CSE 490V Final Project Proposal

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1 ELEVATOR PITCH

Our group plans to design a virtual 3D simulation of a crime scene investigation. The user will be able to view a crime scene in 360 degrees by turning their heads around, and look for evidences by clicking on different objects presented in the scene using hand controllers. They will also be able to look closer into certain spots inside the scene through a magnified view. There will be text displaying next to the evidence after the user made the selection. After acquiring sufficient information, the user will need to identify the murderer from X(2-3) suspects.

2 EXTENDED OVERVIEW

The inspiration comes from many existing VR tour applications made using Unity. By creating panorama and cube-maps, those applications is able to provide the users with a 360 degree view of the surroundings [Chung 2018]. Scene switching is made available by adding new hot spots [tut 2019].

The users will be able to click on different spots and get a magnified view. Potential applications involve house tour and famous scenery tour. Our group thinks that similar work can be done to reconstruct some realistic views of crime scenes to allow the users to discover what are the hot spots in the scene (Potentially adding hints for the positions of the evidences). Previous study on cyber crime scene simulation with VR talks about the importance of visual feedback, due to the lack of touching in the virtual environment [Liu et al. 2017]. Therefore, we will integrate in feedback systems such as color changes when user selects an object, and vibrating effect on the hand controller to provide a sensation of touch.

2.1 Technical Challenges

This project involves addressing the following key technical challenges.

- We will generate 3D panoramic video using sky box.
- Learning Unity: Both teammates have not used Unity before.
- We will enable hand tracking functionality with Oculus controller, implement responsive listener for hand actions, and make according adjustments to have good user experience.
- We will need to figure out the proper way of displaying pop-up evidence when users click things inside the scene(manual selection for the users). For example, text might be distorted on the panorama.
- We will take photos and make accurate cube images from them in order to render cube mapping of the scene.
- We will implement scene change under user choice and experiment with the change effects (i.e. video mimicing walking, animation).
- We will potentially edit photos or make graphs with Photoshop to modify some of the scenes.

2.2 Key Risks and Mitigations

- Lack of resources to reconstruct an existing crime scene. Possible mitigation could be create the scene by taking photos of a fake crime scene created by ourselves

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- Lack of familiarity with the necessary software Unity. The mitigation plan is to render panoramas manually with other packages, or writing the algorithm from scratch.
- Scene transitions triggered by user's selections might not be very smooth. The effects can be mitigated by using transition animations between scenes

3 HARDWARE AND SOFTWARE

This project requires the following hardware.

- [Requested] Oculus Quest (headset and controller)
- [Personal] None

This project requires the following software.

- [Requested] Adobe Photoshop License
- [Personal] Unity.

4 TEAM RESPONSIBILITIES

The amount of works depends on our story design, so it is hard to split the scenes at the proposal phase. We will split the scenes evenly according to factors including different view positions in the main room, different enlargeable scenes, target objects.

- **Zhu Li**: Responsible for: (1) Design the story with teammate and design the scenes assigned to this member. (2) Take photos and make panorama for the scenes . Test the functionality. (3) Make scene transitions and add hot spots to the scenes. Test the functionality. (4) Write final report with teammate.
- **Weihan Ji**: Responsible for: (1) Design the story with teammate and design the scenes assigned to this member. (2) Take photos and make panorama for half of them. Test the functionality. (3)Pair programming with teammate to make scene transitions and add hot spots for evidence details. Test the functionality. (4) Write final report with teammate.

5 DEVELOPMENT PLAN

We aim to complete this project over three weeks, with the following major milestones.

- **March 4**: Finish design of the scenes and story line. Prepare photos for the panorama.
- **March 9**: Finish generation of panorama using sky box.
- **March 11**: Finish making and testing head tracking with Oculus headset in the panorama.
- **March 16**: Finish making hand click listener for targeted objects in the scene, and testing hand tracking with Oculus controller in the panorama.
- **March 18**: Complete final project report.
- **March 19**: Prepare for final project demo session.

REFERENCES

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