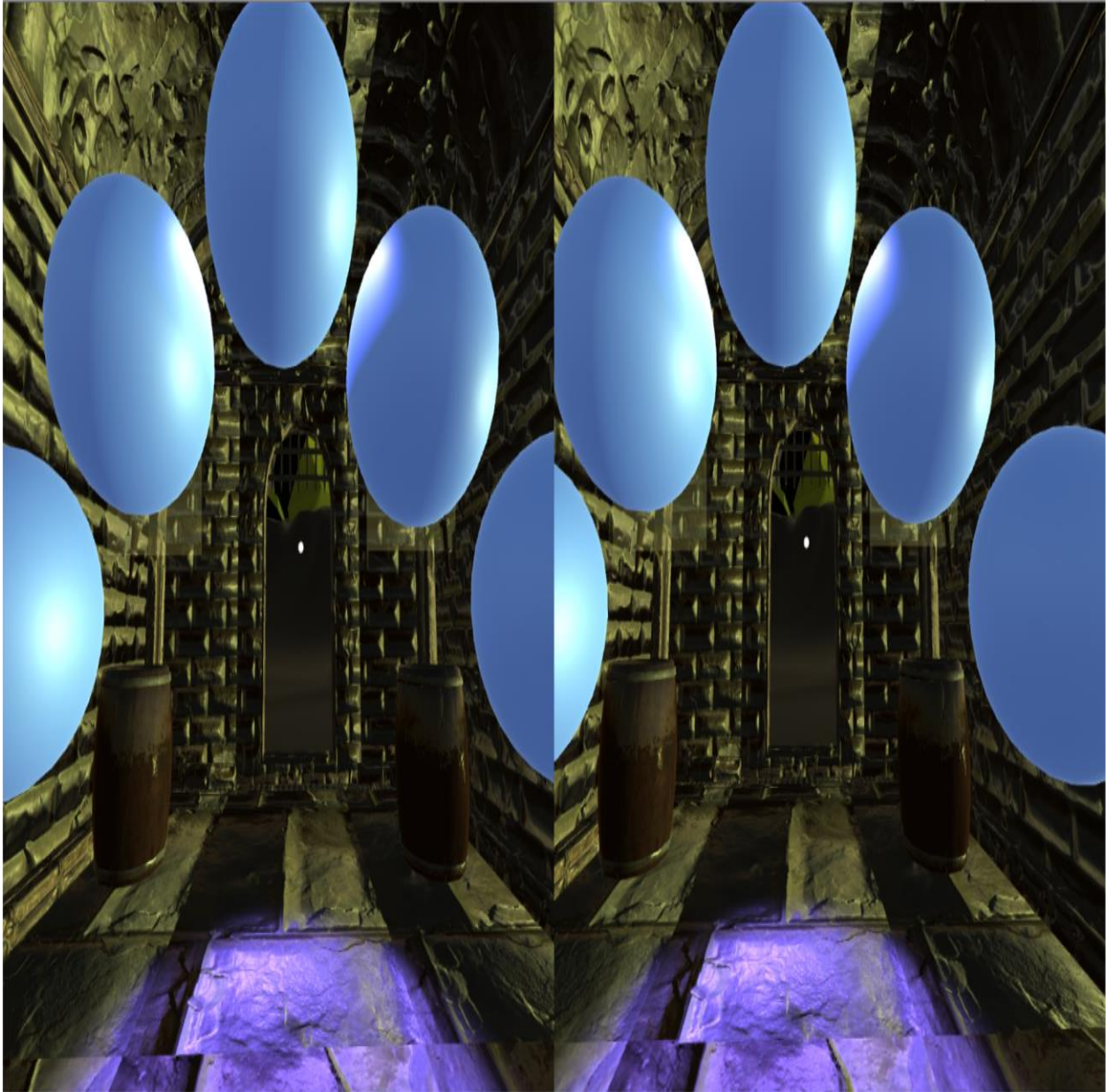# Puzzler VR Game Project Design Presentation

