An Immersive Virtual World in Unity

# Claustrophobia Simulator

## Introduction

Virtual Reality has been a focused area of research for many years. With the release of some advanced tech VR headsets later this year such as the Oculus Rift and Vive [2] the demand for further development in VR technology is dramatically increasing. Currently VR has been used to create some innovative practical VR applications such as Virtual theatres for Doctors to practice critical surgeries or simulated environments to diagnose and treat phobias and illnesses [3].

This assignment extends the learning materials and academic competencies taught on the SE3VR11 Virtual Reality course at the University of Reading [4]. It investigates the practicalities of using virtual reality to build applications that deliver an interactive virtual environment, scene object etc.

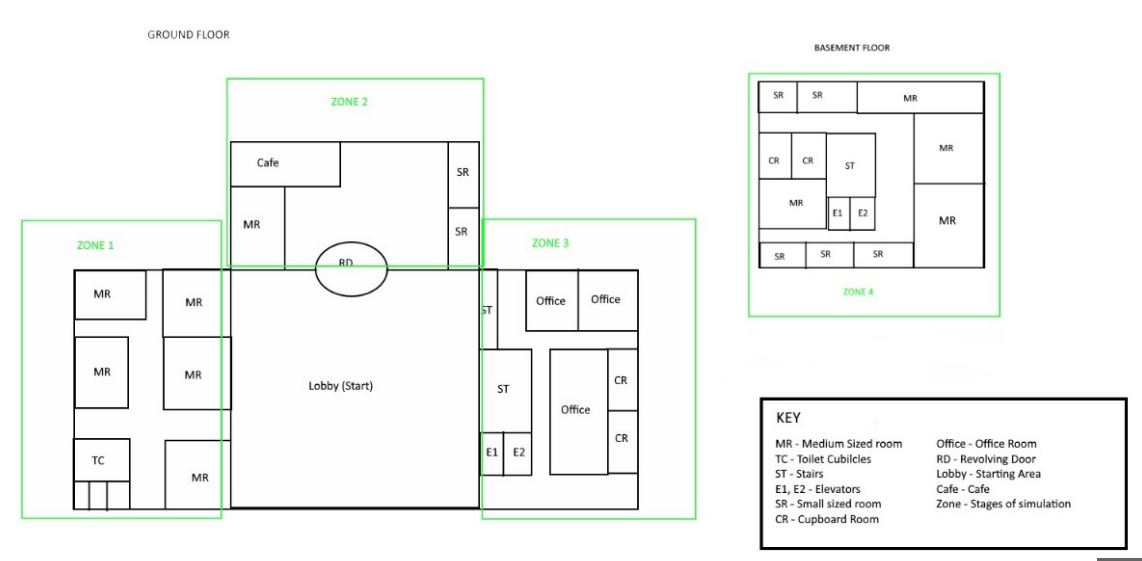
## Background/Motivation

In order to further absorb and reinforce the course content delivered on the SE3VR11 module two assignments are to be completed. The first was an Individual assignment to design and implement a virtual world in Unity. This is initially to familiarise oneself with the Unity editor tools and explore the mechanisms that allow a user to interact within a realistic virtual world. The first assignment was satisfied with a virtual two storey house incorporating windows, interactive doors and light switches. Textures, materials and models are also used to increase the believability and immersion of the world [4]. This assignment investigates the practicalities of an immersive virtual reality application through completion of a group project. Each of the members is expected to contribute to the design and development of a virtual world that is utilitarian, immersive and realistic. The members are then to document their contribution towards the project by discussing the projects objectives, how their work contributed towards the project aims and how and if they were satisfied.

## Design/Requirements Analysis

The team discussed the possible applications that could be developed and there purposes. After researching current VR applications and simulations a conceptual design was reached. The team concluded on a claustrophobia simulator which would allow the user to experience, manage and train claustrophobia symptoms by introducing features and triggers into the world that trigger symptoms of the phobia[]. The proposed environment would be comprised of four zones which would introduce features and scenarios that replicate real world common challenges a claustrophobic person may encounter in the world today such as elevators, revolving doors small cupboards etc. There would also be a comfortable starting area. The concept here is that each zone would become more of a challenge by introducing harder tasks to overcome and magnifying triggers in the environment. For example the last zone is located in the basement where there are no windows, very narrow hallways and small rooms compared to the Zone 1 which has wide hallways and fair size rooms. Aspects such as time constraints and team member numbers also dictated the design and concepts that could be proposed. This environment built up of zones essentially serves as the training or diagnostic suite for the application and then a separate environment would host a resizing/shrinking room that serves as a test suite. This is so that the user would be able measure there progression in some form from the training scene. Depending on the progression of the project other features such as a point scoring system for areas entered and features interacted with may be implemented. Figure 1 below shows the designed floor plan by the team.

