By Ghanem Jamal Eddine
Shreya Gummadi
Sneha Nayak

ENPM673 Project 1

Detection and Tracking

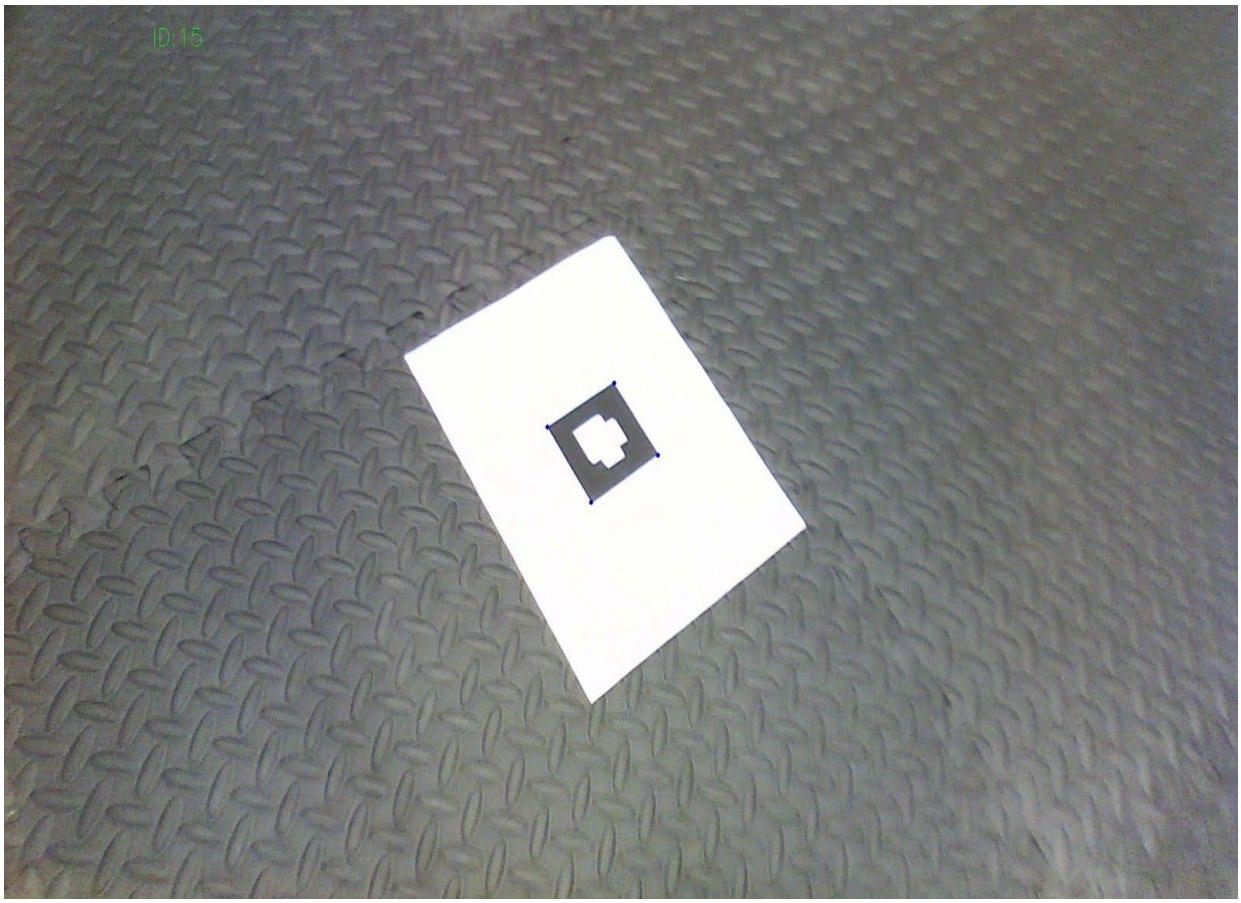
The algorithm dissects the given video into frames. The code then runs for each frame and and combine the frames to produce a smooth video with the code implemented.

In the first part, we first smoothened and thresholded the frame, so unnecessary points are not detected. Then, the contours were found in order to run a for loop using approx function to find the corner points of the AR tag, which are show on the frame using 4 green circles.
To find the orientation and ID of the AR tag, the code finds the homography H given the detected corner points and the reference marker and performing SVD. After that, it crops the the detected AR tag and converts it to a binary 8x8 array that represents the tag. A for loop is used to detect the upright orientation of the scanned AR tag. As a result, the code scans the inner 2x2 array of the 8x8 array of the correct orientation to determine the ID, top left being the LSB, and bottom left the MSB. Hence, if the top left square is missing (i.e. black), the ID would be 1+2+4+8 = 13. The tag's ID is then shown in the frame.