Designed and **Developed** by - *Sujatha Jagdeep*

1. Introduction to Puzzler Virtual Reality Game:

The Health Inspector of the local county health department contacted me to design and develop a VR app which helps **Food Safety Specialists** to **ensure their safety** through **audio** and **visual alerts** of **dangerous situations** while visiting unknown and mysterious food establishments to conduct **food safety inspections** in **real life**. It was an amazing learning opportunity for me to use my hands-on design and development skills pertaining to Virtual Reality, as I am very passionate regarding both Virtual and Augmented Reality. I am also pursuing online courses in Virtual Reality at Udacity to enhance my hands-on skills. Hence, I collaborated with a Food Safety Specialist to obtain her input, along with a couple of users who were willing to participate in user testing to design and develop the "**Puzzler VR Game**" app such that it meets the requirements of the Health Inspector and his employees.

This design presentation provides in-depth details regarding the design and development process, along with user testing conducted to design and develop the "**Puzzler VR Game**" app.

2. Project Title: Puzzler Virtual Reality Game

The **Puzzler VR Game** video provided below depicts the overall design and development process related to setting the scene, development of graphical user interface, movement mechanics, audio goodness, game mechanics and feedback, along with user testing and iteration to incorporate user inputs performed to create the final version of the VR app for use by the Food Safety Specialists on-the-job.

Please Note: Watch this video using a VR Headset such as Google Cardboard.

3. The Design and Development Process:

User Persona:

Susan, 25 years – **Food Safety Specialist**.

"I want to ensure my safety when I visit unknown and mysterious food establishments for food safety inspections."

Susan has been working as a Food Safety Specialist for the county health department for the past two years. She visits various unknown and mysterious food establishments to conduct food safety inspections on the job. She wants to ensure her own safety during food safety inspections.

VR Experience: None

Statement of Purpose:

Puzzler is a **Mobile Virtual Reality** app which helps **Food Safety Specialists** to **ensure their safety** through **audio** and **visual alerts** of **dangerous situations** while visiting unknown and mysterious food establishments to conduct **food safety inspections** in **real life**. It was developed in **Unity** using **spatial audio** and **gaze tracking** by **Sujatha Jagdeep**.

Sketch of the Environment:

I designed three sketches of the environment to begin with. Then, I chose the most preferred sketch based on user input. My final sketch of the environment is shown below.



Final Sketch of the Environment.

4. Setting the Scene and User Testing:

I began to set the scene by scaling down the virtual door to a similar measurement of a real-life door of my room. So, I first scaled down the door from 100, 100, 100 units in the x, y, and z axes to 50, 70, 100 units. However, when I checked the build of the scene on my phone, I felt that the door was a bit small from a normal human perspective. So, I scaled up the door to 70, 70, 100 units and checked the scene build again. Now, I felt that the virtual door in the scene is almost the same size as the real-life door of my room. Then, I proceeded further to build the four walls and roof, and setup the dungeon scene and its mood using the game orbs, fire torches, and scene lighting to develop the Puzzler VR game environment as per the final sketch provided above. I again checked the build on my phone to ensure that the scene setting looks as intended. Finally, I conducted user testing of the scene setting to obtain user inputs.