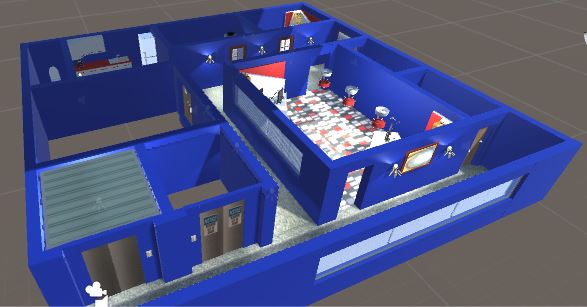
**Figure.1 Original Floor plan design**



## Implementation

This report documents the development of Zone 3 of the simulator illustrated in the figure 1 floor plan. Zone 3’s main feature is the elevator, a common trigger for claustrophobia []. Considerations for the area being one of the last zones is taken into account where the size of the rooms are smaller, there is less lighting and more challenges incorporated in a smaller environment. There is one functional elevator and an alternative set of stairs if the user is not comfortable with the feature but still wishes to continue to the next area. Interactive openable/closable doors, 3d models and lighting are placed around the scene. Box colliders where implemented for the models to represent physical mass and enhance the realism of the virtual world. The lift has an empty collider which is triggered when the user enters to pare the FPS Controller object with the elevator object. There are two small cupboard rooms a closet toilet and two slighter larger offices which all feature doors. In the centre is the biggest room which has to archway entrances without doors. Figure 2 below displays a screenshot of Zone 3.

**Figure.2 Screen Shot of Zone 3**



## Testing

How do you know if your solution is effective? How did you establish this, did you have a testing plan, a table of requirements and necessary functionality? Did you get impartial subjects to try the system and report on their experience?

The main methods of testing where carried out by myself and other team members. Some testing was carried out by course associates. In the ideal practice of testing users with diagnosed claustrophobia would provide the best quality of test results. Unfortunately expanding the testing scope that far is unrealistic for timescale designated for this project.

Object Collision Test

3D models and walls where tested for the resilience by walking into them. The box colliders implemented represented realistic physical mass for objects in rooms and walls such as the office desks and, wall paintings and lamps.

Feature Interaction Tests

**Elevator**

* The exterior and interior elevator buttons where pressed rapidly throughout the animation being played which caused the doors and elevator operations to fall out of synch. This can be fixed with some error handling that will prevent the user clicking more than once until animation has finished playing or an amount of time has passed.

**Doors**

After applying the ceiling extra lighting was needed as some features of the room where in complete darkness. Still had to consider here that Zone 3 would hosts as much lighting as the previous Zones.

## Results

This is only a small project but you still have plenty of results to discuss. Which aspects of your design did you meet (based on your test criteria), which need work?

Zone 3 successfully presented a

Although the elevator could provide a means of access to zone 4 its realism was unfortunately spoilt

Once entering one of the offices, the bathroom or either one of the cupboard rooms and closing the door

As the user clicks the button to open the doors on arrival of the basement floor the elevator proceeds to go back up.

## Discussion

Clearly some extra functionality needs to be implemented on the elevator to manage the door operations when entering and exiting the lift.

Although the

The program was very large and demanding on computer resources when running.

Other deadline priorities, time management, team communication. Team congregation

## Conclusion

Consider: Critically evaluate your work (as a whole and on your personal contribution), what was achieved, what were the problems and challenges, what has been learnt. A good conclusion reflects on the questions posed at the start of the project and attempts to provide and answer

## Further Work

Light switched in the cupboard rooms.

Correct and perfecting the elevator would be an aim.

Applting physics to the chairs. Interaction with fridge

The main two aspects referred to with claustrophobia is the feeling of restriction and suffercation

If a heart rate receiver from something as common as a smart phone could input readings from a user into the environment then even more interactive control and immersive reality can be achieved.

## References

[1] ref to VR module

[2] ref to previous individual coursework

[] Common trigger for claustrophobia, Phobias.com. Available at: <http://phobias.about.com/od/phobiasatoh/f/What-Is-The-Fear-Of-Elevators.htm>