up the pet environment to that of a petting zoo. Different animals will exist as a means to provide the stress reliever by a variety of interactions. The goal for this portion of the activity is to have the player "spawn" in front of a variety of fences containing different animals the user can interact with (These animals are obtained from the farm animal bundle on the Unity store). These animals will be roaming in their enclosures.

A petting zoo isn't a petting zoo if you can't pet the animal! Depending on the animal the user will (ideally in a future build) be able to pet the animal in a variety of ways, for example petting the animal's head or petting the body. The animal's will (Ideally in a future build) react differently to each pet. For example if the user pet's the head, the animal will react by making a sound and possibly encouraging more head petting or if the user pets the body, the animal could potentially dance around. These reactions depend on the animals themselves (It would be weird for a pig to jump and run around versus a dog). As of right now the user is able to look around the scene with VR through Google XR Plug-in.

Upon loading the scene, one will notice a few things: the fences encompassing the user, the red platforms that are raised from the group and the duck that's sitting idly in the middle. The fences in their current state are for aesthetics (talked about later) and do nothing in the scene otherwise. The red platforms are used to move the user around which in hindsight could have been much better designed, but for the sake of my eyes and trying to find the platform in a timely manner, it was made to be instantly eye catching for ease of access. The last thing that is noticeable is the duck in the middle that will be the main attraction of the scene.

Gazing at the red platform turns them into a blue platform which indicates that the player is looking at the platform and can interact with it, in this case tapping it to move to that platform. There are 3 of these platforms that do the same thing and allow for the user to move with ease.

Gazing at the duck on the other hand does a multitude of things. The first thing is that the duck is highlighted indicating that it can be interacted with. The next thing that happens is that the duck will face the user no matter what and start making duck noises or quacking. Following up the user is able to see heart emojis rise from the duck indicating that the duck is fond of the petting. Lastly a canvas in the background let's the user know that they are indeed petting the duck thus why these things are occurring.

If the user decided to move across the 3 platforms located on the scene and gaze at the duck; the duck will also repeat the above as many times as necessary.

VR Meditation Garden - Petting Zoo

Midterm: https://www.youtube.com/watch?v=2122tqewSbo

Final:https://www.youtube.com/watch?v=LHpQN8hVuzw

2.3 Activity Three - Vegetable Garden (K. Ng)

Gardening has always been equated with being peaceful and surrounding yourself in nature is known to be relaxing and soothing. Unfortunately, not everyone has access to their own garden, and there are also people who do not wish to step out of their homes for any reason because they are wary of COVID-19.

As of this paper, the gardening scene has expanded to both the watering aspect of gardening, and the harvesting of crops.. The reason for this activity is because many people take gardening as a relaxing hobby. Additionally, this scene is semi-inspired with personal experience in gardening and being modeled after it. Setting the scene, we have the player start in a position at the back entrance to a garden. They are already situated in the garden, among flower, tomato plants and cabbages surrounded by fences. (Assets were taken from a farming bundle on Unity). Using Unity Google XR Plug-in to manage the VR portion of the game, the user is able to look around the scene.

Nearby is a watering can, which will be highlighted when the user gazes at it. Upon clicking their Google Cardboard button (simulating a tap on the screen), the watering can will be "picked up". In order to simulate the lifting of the can, the position is changed on click and it becomes a child of the Player GameObject. Clicking the watering can a second time will place it down from its current position.

The flowers are for decorative purposes only, so we will focus on the two activities we can do. The cabbages denote the watering section. Both cabbages and tomato plants highlight yellow to show the player they may interact with it. On click, the cabbages will move the watering can above and tilt it forward to give the illusion that the cabbage is being watered. A second click will return the can to its original orientation to mimic a pause from watering.

As for the tomato plants, interacting with them will instantiate a tomato GameObject, a prefab from the LowPolyFarmLite Assets package. The plants are set to spawn up to a limit of 3. Spawning anymore will lead to the plant turning gray to indicate that there are no more tomatoes to harvest.

VR Meditation Garden - Watering Scene Demo

Midterm: https://www.youtube.com/watch?v=sVy3peUD1rE

Final: https://www.youtube.com/watch?v=HXTqzAHnx3w

2.4 Activity Four - Sand Garden (M. Washington)

Traditional meditation gardens are distinguished by their deeply patterned beds of sand, arrangements of rocks, and still ponds or gently flowing streams. They range in majesty from the historically significant (Japanese temples, such as the UNESCO Historical Site, Ryōan-ji, dated to 15c. CE) to the mundane (backyard enclosures, and popular desktop accessories).

Creators and visitors of such gardens vary in spiritual, cultural, and personal intent, but design commonalities exist: use of open or "empty" space, judicious use of color, and representative features of traditional "elements" (water, fire, earth, air).

In some approaches, the garden itself may serve as a medium of creative communication, either between those who visit and those who tend the garden, or in a more solitary or spiritual context, between humans and the world without or within.

For this project, I have chosen to set my sand garden within a warm, tropical island, to evoke a sense of comfortable solitude. The visual environment - sand, sky, trees, ocean waves - will in future versions be complemented by an aural environment - gentle breeze, tidal sounds, sand sifting.