The screenshots relevant to setting the scene and user testing are shown below.
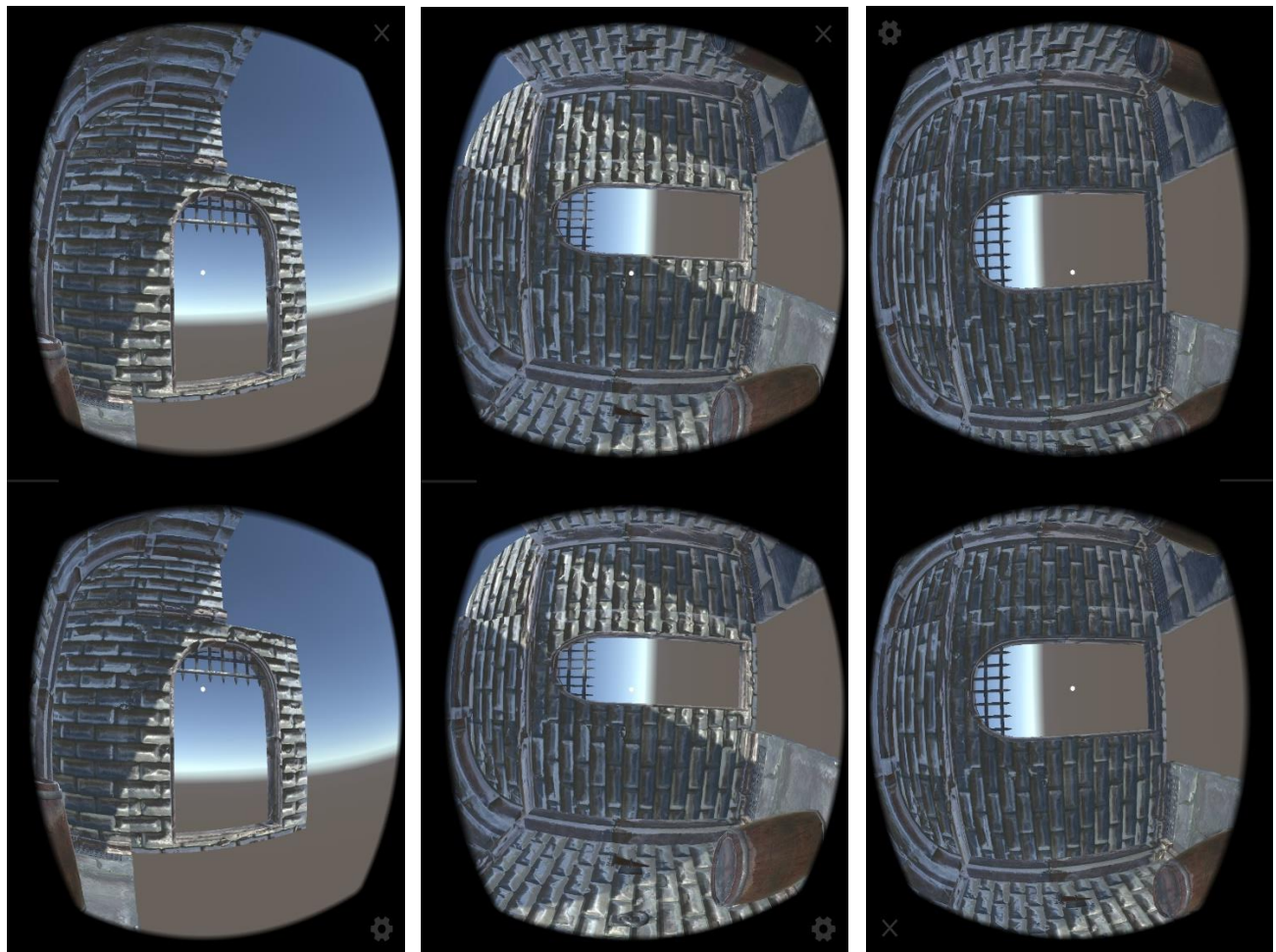
The Virtual Door scaled down to the same size as the Real-life Door of my room.
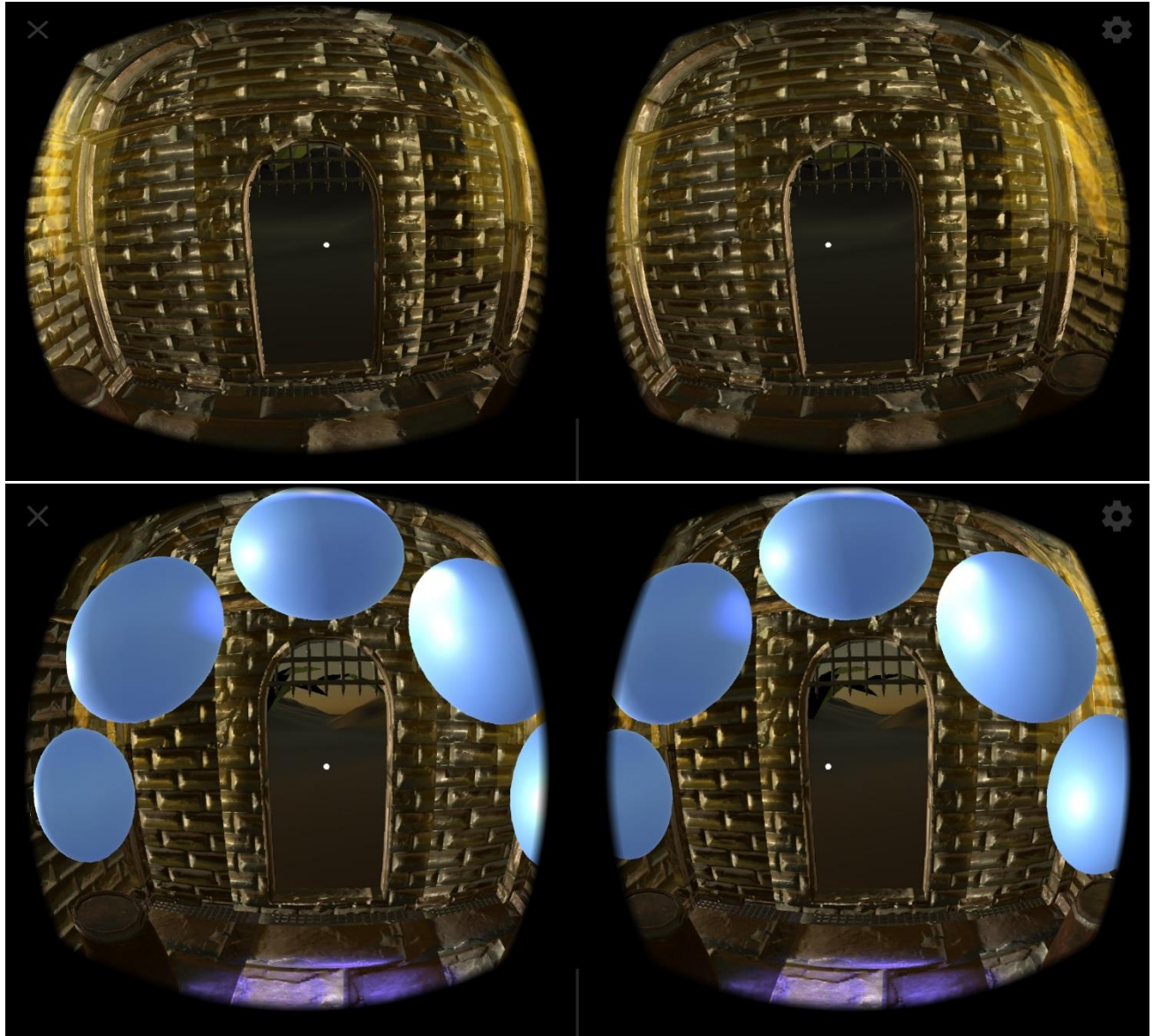
Setup of the dungeon scene and its mood using the game orbs, fire torches, and scene lighting.

