CSE 490V Final Project Proposal Template

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INSTRUCTIONS

Your final project proposals are due on 17 February at 11:59 pm. Proposals are to be submitted on Gradescope (sign-up code: M67ZKB). Submit a single ZIP containing a PDF proposal document and any auxiliary materials (e.g., images or videos). Students should discuss their final project ideas with the instructor, during office hours or using Piazza, before developing the full proposal.

1 ELEVATOR PITCH

Our project will create a vr experience to render 3d volumes. We would create a realistic world space for the user to examine medical scans in an intuitive manner. The experience would allow the user to isolate certain features, focus on parts of the volume and move the object around.

2 EXTENDED OVERVIEW

Volume rendering is an important visualization method and has been existing for a long time. It is widely used in making medical diagnosis. In years, doctors must access patient's bones, organs, or tumors on a personal computer with help from a mouse and keyboard. Obviously it is not very intuitive to use as they have to adjust view point throw mouse movement; meanwhile the displays are limited only to 2D screens. We can successfully address these issue through creating a virtual 3D environment that renders the volumetric data, and control the viewpoint in a realistic way with a VR. Most of the knowledge necessary for this was already covered during lecture.

We will be doing this project based on existing open-sourced volumetric data set. With the data, our rendering system will define a camera location and perform a ray-casting to simulate a projection of camera ray through the data object and calculate pixel values. Volume rendering in general has a higher computational complexity, so volume rendering an object in 3D with fine details and high frame rate might be a major challenge. Some advanced volume rendering algorithms like Frustum Shear transformation can improve our result.

Here is a link to a paper that we referred to: Click Here

2.1 Technical Challenges

Your individual contributions to the final project should have the relative difficulty consistent with two regular CSE 490V homeworks, excluding the time required to produce the final report and prepare the final project demo. Multiply this difficulty by the number of team members (i.e., projects with two contributors should be as challenging as four homework assignments). Please provide a list of the key technical challenges.

- Rendering the volume will be a challenge as it involves taking a finite set of points and finding a gradient in order to come up with the normal vectors. This is a very big challenge that could create unrealistic renderings.
- Virtual reality controls is another big challenge. We will need to make an intuitive control system that can give the user the largest variety of possible settings.

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2.2   Key Risks and Mitigations

Use this section to outline key risks (i.e., reasons you may not fully realize your elevator pitch). Examples include lack of familiarity with the necessary software (e.g., Unity), unknown hardware limitations (e.g., lack of documentation), and reliance on prompt delivery of unique hardware.

- None of the group members are familiar with developing for a vr system so we will need to familiarize ourselves with using the associated sdk.
- Volume rendering could be far slower than we expect it to be so we may need to deal with certain optimizations to provide a usable experience.

3   HARDWARE AND SOFTWARE

List the hardware required to complete your project. Indicate which items are requested to be provided by the teaching staff, as well as personal items you already own.

- [Requested] Commercial VR headset.
- [Requested] VR-Ready PC.

Also list the software required to complete your project.

- [Personal] VR SDK.

4   TEAM RESPONSIBILITIES

Describe the primary responsibilities for each team member. Remember that the individual responsibilities should be on the order of complexity of two CSE 490V homeworks.

- **Xiao Liang**: Responsible for: Researching developing for the specific vr headset, (2) implement the volume renderer for the standard display, and (3) fine tune other aspects of the system.
- **Jeffery Tian**: Responsible for: (1) Preparing the data to be rendered and test other volume rendering libraries (2) implement controls for the headset, and (3)implement stereo rendering.
- **Nguyen Duc Duong**: Responsible for: (1) Implementing the homework for the vr headset, (2) implement the volume renderer as well, and (3) fine tune other aspects of the system.

5   DEVELOPMENT PLAN

Final projects should be completed over three weeks (i.e., February 29 through March 19). Students are encouraged, but not expected, to start earlier. To assist in assessing the complexity of your project, please provide a high-level development plan, including major milestones (i.e., dates that significant hardware or software features will be tested or completed). Include time for writing your final project report and preparing for the final project demo session.

- **3/4/2020**: Be able to create a little vr application using homework so we can see teapots in vr on the commercial vr set.
- **3/13/2020**: Perform volume rendering and display it on a computer monitor along with being able to make controls for the user.
- **3/19/2020**: Rendering the volume to the vr headset.

Include a list of references (e.g., external websites and publications).