# CS6550 Computer Vision
Homework #2
Due: 11:59pm, 11/9/2022

1. **Fundamental Matrix Estimation from Point Correspondences: (50%)**

   In this problem, you will implement both the linear least-squares version of the eight-point algorithm and its normalized version to estimate the fundamental matrices. You will implement the methods and complete the following:

   (a) Implement the linear least-squares eight-point algorithm and report the returned fundamental matrix. Remember to enforce the rank-two constraint for the fundamental matrix via singular value decomposition. Briefly describe your implementation in your written report.

   (b) Implement the normalized eight-point algorithm and report the returned fundamental matrix. Remember to enforce the rank-two constraint for the fundamental matrix via singular value decomposition. Briefly describe your implementation in your written report.

   (c) Plot the epipolar lines for the given point correspondences determined by the fundamental matrices computed from (a) and (b). Determine the accuracy of the fundamental matrices by computing the average distance between the feature points and their corresponding epipolar lines.
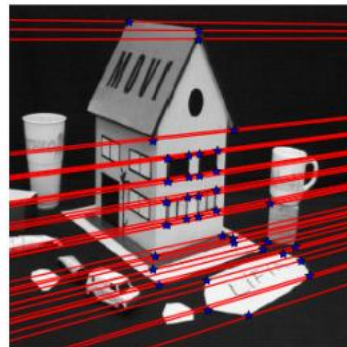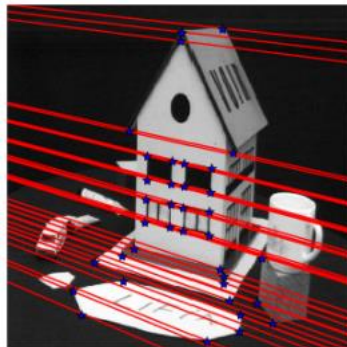
2. **Homography transform: (50%)**

   You need to determine a homograpgy transformation for plan-to-plane transformation. The homography transformation is determined by a set of point correspondences between the source image and the target image.

   (a) Implement a function that estimates the homography matrix H that maps a set of interest points to a new set of interest points. Describe your implementation.

   (b) Specify a set of point correspondences for the source image of the Delta building and the target one. Compute the 3X3 homography matrix to rectify the front building of the Delta building image. The rectification is to make the new image plane parallel to the front building as best as possible. Please select four corresponding straight lines to compute the homograph matrix. Describe your implementation and show the selected correspondence line pairs, the homography matrix, and the rectified image. (Please use backward warping and bilinear interpolation)

Note

- You should not use any functions which can get the result directly in each steps.

- Your code should display and output your results so that we can judge if your code works correctly.

- You should provide a README file about your execution instructions.

- Please compress your code, input images, result images, report and README in a zip file named HW1_{Student-ID}.zip and upload it to eeclass.

- If you encounter any problem, let's discuss on eeclass instead of email.

- Please follow the file structure below:

HW2_{student id}

├ 1

  ├ output

    ├ a_img1

    ├ a_img2

    ├ b_img1

    └ b_img2

  └ HW2-1.py (please output fundamental matrix in (a) and (b), and average distance between feature points and epipolar lines)

├ 2

  ├ output

    ├ selected_img

    └ rectified_img

  └ HW2-2.py (please output homography matrix)

├ report.pdf

└ README.md