User Testing Questions and User Responses (2 users):

1. **How big you are?**
   I am of a normal human height.
2. **How does the atmosphere look like?**
   It is dark, cool (due to the colors), mysterious and gloomy.
3. **Do you find it difficult to see something?**
   No, I can see everything clearly.

## Iteration to incorporate User Inputs:

It is obvious from the user responses that the scene of the Puzzler Game provides a good and enjoyable user experience for the users. Hence, there was no need to make any changes to the scene setting of the Puzzler VR game.

User Testing by the Twin Users.

Sketch of the Graphical User Interface:

I designed three sketches of the graphical user interface to begin with. Then, I chose the most preferred sketch based on user input. My final sketch of the graphical user interface is shown below.
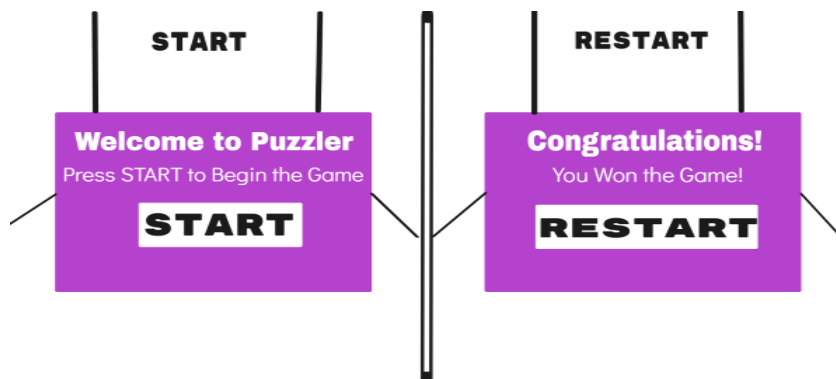

