COL780
Assignment 3 Report
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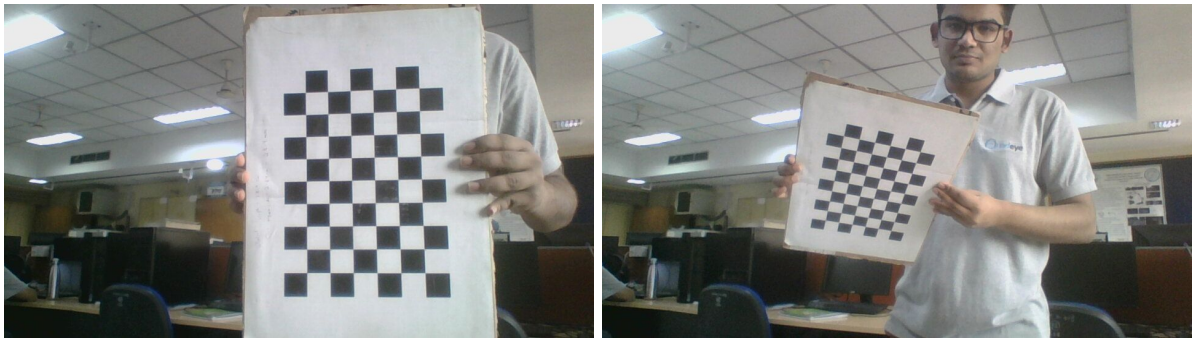
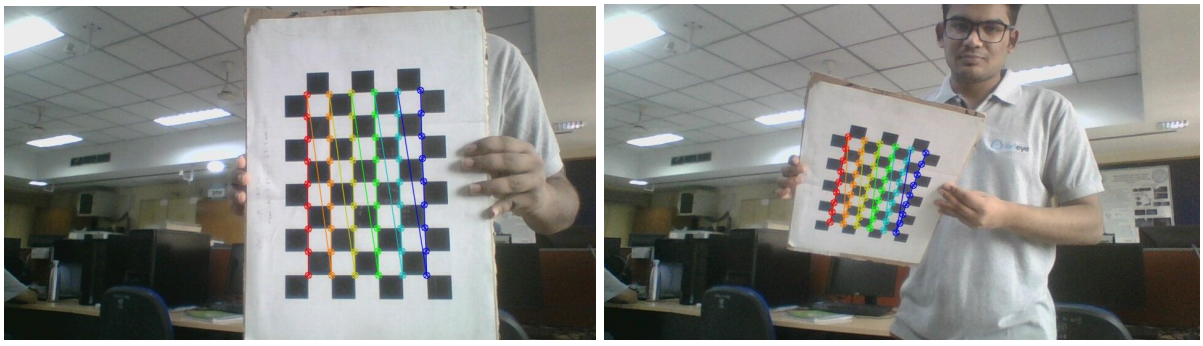
We used webcam in this assignment.

PART 1 - Camera Calibration

For camera calibration, we took 43 photos of a chessboard in total. 2 of those are:



The result of running camera calibration is shown below:

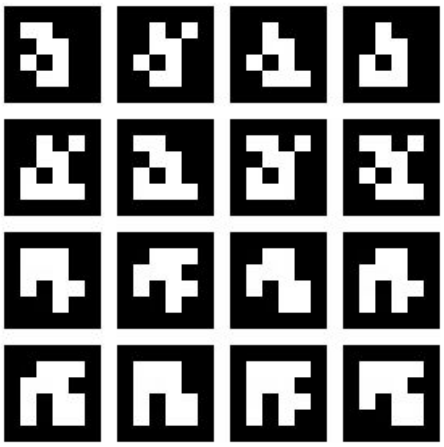


The camera intrinsic matrix, K, found for the webcam was:
[[756.56499986 0. 493.2992946]
[0. 753.44416051 304.00857278]
[0. 0. 1.]]

