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EE 267 Project Proposal

Imagine that you have created the perfect virtual reality world, with a multitude of carefully crafted stories that you would like to tell. However, once a user steps into this world, everything falls apart. Instead of looking at what you intended, they are off exploring a different part of the world that is not nearly as rich. How do you guide the user back to where you would like them to be? How do you ensure the story is told in a seamless and immersive way?

Gaze direction is one of the problems that content-creators face in virtual reality. There are a number of different approaches that could be used to achieve gaze guidance: we propose exploring flicker, blur, and 3D (directed) sound as potential approaches to guide a user around a scene.

Sound

Humans are very responsive to sound. With this in mind, perhaps having sound emanate from an area of interest would attract a user towards it. However, this approach has a few drawbacks. What if the scene is not supposed to be noisy? Content creators might not want to add artificial noise to their scenes. Additionally, to do this effectively, the audio engine must be able to accurately represent 3D sound (or at the very least stereo sound). Furthermore, using sound is a very active way of guiding gaze, as users will consciously recognize that something is happening that they do not see. A poor user experience might be had if they are disappointed when they reach the area, or pick up on this trick.

Blur

Blur is another potential approach to directing a user's gaze. The hypothesis here is that users might be guided toward areas that are in better focus and away from areas that are blurry. By blurring certain parts of the scene and not others, perhaps a user can be guided. This approach might harm the user experience (the user may lose their immersive experience) if the blur is not carefully applied.

Flicker

Flicker could be a subtle way to guide a user around a scene. In a previous class (EE 367), we explored this technique on images. We can take advantage of the differences in foveal and peripheral vision to guide gaze: foveal vision is sensitive to color but not motion, and peripheral vision is sensitive to motion and not color. This arises from the distribution of rods and cones in the eye. We have seen some success in gaze guidance for static images, but believe this technique could also be applied successfully to virtual reality. The principal advantage of this technique is that users are not aware that their gaze is being directed, and it does little to alter the immersive experience of VR. However, it is indeed subtle and may not be able to attract their attention all of the time or for a prolonged period of time.

For our project, we propose running a small-scale user experiment (around 10 participants) where users are shown realistic scenes that are downloaded from the Internet. We will try to direct them to a random part of the scene with the different guidance cues. We will measure how quickly we can guide their gaze, as well as its success rate. We will use head angle as a proxy for where the user is looking. We hypothesize that this is reasonable, as it is natural for one to turn their head when looking at an object (especially if the object is in the periphery) - we will look for literature that supports this claim.

As far as the timeline goes, we will spend about a week doing literature research on these different techniques. We will then spend another two weeks constructing the experiment and optimizing parameters on ourselves. A few days will be then needed to run the experiment and analyze the data.