Final Sketch of the Graphical User Interface.

5. Developing the Graphical User Interface and User Testing:

I began to develop the graphical user interface by creating a canvas and switched its render mode to world space to scale it down to an appropriate size. Next, I added all the user interface elements such as panels, text, and buttons on it and rescaled them to fit the canvas. I changed the color of the panel, text, and buttons to make them attractive, clearly visible, and readable to the users. I duplicated the canvas and changed their names to "START" and "RESTART" to create the feedback and feedforward loops. Then, I built the graphical user interface onto my phone to ensure that it has been developed as per the final sketch provided above and works as intended. Finally, I conducted user testing of the graphical user interface to obtain user inputs.

The screenshots relevant to the graphical user interface and user testing are shown below.
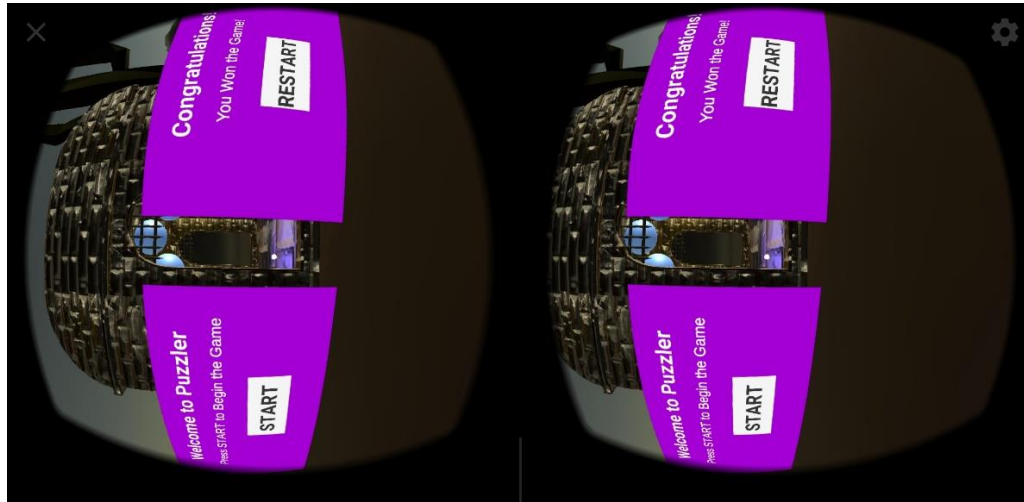
The Developed Graphical User Interface.

User Testing Questions and User Responses (2 users):

1. **What do you see?**
   I can see two screens with the "START" and "RESTART" buttons.
2. **What are the two screens/panels meant for?**
   They are meant for "STARTING" and "RESTARTING" the game.
3. **What happens if you click the "START" button?**
   I can start playing the game.
4. **Could you please click the "START" button?**
   Yes, I can (user clicks the "START" button to begin the game).
5. **What happens if you click the "RESTART" button?**
   I can restart the game again.

Iteration to incorporate User Inputs:

It is obvious from the user responses that the Graphical User Interface of the Puzzler Game works as intended to provide an interesting user experience for the users. Hence, there was no need to make any changes to the graphical user interface of the Puzzler VR game.

