Project Proposal: *Fire Disaster Simulation*

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Project Summary

The goal of our project is to create a Virtual Reality fire simulator that can teach users how to properly protect themselves and escape during a fire. There will be two main scenarios in our project: a fire guidance scenario and a fire simulation scenario. In the fire guidance scenario, people can explore a VR environment to understand the dangers of fires, learn the correct safety procedures, and practice using the VR equipment. In the simulation scenario, users will have to deal with a simulated fire outbreak. In order to complete the level, they will need to make the right decisions within a certain amount of time to safely escape the fire.

Statement of Problem or Need

According to statistics from the international fire department, there are currently about 7 million fires each year, and about 60,000 to 70,000 people were killed in the fires all over the world. The recent Australian bushfires are a grim reminder about the hazards posed by fire. We believe It is difficult for people to deal with fire accidents correctly only through books and posters. The fire simulator places people in the virtual fire scene to train their actual ability to deal with the fire and increase their fire handling experience.

Objectives

There are 6 major objectives for this project

1. To simulate the fire and fire-spread in a VR system. Specifically, If users touch fire or get too close to it, they will get hurt. We set multiple fire spots at different locations of the scenario and will randomly activate parts of them. The fire also can spread and generate smoke which will reduce users' vision.
2. To simulate real fire survival, we plan on creating a variety of items that can be interacted with, such as masks, doors, fire extinguishers, etc. Users operate items through Oculus Touch Controllers.
3. Users can play through a fire guidance scenario and a fire simulation scenario. The fire guidance scenario trains the user and the fire simulation scenario tests the user. The fire simulation scenario will be a building such as an office or a school and the user must escape from/extinguish the fire within a certain time limitation to succeed.
4. To create a sufficiently detailed virtual office or school in the fire simulation scenario that can be explored by users.
5. Populate the office or school with a range of interactable items. We will try to ensure that some items can be used to extinguish and stop the spread of fire.

6. Alert user about their health status through vision and breathing changes. If the users continue to remain in hazardous areas, they will die.

System Design

The system will have two main scenarios, an untimed training scenario and a timed testing scenario. The training scenario will focus on teaching the controls, correct safety procedures and will provide a variety of tips on surviving a fire. In the testing scenario, players will be put in the midst of a fire outbreak which they must escape. The testing scenario will have a more complex level design(possibly 3 or 4 floors) and a fixed time limitation.

The most important part is to simulate the fire spread physically through the levels. We will use some existing assets in the unity asset store to achieve the particle effects of the fire and smoke which will ensure we finish the most basic elements of the project quickly.

All the rooms will be custom-built on ProBuilder. We intend to use some existing assets to accelerate the process. The fire simulation scenario will cover the most common indoor scenes like hallways, office spaces, stairs and restrooms. We will have a fixed number of spots the fire can start from, but only a random subset of these spots will actually be used during each playthrough.

Ideally, there will be multiple different solutions to the level. Players can either find a way out or put out the fire by using the interactable objects if the fire hasn't spread too much.

Project Deliverables

Milestone 1:

- Simulate fire using the asset from the asset store
- Allow users to switch between two scenarios
- Create a basic layout for the two scenarios
- Get all of this working in VR

Milestone 2:

- Set up locomotion in VR
- Set up vision changes
- Create interactable items that can be picked up, held and used in put out of the fire
- Populate non-interactable items to simulate the real scenarios
- Run and test the simulations

Milestone 3:

- Finish adding the remaining interactable items and assets to the levels
- Set up fire spreading rules and scripts
- Set fire survival rules
- Add ambient background music and sounds on pickup/drop/use of objects or items
- Add haptics when selecting objects