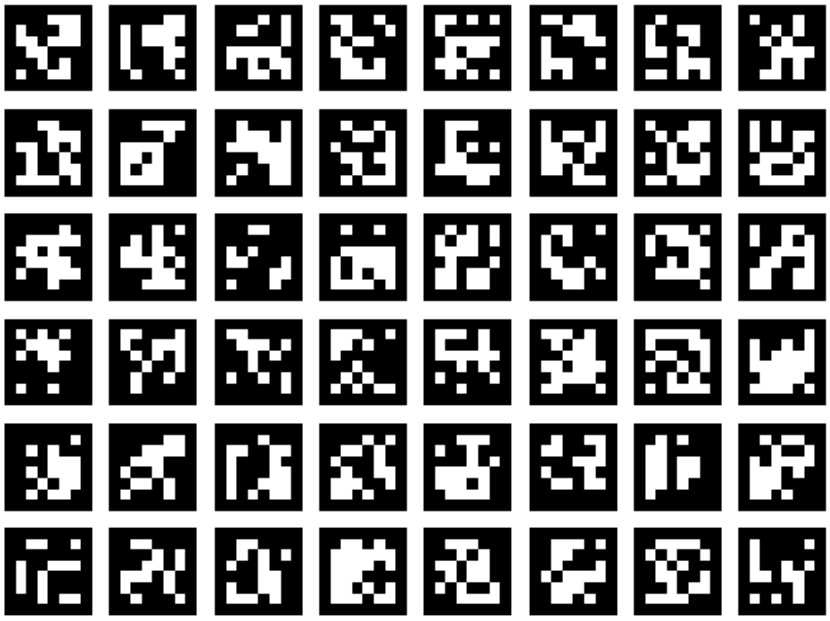
For this part, we used the code given in the opencv camera calibration page.

PART 2 - MARKERS

We used 2 markers:



MARKER 1



MARKER 2

PART 3 -

Using the reference given in the assignment, we generated the base model. We realised that the homography has to be consistent in each frame, otherwise it will give a very bad result. So we have to move from single marker to multiple to get better results.

So we used marker1 in this part given above. It was able to get enough good points to get a consistent homography in each frame.

We also had to change our descriptor from the ORB to SIFT/SURF given in the reference. It definitely improved the result a lot. This was also used to get good matched and remove most of the outliers.

We also analysed the effect of changing the camera calibration matrix. We found that as we increased / decreased the value in the K matrix, the image started to become unstable progressively.

Drive link for video: https://drive.google.com/open?id=14htaRrMYUSgxn2p1iJNi1AklSGXNUozt

PART 4 -

In this part, we have generated the animation on the below picture:

Iteration 1:
Initially, we were starting from the center of marker 1 and going to center of marker 2. We successfully obtained the result, but it didn't make much sense. What the assignment showed was a car going from marker 1 to marker 2, and hence we thought you probably want the route to be on the plane, and not "aerial".

Iteration 2:
We start the object from the center of marker 1 and we want it to reach the bottom-center of marker 2 plane. We calculate 2 different homography matrices, one for each marker. Using homography for marker 1, we render the object (pirate-ship in this case) at the center of marker 1.
Using the homography of marker 2, we calculate the end points for the object in the image plane. Then, we move it from starting point, meanS to end point, meanD. Although this was

done for only a single image (because the markers are stationary), it will work (with minor changes) with moving markers and video feed.

We also tried with different 3D objects, and as the number of points in the objects decreases, it becomes faster to render.

Video present in the zip itself.

REFERENCES:

1. https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_calibration/py_calibration.html
2. https://bitesofcode.wordpress.com/2017/09/12/augmented-reality-with-python-and-opencv-part-1/
3. https://bitesofcode.wordpress.com/2018/09/16/augmented-reality-with-python-and-opencv-part-2/
4. https://github.com/juangallostra/augmented-reality