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CS232 Project Proposal

Exploring Efficient Image-Based 3D Rendering

Despite continued advancements of 3D graphics capabilities of consumer PCs and mobile devices, there’s a surprising lack of 3D content on the web. One possible application of 3D content may be online shopping. However, in order for 3D content to be practical for such application, there needs to be an easy method of scanning 3D objects as well compressing the data for use in an online context. With recent advancements in computer vision based 3D scanners and mesh simplification techniques, I believe this may not be too far off in the future. This project will attempt to build a pipeline that demonstrates the feasibility of using current technologies for such a purpose. The pipeline I’m thinking of looks like this:

1. Take photos of an object from multiple angles
2. Segment foreground and background in photos.
3. Feed photos and mask to PMVS (patch-based multi-view stereo) algorithm
4. Take extremely detailed (vertices at pixel level) mesh from PMVS, simplify it using a texture sensitive mesh simplification algorithm.
5. Devise the scheme for rendering and displaying 3D meshes while interpolating between photos to get textures at angles in between the original photographs.

Most of my efforts will focus on exploring steps 4 and 5, since there already is a lot of existing research in the other steps of this pipeline. Rather or not I will be successful with step 5 is a little fuzzy. The closest paper I’ve seen to solving this problem is on eigen textures. Importantly, step 5 (rendering step) needs to be efficient enough to run on a variety of hardware unlike the other steps in the pipeline that can be processed offline. Step 4 (mesh simplification) will need to work in such a way that details are preserved when the mesh is displayed using the algorithm in step 5, meaning I will probably have to modify an existing one.

Ideally, I would like to implement a web interface for processing these photos on a server in the cloud and viewing it in browser. However, I don’t think I will have time to implement and test one within the length of the course. Instead, I will attempt to implement and test the performance
of my algorithms on a stand-alone machine, so I can assess the feasibility of using these techniques in a web context.

(I will not be using an Android device for this project.)

**References:** (Please let me know if you know any papers that are relevant to my project. I’m still looking for ideas.)

