Name: _____

Score: /16

CSE 5524 Computer Vision for HCI AU'22

Homework Assignment #9

Due: Tuesday 11/1

Camera Calibration:

1) Load the 100 pairs of corresponding 2-D and 3-D points in the files 2Dpoints.txt and 3Dpoints.txt (the i^{th} row of both files corresponds to the i^{th} point). Use these point correspondences to solve (using Eigen-analysis) for the camera matrix P (whose rasterized vector **p** has a unit L_2 norm). [5 pts]

2) Given the computed matrix P (from Problem 1), project the 3-D homogeneous points $(X_i,Y_i,Z_i,1)$ to 2-D. Compute the sum-of-squared error (sum-of-squared Euclidean distances) between the resulting 3-D-to-2-D projected points and the given 2-D points (ensure all 2-D points are inhomogeneous). [3 pts]

Homography:

3) The file homography.txt contains 15 corresponding 2-D points from two different images, where the first and second columns correspond to the x and y coordinates of the points in the first image and the third and fourth columns correspond to the x and y coordinates of the points in the second image. Load the 2-D point sets and use the **Normalized Direct Linear Transformation algorithm** to compute the final homography H that maps the original points ***from* image 1 to image 2** (i.e., make sure $P_2 = HP_1$). [5 pts]

4) Plot the points from image 2 and the projected points from image 1 on the same plot. Make sure the projected points are converted into inhomogeneous form. [1 pt]

5) Compute the sum-of-squared error (sum-of-squared Euclidean distances) between the actual points from image 2 and the projected points from image 1. [2 pts]

6) As usual, upload the standard material.