REAL-TIME CAMERA POSE ESTIMATION FOR VIRTUAL REALITY NAVIGATION

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Navigating virtual realities can be done in a variety of ways, ranging from simple joystick controls to complex sensor-based methods. In this project, we propose to use the movement and orientation of the display device itself (in our case, this device is a mobile phone) to navigate through such a virtual world. As we move the phone around, the image on the screen changes accordingly, as if we were standing in the virtual world itself and viewing it through the phone's camera.

To accomplish this task, we subdivide our project into several components. First, we need to detect a distinct and robust set of features in a particular frame. Then, we need to track this set of features across a succession of frames. Using the feature correspondences, we can then calculate the location and relative movement of the camera. Finally, we project this location and relative movement into our virtual world to produce the images that will be displayed on screen.

Since we want our program to work in real time, we need a feature detection and matching algorithm that is both fast and accurate. We plan to try and use SURF for this, because it satisfies these requirements. Once we have a set of matching feature points, we can use linear methods to solve the homography between them. However, we're not sure if we can accomplish this in real time.

An alternative solution would be to use a simpler feature detection algorithm, such as the Harris corner detector. Then, we make an initial estimate of the homography between two frames, apply this to our feature set, and see if this correlates with our feature set in the next frame. The homography can be calculated iteratively using an algorithm like RANSAC.

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