**AUGMENTED REALITY OBJECT INSERTION ON A PLANE**

HARSH VARDHAN SINGH (2020202) SUBHANSHU BANSAL (2020135) PRAVAR AGGARWAL (2020229)

**Abstract**

*Augmented Reality (AR) is a rapidly growing field that allows the user to interact with virtual objects in real-world environments. In this project, we aimed to develop a system that enables the insertion of virtual objects onto a plane in real-time. The system utilizes computer vision and image processing techniques to accurately position the virtual object onto the plane.*

**Methodology**

To develop the system, we utilized the following steps:

***Camera Calibration***

We calibrated the camera to accurately capture the images of the plane. Camera calibration is crucial to ensure that the image captured is not distorted.

***Feature Detection***

We used SIFT Algorithm to detect local features in live videos to get a better view of the given image and also detect major as well as minor keypoints.

***Computing Homographies***

We tested both Brute Force and Flann based planar homographies and Flann based provided good results even when camera was shaking and computed homographies more accurately.

***Plane Detection***

We utilized computer vision techniques to detect the plane in the image captured by the camera. We used the RANSAC algorithm to estimate the plane's parameters and remove the outliers.

***Virtual Object Insertion***

Once the plane is detected, we inserted the virtual object onto the plane. The virtual object was designed using 3D modeling software and rendered using Unity 3D.

***Object Tracking***

We implemented an object tracking algorithm to track the virtual object's position and orientation. The tracking algorithm utilizes the camera feed and the plane's parameters to update the virtual object's position in real-time

**Result**

The system was tested on many different kinds of planes. The system was able to accurately detect the plane and insert the virtual object onto it. The tracking algorithm was also able to accurately track the virtual object's position and orientation, even when the camera was moved.

**Conclusion**

The system developed in this project enables the insertion of virtual objects onto a plane in real-time. The system has several potential applications, including interior design, education, and entertainment. With further development, the system could be extended to detect and insert virtual objects onto complex surfaces such as curved surfaces.

**References**

https://bitesofcode.wordpress.com/2017/09/12/augmented-reality-with-python-and-opencv-part-1/

https://bitesofcode.wordpress.com/2018/09/16/augmented-reality-with-python-and-opencv-part-2/

https://github.com/juangallostra/augmented-reality