6. Movement Mechanics and User Testing:

I began to develop the movement mechanics by downloading the iTween library, as it provides a lot of options to create movement between two values within the scene. I updated the gameLogic script present in the project folder and attached it to the gameLogic object in the scene hierarchy. Next, I created three waypoints namely "START", "PLAY", and "END" using empty game objects and positioned them outside the entrance, in the play area, and outside the exit in the scene. Then, I repositioned the "START" and "RESTART" user interface panels outside the entrance and exit. I also setup the gameLogic script along with the "START" and "RESTART" user interfaces to ensure that the movement mechanics works at an appropriate speed as intended. I checked the build on my phone to ensure that the movement mechanics works as intended. Finally, I conducted user testing of the movement mechanics to obtain user inputs.

The screenshots relevant to the movement mechanics and user testing are shown below.

Movement Mechanics of the Puzzler VR Game.

User Testing Questions and User Responses (2 users):

1. **Could you please wear the VR headset and click the "START" button?**
   Sure, I can (user wears the VR headset and clicks the "START" button.
2. **Did you move into the dungeon?**
   Yes, I was able to move into the dungeon.

3. **What do you feel about the speed of your movement?**
   It was like a normal movement in real life (neither fast nor slow).
4. **Do you feel sick in any way?**
   No, I enjoyed my first experience of moving in VR 😊!
5. **Did you notice any height changes or disorientation during the movement?**
   No, I did not notice any changes or disorientation while moving.

Iteration to incorporate User Inputs:

It is obvious from the user responses that the Movement Mechanics of the Puzzler Game works as intended to provide an enjoyable user experience for the users. Hence, there was no need to make any changes to the movement mechanics of the Puzzler VR game.

User Testing by the Twin Users.

7. Audio Goodness, Game Mechanics, Feedback and User Testing:

I began to develop audio goodness by enabling the GVR Audio Spacializer plugin and added the GVR Audio Listener to the main camera. Next, I added the GVR Audio Source to the "Start", "Play", and "End" waypoints, along with assigning two different audio clips; one to both "start" and "end" waypoints to create a background spatial audio effect outside the dungeon, and another to the "play" waypoint to create a different spatial audio effect inside the dungeon. Then, I setup the game orbs to interact with the GVR Recticle Pointer and the recticle to provide feedback to the users by adding an Event Trigger along with PointerClick, PointerEnter, and PointerExit events on each of the game orbs. I checked the build on my phone to ensure that the audio goodness, game mechanics, and feedback work as intended. Finally, I conducted user testing of the audio goodness, game mechanics, and feedback to obtain user inputs.

The final project video depicting audio goodness, game mechanics, and feedback has been provided on page 1 under "**Project Title**: Puzzler Virtual Reality Game".

The screenshots and video of user testing are shown below.

User Testing Questions and User Responses (2 users):

1. **What is your overall opinion regarding the Puzzler VR game app?**
   I feel that the Puzzler VR game app is both mysterious and interesting to play, as it involves resolving a puzzle to win the game.
2. **What do you think about the Puzzler VR game app?**
   I like the desert and sunset background, colors inside the dungeon, and the music. However, the game orbs are placed very high and I should keep looking up all the time. The game also alerts me through both sounds and visuals. I feel that I must solve the puzzle and quickly move out of the dungeon.
3. **Do you have any comments/concerns/suggestions to improve the Puzzler VR game app?**
   Yes, the game orbs are placed very high and my neck hurts while playing due to looking up all the time. So, they should be placed at a lower level (normal human height) for the player to play the game with ease.

Iteration to incorporate User Inputs:

The user responses clearly indicate that the game orbs are placed very high and hurt their neck while playing, as they should look up all the time. Hence, I took a step back to detect the actual cause for the game orbs being placed very high. I found out that the game orbs seemed to be placed very high by the users, as the start, play, and end waypoints were placed at a lower level while developing the game mechanics. Hence, I increased the height of all three waypoints and moved the game orbs to the center of the dungeon along with the spotlight.

