CIS5800 Homework 1: Coding Report

Inputs:

1. X is a 4*2 matrix of (x, y) coordinates of goal corners in video frame.
2. Y is a 4*2 matrix of (x, y) coordinates of logo corners in Penn logo.
3. Interior Points are coordinates that describes where a point inside the goal will be warped to inside the Penn logo.

Function est_homography:

1. Creation of a matrix with zeroes of 8*9 dimension assigned to variable “a”.
2. Initialization of “a” with “ax” and “ay” as below:

   ax = (-x -y -1 0 0 0 xx’ yx’ x’)
   ay = (0 0 0 -x -y -1 xy’ yy’ y’)

3. Once “a” has been initialized, it has been passed through singular value decomposition (svd) through the command, “np.linalg.svd” to get U, S, and Vh where U and Vh are orthogonal Matrices.

   [U , S , Vh] = svd(A)

4. The last row of Vh is considered for H matrix which is a 9*1 vector and H is then reshaped into a 3*3 matrix.

Function warp_pts:

1. X and Y is passed through the est_homography function to get a homography matrix H.
2. Now with the H matrix known and the given input of interior points, we can recover x’ and y’ and hence the values x’ and y’ was found out using the equation:

   x’ = (h11 x + h12 y + h13) / (h31 x + h32 y + h33)
   y’ = (h21 x + h22 y + h23) / (h31 x + h32 y + h33)

3. Hence now, warped points are found out and the function warp_pts return the warped_pts.

Filling the functions and running the program project_logo.py, resulted the following output: