Spring 2019 **CSCE 867: Computer Vision**

Project #2

Due time: 11:59:59pm, Wednesday, April 17st

For this project, you may work in a team of 2 or 3 students and clearly indicate the team members in the report.

In this project, you will extract 3D information of a human face from its 2 images taken from two different views. 28 facial landmarks are detected and are superimposed on each image. The project includes the following tasks:

1. Compute the intrinsic parameters **W** of both cameras respectively using the calibration data attached and the camera calibration procedure you developed for last project. Compare the **W** for each view? Are they the same? If not, why?
2. Manually establish correspondences between the marked facial landmarks between the two images. To avoid all points being co-planar, you may need to select additional unmarked facial feature points from two images and match them. Indicate what other facial landmarks you select. Given the matched points, use the 8-point method to compute the fundamental matrix **F**, and then the essential matrix **E**. Note **E** is only up to a scale factor.
3. Derive the relative orientation and translation **R** and **T** of the two cameras based on the absolute orientation computed for each camera from step 1.
4. Produce the rectified left and right images using the rectification procedure introduced in the lecture notes. Write down the rectification process, display the rectified images, and verify the results.

Your report should include

- Introduction
- Discussion of the theories for computing **E** and **F** and output the results
- Discussion of rectification theory and display the rectified images. Given the four corners of the eyes and the mouth corners on the left image, draw the epiploar lines on the right images before and after rectification
- Summary and conclusion.

Submit your report and codes in a single zipped file to dropbox with all the members' names in the file name.

Extra Credit (20%):
Use the normalization method to improve the data. Details on the normalization method can be found in wiki: http://en.wikipedia.org/wiki/Eight-point_algorithm#The_normalized_eight-point_algorithm .