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15-400 Project Milestone Report

Major Changes: After reviewing the literature on the subject and discussing it with Professor Hodgins, we have decided to narrow the scope of this project. Rather than trying to answer all of the questions related to seeing one's physical environment from within the virtual world, I will be focusing on the social aspect: how can we show users what other people are in the space with them? How do users expect/prefer this to be done?

The primary reason for this is feasibility; we want to make sure that I can finish my project with a strong result, rather than rushing or failing to complete the very complicated (and admittedly somewhat vague) original idea I suggested. Another reason is originality; there are already several projects and papers out there exploring ways to keep people from colliding with objects in their physical space, either by generating models of them or replacing them with different virtual items. The idea of social interactions between people in VR and people outside it is much less researched.

What I Have Accomplished So Far: I have read several papers related to awareness of one's physical space from within virtual reality. I have also researched the various VR headsets and 3D sensors available to determine which ones are best for my project (see more info on that below), and have spoken with a few people about using/borrowing their hardware for this project.

Meeting My Milestone: In some ways, I have met my milestone: I have made my plan for next semester more specific, have updated my milestones (see below), and have done quite a bit of reading regarding the best hardware to use and what other researchers are doing in this area. However, I'm not sure I'd say I'm entirely "caught up" on related research, since now that I've chosen a specific area, I should probably do a bit more reading on social interactions and presence in virtual reality.

Surprises: Obviously my project has changed a lot since my initial proposal, but I expected that to happen. I wouldn't say there have been any real surprises during that process, though.

Revisions to My 15-400 Milestones: I have revised my early milestones to reflect my new plan, which is to look into several different methods of representing people in virtual reality. My last few milestones, which all related to conducting a user study, have not changed. Here are the updated milestones:

> **February 1st:** Implement very simple VR experience involving data from the RealSense camera, to get used to working with it. Make sure it's performant.

February 15th: Implement point-cloud method of rendering people in VR. Ideally, make the users' own body be optionally invisible. Prepare and submit IRB proposal for user study.

March 1st: Implement abstract skeleton method of rendering people in VR. Again, user's body is optionally invisible.

March 22nd: Implement third method of rendering people in VR (designed later, based on observations so far and/or literature). Begin recruitment for user study, and begin planning playtests.

Resources Needed: Rather than use a headset-mounted sensor to detect the physical world, I have decided to use room-mounted sensors (easier to implement). So, I can use a standard Vive rather than Vive Pro, and will use RealSense cameras as sensors (ideally three, though I haven't found three I can use for sure yet). If needed, I can use Kinect rather than RealSense, though I doubt they will be easier to obtain. I have identified one Vive that I can use, but I would not have exclusive access to it, which could make scheduling difficult. My current plan is to develop on that Vive, and check out a different Vive from Hunt Library when conducting user tests, so that I can do those somewhere private. However, I am asking around to try to find another Vive I could use that is already in a suitable place for user tests and isn't as frequently used as the other one (if you know of anyone I could ask who I might not have yet, let me know). I already have Unity and all other software that I expect I will need.