My development device is the Oculus Quest, which includes hand tracking (Oculus Touch controllers), however I hope to eventually include an alternate HMD-only control scheme for a more accessible, passive-immersion experience. Unity's XR Interaction Toolkit offers a modular framework that over time will support vendors' devices (via manufacturer's plugins, or the OpenXR standard) without the need to rebuild/retarget for each platform.

Interactive zones/activities included in this demo:

- carpeted area for yoga or other body-mind exercises,
- firepit with incense that may be colored differently to change the fire's color and evoke different scents,
- sand rake to grab and possibly make ground patterns
- "Singing bowl", typically attributed to Tibetan origin, used to create vibrant tones that can be calming

VR Meditation Garden - Tropical Sand Garden demo

Midterm: https://www.youtube.com/watch?v=nnOMt745Qws

Final: https://www.youtube.com/watch?v=D5ebCHkMoO8

3 Discussion

3.1 Activity One - Breathing Exercises (S. Bravo)

For people who deal with anxiety, a breathing exercise that is very well known is the "4 7 8 breathing technique". This technique is known to be effective when trying to reduce the level of stress and anxiety a person could be having. Furthermore, there are people who use it when they are having a panic attack. Since this project is focused on mental health and reducing levels of anxiety, it is crucial to have this technique embedded into the VR experience we are trying to create.

It is important that the environment the user will be engulfed in when experiencing our game is relaxing. This is why every aspect and component in this scene was chosen carefully. When designing this at first the environment had a lot of trees. In fact, after much thought, I realized that the design felt a little too overwhelming. There was too much going on and this is why I scraped the whole design concept and decided to start over.

The goal throughout the design process after this was to create an atmosphere that was simple, straightforward and calming. The player will be in the middle of the plane at the start of the game and will have the option to move around. If it looks behind it will see trees to both the left and to the right, as well as a path in the middle. The path was created so that they could walk around and take in the nature like environment without having to walk through the actual cluster of trees.

In the front of the player, however, there are no trees. Instead they are met with something that reflects more of a garden. There is a bench in the middle and two water fountains on the sides of the bench. The player could walk around and take in what they see.

The player has the choice of when they want to begin the breathing exercise. Whether they want to do it as soon as they start the scene or after they walk around, they have the freedom to choose. There is a collectable above the bench that spins to get the attention of the player. When the player gazes at this collectable it resizes and becomes a little bit bigger. Not too much to overwhelm the player but enough so the player could know that it is an interactable. This was done with the Spin and Highlight script files.

Since I used the Google Cardboard for this scene, the button on the top of the Google Cardboard acts as a button for all the actions. When the player wants to move around they will use the reticle that I designed to point to the ground and move. When they want to start the breathing exercise they will gaze at the collectable. When the collectable is gazed the reticle will no longer just be a point signaling that the user could use the button to click on it. These actions were able to be done using the Navigation, Gaze Interaction, and Collectible file.

Once the player clicks on the collectable, it will be destroyed and the breathing exercise will commence. This is done by the countdown timer script that controls all of the text in the scene. It will tell users when to breathe in, hold and when to breathe out. It will also count down for each action to let them know how long they have to do it for.

The last aspect of the application is the audio, which simply mimics the nature like environment we are trying to create. You hear a little bit of wind and a lot of birds chirping. The audio plays throughout the whole game nonstop.

When I tested the application, I personally found it helpful and thought that it worked. However I also knew that since I was the one who designed it and created it, it would most likely adhere to my preferences. This is why I felt that my opinion on whether this was helpful or not was not enough.

Due to quarantine it wasn't easy to get participants, however I still managed to find four participants. Two were fully on board with being part of the demo participation and the other two were younger and therefore I felt a little uncomfortable with using them. However, I was able to observe how each person interacted with the game and recorded their opinions after. I didn't tell the participants much before starting the game except where the button on the Google Cardboard was and how they could use it.

There are many things I noticed. I noticed that although I told them they didn't have to physically walk around to move three of the four participants did and the participant that did not took a step before realizing they didn't have too. This made me think that maybe telling them that they did not have to physically move was not enough. Two out of the four participants also said they felt dizzy while using the game. One of them said that she felt like she had vertigo and that it was probably due to the spinning she did to look around.

Two of the participants also brought up the audio component of the game. They said that they found that the audio was a little too loud for their liking. One said that it kind of defeated the purpose of "creating a calm environment", meanwhile the other said they thought the idea and the sound worked but that the loudness in their ear bothered them.

All the participants agreed that the color scheme of the text in the application worked fairly well. They said that they liked that they were not bright colors but instead pastel and soothing. Although none of the participants said they had an issue with the collectable after taking a close look at all the screen recordings of when they played the game, I could tell they had a little trouble with finding the collectable. It took them a while to realize that they could click on it.

There are a few things I would have done differently after watching each participant's interactions. I would have thought twice about using the audio that I did. I also would have lowered the volume of the audio on unity more than I already had because clearly it was not enough. Although at first I was thinking about creating a stopwatch kind of countdown timer, I chose not too for many reasons but mainly because it felt too out of place with the rest of the scene. It didn't go with the simple look I was going for.