Then, I conducted a final user testing to confirm that the game orbs are placed such that the users can easily play the game without any strain on their neck. The user responses from the final user testing proved that the height issue of the game orbs has been fixed and the users can play the game with ease.
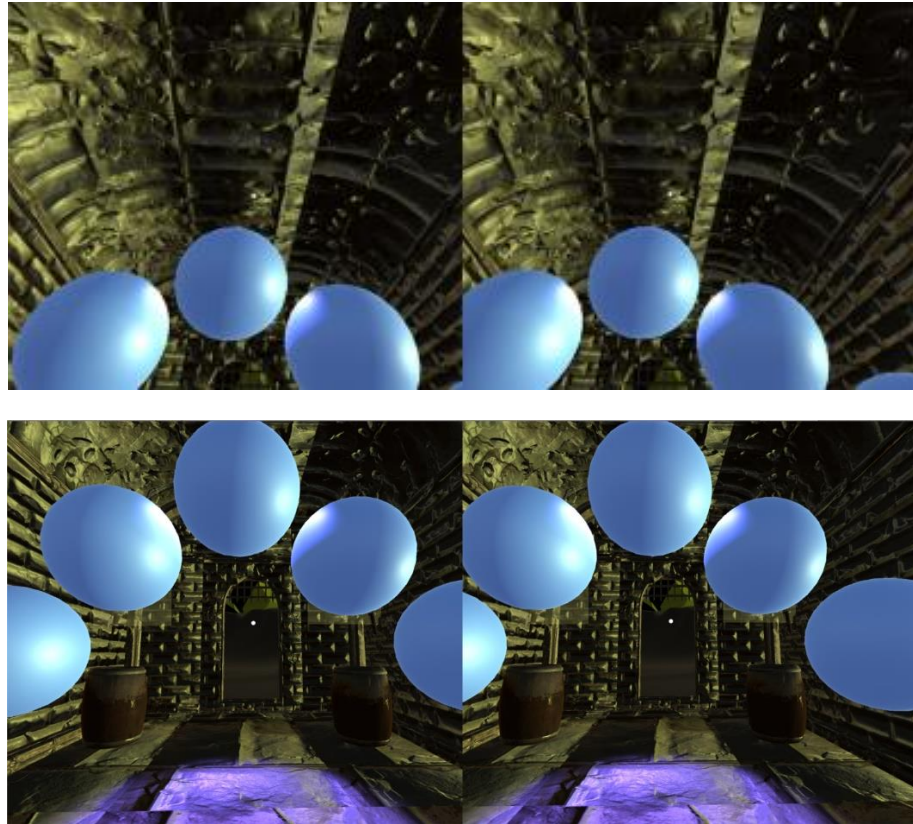
Position of the Game Orbs Before and After Iteration.

User Experience Video of the Puzzler VR Game.

8. Conclusion:

The design, development, and user responses from user testing of the **Puzzler VR Game** app reveals that it helps the users to ensure their safety by providing both audio and visual alerts of dangerous situations when they are present in an unknown and mysterious environment.

Therefore, I can confidently conclude that the **Puzzler VR Game** app will help **Food Safety Specialists** to **ensure their safety** through **audio** and **visual alerts** of **dangerous situations** while visiting unknown and mysterious food establishments to conduct **food safety inspections** in **real life**.

9. Further Steps to Improve the Puzzler VR Game:

1. I constantly get a warning in the console that states "Assets/UdacityVR/Scripts/Solutions/LightUp_2_Final.cs(82,21): warning CS0618: `GvrAudioSource' is obsolete: `Please upgrade to Resonance Audio ([https://developers.google.com/resonance-audio/migrate)](https://developers.google.com/resonance-audio/migrate)." Hence, I intend to use Resonance Audio to improve the Puzzler VR Game app instead of GVRAudioSource after completing all the VR projects.
2. I plan to improve the Puzzler VR Game app by adding more dungeon rooms instead of just one room, along with including more puzzle games to enhance user experience for the users.
3. I plan to improve the Puzzler VR Game app by designing different environments other than the desert environment.

References:

Vegas, J. (2015, May 14). Mini Unity Tutorial - How to Create Fire - Beginner. Retrieved May 24, 2019, from

      https://www.youtube.com/watch?v=qShjsxopbfQ&list=PLCteXJyIZTSBxXvXqrKtAmyASYujtKx4I&inde

      x=132&t=0s

Vecteezy. (2017, February 10). Headshot Icons. Retrieved May 29, 2019, from

      https://www.vecteezy.com/vector-art/138135-headshot-icons

******