Assignment - 3

Augmented Reality

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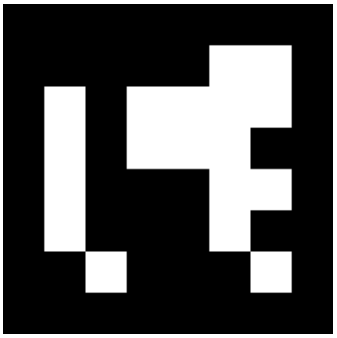
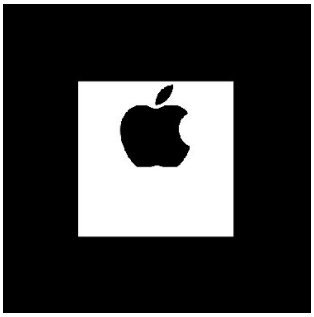
1. In this part we are to perfrom camera caliberation for finding the quantities internal to the camera that affects imaging process like image centre, focal length and lens distortion parameter. We Performed camera caliberation by passing series of images taken from camera of chessboard to get camera calibration matrix.

2. Created 3 markers namely ArUco , Hiro and 1 Apple custom marker.





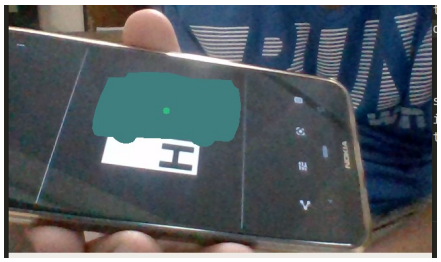
3. Following algorithm is performed for displaying Augmented object on given marker.

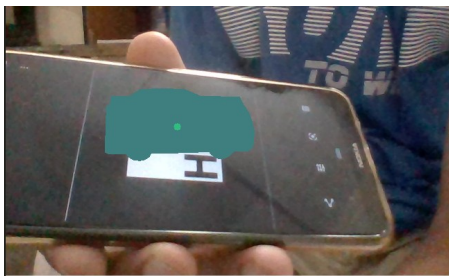
a) Identify the flat surface of reference in video frame. We used ORB for image feature extraction and computing its descriptor. Once descriptor is found then we use Brute force for feature matching and tafter the match is found I used thresholding on minimum number of matches to increase the accuracy of detection.

b) A homography is estimated for reference surface image to target image and this transformation is updated for each new frame

c) Derive from the homography the transformation from the reference surface coordinate system to the target image coordinate system. For this transformation I used RANSAC.

d) Then applied this transformation to out 3D model object and draw it on screen.





4. Following procedures are followed for this part

a) For this we first did step 3 over Hiro marker

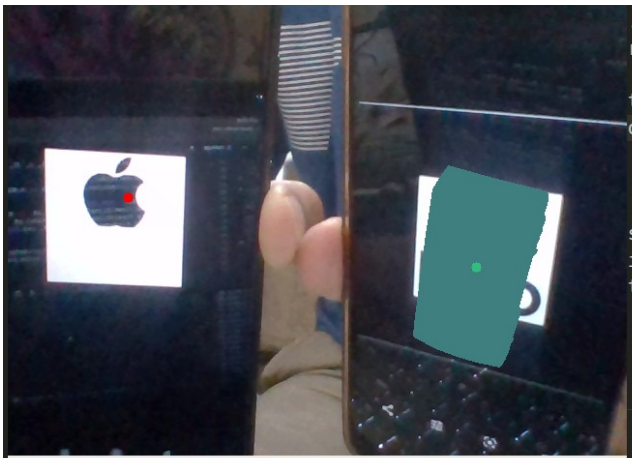
b) As other marker is detected in frame we find the centre point of other marker using ORB for feature detection and description and RANSAC for homography and hence finding centre point .

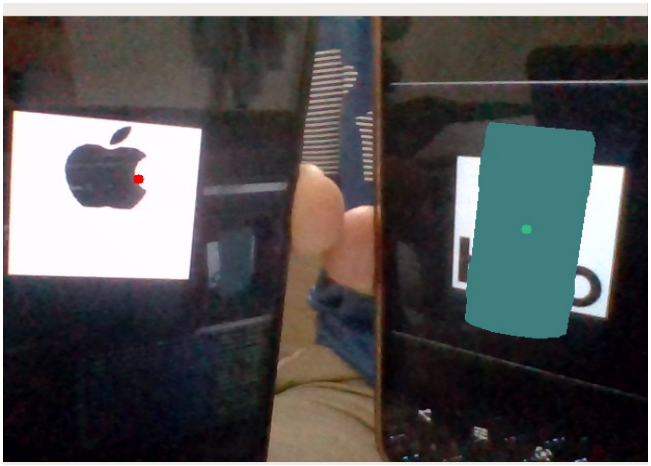
c) We then calculated the centre of mass of the Augmented object.

d) Using COM of augmented object and centre of other marker we calculated the direction vector of motion.

e) We then moved our object along this calculated vector and also controlling the speed factor by dividing it into direction vector by some factor per frame.

f) To stop our rendered object we calculted COM of object with calculated centre of marker in every frame and stopped it as the calculted distance is less than a threshold value.





Link for vides- https://drive.google.com/drive/folders/19MfS2Aha-4I8bUAPCemUo_obl8uHSJeS?usp=sharing

References -

[1] https://bitesofcode.wordpress.com/2017/09/12/augmented-reality-with-python-and-opencv-part1

[2] https://bitesofcode.wordpress.com/2017/09/12/augmented-reality-with-python-and-opencv-part2

[3] https://en.wikipedia.org/wiki/Homography_(computer_vision)

[4] https://arxiv.org/pdf/1907.06796v1.pdf

[5] Discussed the assignment with Ansh Prakash