VR Meditation Garden: The 4-7-8 Breathing Technique

Final Demo: https://youtu.be/wUqe8ObjpKU

Participant's Transcripts:

https://docs.google.com/document/d/1u1ITJxCBORcPMcE9of2Zi5IzCBBH38zJ9eDz_uJJo4E/edit?usp=sharing

3.2 Activity Two - Petting Zoo (P. Du)

Working through this scene I realized that there were lots of possibilities to expand on it. The first noticeable thing is the lack of a zoo as the user is only in one enclosure upon loading the scene. I would have also liked to add animations such as different petting animations, walking animations as well as the hand petting animation.

Fences are meant to encompass the animals since realistically the animals would be roaming around their enclosure doing their own things. However, the current fences that exist are nothing more than aesthetics. I would have liked to make the fences be actual enclosures that keep the animal and the user in.

The platforms could definitely be optimized to be eye catching and easily accessible for movement if given the chance. The particles that come out of the duck are shot into the air and can be smoother to actually show the duck slowly enjoying itself. The canvas that tells that user that they are petting the duck should also be tied to the player so they can see it wherever they are versus being tied to the background statically.

The scene and scripts can definitely be optimized to execute better. Currently the petting zoo scene only uses 2 scripts, 1 that handles the movement of the player and another that handles all the interactions with the duck. Splitting the script up would definitely optimize the efficiency of the scripts as well as the scene.

I would have also liked to add music that resounds with the petting zoo such as country instrumentals to make the user really feel like they are at a petting zoo. Also having the duck make a default sound different from when being pet would be optimal, but finding the correct sound for it would pose a challenge in itself.

3.3 Activity Three - Vegetable Garden (K. Ng)

If I were to expand on this scene, I would have liked to add further interactions with the tomato plants. It stands to reason that you should be able to water a plant and harvest, but with the way my scene was set up it only did one action. Additionally, I had wanted to make a script for the tomatoes themselves, either move them into the basket the Player is carrying or simply destroy the tomato GameObject to make it seem like the player was collecting them.

Unfortunately, I ran into some issues with the scripts and Unity bugs and had to scrap the idea for the sake of time. Something I also wanted to add was audio, both one for the scene itself and another for when the can was tilted to help the illusion of watering. After all, a good way to relax is with calming music or soft nature sounds.

Lastly, for the interactions currently in place there are many issues and finding a better method to execute them would be important in ensuring the player doesn't encounter difficulties when playing the scene.

3.4 Activity Four - Sand Garden (M. Washington)

In building the tropical sand garden, I encountered two main design challenges. First, the activities should be as intuitive and accessible to new-to-VR users as possible, with limited prompting, or a need for instructions. Second, the visual and aural environment should be as immersive as possible, to make up for the lack of other expected sensations - the feel of sand, or the spray of the ocean on one's face.

At present, the planned scene includes all rudimentary functionality, amidst a pleasantly styled visual environment. Basic

near-space/room-scale navigation & teleportation are supported. The firepit, sand rake, and "Follow the Leader" yoga mat activities are complete, while the singing bowl has its socketed ringer/hammer, but lacks gesture detection/animation for its circular hand motion.

Composing the sound design of the environment was expected to be a daunting task, and in fact remains incomplete. I experimented with some simple background music, but was unsatisfied with the results, as it felt too "gamey" for the otherwise grounded visuals. With additional time, I can work on layering in a mix of diegetic sound (e.g. ocean waves, breezes/wind, sandy footsteps, fire crackling), and appropriate audio cues/prompts to complement the UI (especially invalid/valid triggers, which are currently only indicated via color/change).

Through self-testing, I believe I found a good balance between visual cues and explicit UI titles/prompts. That said, I did find some interactions could prove frustrating to a player-user, such as judging spatial distances (especially without a virtual avatar for comparison), using traditional UI widgets in a virtual environment, and truly relaxing while being acutely aware of wearing/handling equipment. It is possible that these annoyances were related to my own VR-neophyte status, and that a more experienced user would find them trivial. However, in the general case, finding a means of reducing - or even eliminating - some of the more artificial-feeling input requirements would aid the goal of achieving a relaxed, meditative state.

In future iterations of the project, besides the aforementioned audio and UI/UX fine-tuning, I would like to develop the scene into a more personalized experience, allowing player-users to have more creative input into the activities. The singing bowl could produce tonal variation, depending on gesture, or the yoga instructor could be exchanged for a tai chi or guided meditation lesson. I left a space (labeled in-scene) for a potential fifth activity - envisioned potentially as a sand art coloring table - which could persist from session to session, increasing immersion through engendering a sense of ownership of the space.

4 Conclusion

Following completion, we hope to open the project for fellow students to try out, and ideally let us know if they actually found it relaxing.

Even as we move out of the pandemic era, there will likely always be a need to have a space for quiet contemplation among nature, albeit from the indoor confines of one's home. Furthermore quarantine has shifted peoples lives in drastic ways and what was viewed as normal before the pandemic is no longer today's norm.

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