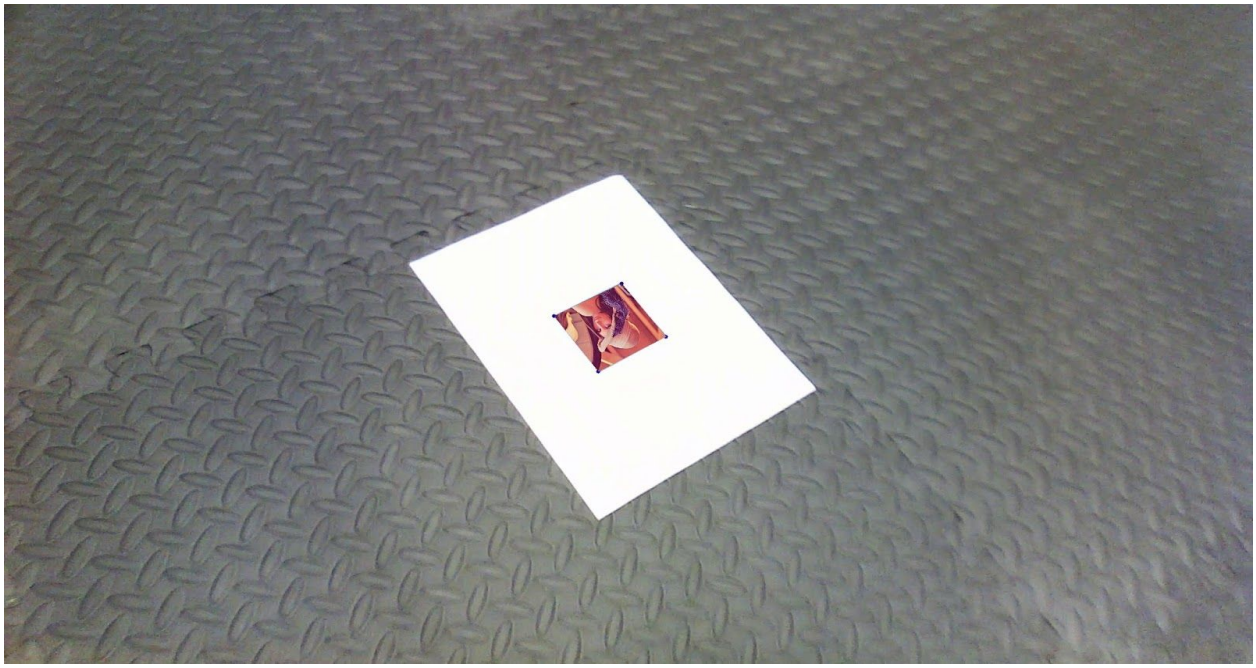
In the next part, we use the homography H that was calculated in the first part to project Lena onto the AR tag, with the tag's upright orientation.

To find the 3D cube, the code first uses the homography and then calculates the rotation matrix and the calibration matrix.

By Ghanem Jamal Eddine
Shreya Gummadi
Sneha Nayak



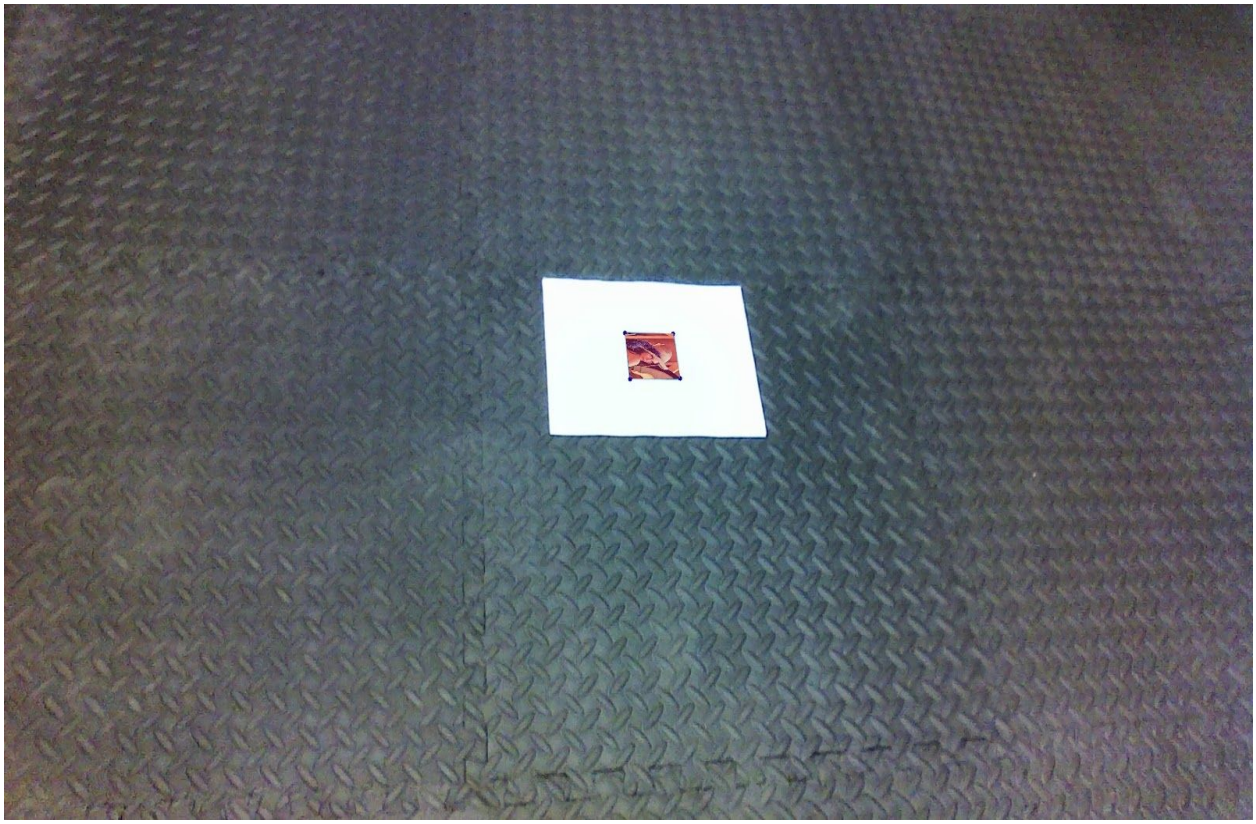
Tag 0: Detected corner points and AR tag with ID on the top left in green (15)



