

Project Demo Report

Project Group: Group 3, Fire Disaster Simulation

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1) Discuss your observations of users' behavior and thoughts about your system

In our project, we created a fire VR simulation system to simulate a real fire scene. We mainly have two simulation scenarios: a fire guidance and escape instruction scenario; a large two-floor office building as a fire practice scenario. When you use a VR device to enter our project, you will be in an ordinary office room, and the text on the wall will guide you how to operate. At the end of the teaching, you will pull down a handle, and the scene will automatically switch to the practice simulation building. In practical scenarios, players need to manipulate VR equipment, interact with objects in the scene, and finally find a safe escape route to escape from the fire building. After the players cleared the game, we also prepared an Easter egg to enhance the fun of the project content.

After receiving feedback from other classmates, roommates and friends to experience our project, I found that everyone's experience is very different. We received a lot of praise for our project, and also received many very constructive suggestions.

Regarding the appreciative evaluation of the project, most of the experiencers expressed great interest in the concept of the fire simulator, which was considered to be a very popular and promising topic. Users can increase their experience by experiencing the virtual fire scene, improve their response capabilities, and reduce the mortality rate of fire. We will also continue to optimize and perfect this project, hoping that it will become more perfect for use in real life.

However, many people also raised the shortcomings of this project and gave quite useful suggestions. The lack of authenticity of flame is a problem that many experiencers have mentioned. After our repeated verification and comparison, we found that the fire model used in our project did not fit our scenario very well. In the simulator, we use a cluster of flames to superimpose a cluster of flames to simulate the flame spread, but this method is very abrupt when it is applied to a large fire scene like ours. Many people suggested that we should adopt a large-scale continuous fire model, and expand the sound of fire, or even create smoke, to reflect the authenticity of office fires.

Another issue that players care about is the playability of the project. Project experiencers report that our project is too simple, and players can easily escape from the building. Others say that we should add a health mechanism to remind users of their health status at this time in order to force them to find the right way out. I want to say that we did design a health mechanism. When the player is close to the fire or even close to death, we provide the player with a strong bloom effect to remind them. However, this is not obvious to the players, and most people can quickly find the correct escape route to leave the building. Therefore, in the future work, we plan to add more doors and stairways to add to the difficulty of the project, and use timers or more obvious physical health mechanisms to remind players to find the exit as soon as possible.

2) Integrate your observations with the course material

There are three topics we discussed in the VR course related to the feedback of the experiencers: presence, audio, and locomotion system. Place presence deals with feeling that you are actually in another place. Through the feedback of the participants, we realized that most people are more satisfied with the visual "deception" brought by this VR project. The architecture, layout and decoration in the virtual environment make users feel that they really seem to be located in an office building. They can also interact with doors, windows and some seats through handles. However, we also received some negative feedback about the authenticity of the flame. In observation, we found that most experiencers are not afraid of flames in VR, because no matter the flame model, the sound and the diffuse effects do not give people a real feeling. In other words, the virtual fire existence is not consistent with what people think subconsciously. People prefer to play it as a game rather than a virtual reality environment.

Audio is one of the essential elements in a VR project. Audio spatializing allows people to localize the sound in the virtual space. About four or five people have reported to us that they feel that this virtual environment is very quiet, making them feel unreal. It is true that we added a lot of special effects audio, for example, the sound of flames, footsteps and other sound effects. However, we ignore the most important environmental background sound. In the real world, we often want to eliminate reverberations, as they can destructively interfere to make sounds less clear. However, since reverberations occur in the real world, sound in VR without reverberations seems less realistic. Because in the real world, we are rarely in a single sound environment, the reverberation of different sounds will make our virtual environment more real.

Locomotion system is what we think is the best part of what we do. We strictly limit the normal height, width, step and jump height of the avatar. This allows users to bring themselves into the virtual environment when experiencing VR projects. We also received a lot of feedback about the locomotion system. They all expressed satisfaction and recognition for our sports system. They did not feel too much stagnation, lag or stuttering. Smooth locomotion system gives the experiencers a very good sense of operation and fluidity.

3) Discuss lessons learned about VR and changes you would make to your project

As mentioned in the first part, we now face two main problems: how to make the fire more real, and how to increase the playability of the project. Regarding these two problems, we can use the knowledge learned in VR courses to solve.

First, we need to optimize the flame model. In our VR scene, we are showing a virtual building fire scene. The current fire model is obviously too small for our scene. According to the experience discussed in the class, we can also make our virtual scene more realistic for audio, such as increasing the noise of fire, using reverb mode, and spatialized sound. Similarly, scene rendering is also very important for our project. It will make our project scene more real. The shadow of the fire and the smoke it caused were also a direction for us to ascend later.

Finally, in order to increase the difficulty, we need to enrich the content of our project. We can use the smooth locomotion system and unity's gravity engine to restrict some of the user's activities. For example, if the user jumps out of the window on the second floor, it will cause death, some doors that cannot be opened, or the passage through which the user cannot pass. At the same time, we need to re-create a health mechanism to inform the user's vital signs in real time, instead of using vague special effects like now. One tester gave us a very good idea. We can use UI technology to make some signs on some walls or passages to guide users to escape the fire scene correctly. We will continue to work hard to optimize our project and make it more and more perfect.