By Ghanem Jamal Eddine
Shreya Gummadi
Sneha Nayak

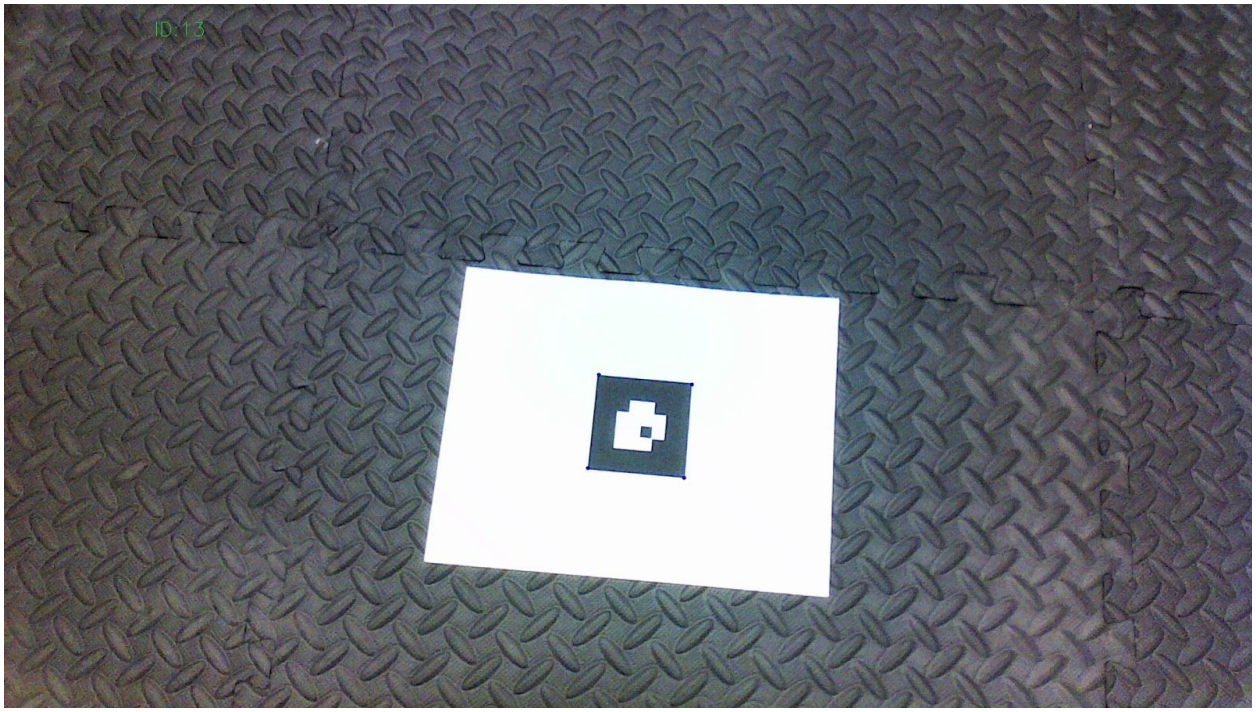
Tag 0: Projecting Lena onto AR tag with its upright orientation

Tag 1: Detected corner points and AR tag with ID on the top left in green (7)



By Ghanem Jamal Eddine
Shreya Gummadi
Sneha Nayak

Tag 1: Projecting Lena onto AR tag with its upright orientation



Tag 2: Detected corner points and AR tag with ID on the top left in green (13)

By Ghanem Jamal Eddine
Shreya Gummadi
Sneha Nayak

Tag 2: Projecting Lena onto AR tag with its upright orientation