EE 417
Assignment # 2
Camera Calibration Project
(Due: December 9, 2018, Time: 23:55)

Note: You can submit your reports to SUCourse as a single pdf document which contains all the explanations, resulting images, comments/discussions and MATLAB source codes.

1. We have covered the calibration method from the camera projection matrix (SVD technique and closed-form formulas for camera parameters) in the class.

   Do the followings:

   - Create a precise calibration rig (3D calibration object). To do this, print two identical checkerboard patterns in a good laser printer and post them onto the orthogonal planes (You may consider two orthogonal sides of a rectangular/square box or two walls of your room!). Make sure that you can easily associate a world coordinate system with the calibration rig and determine the metric (in mm) world coordinates of all the corner points on the rig (both planes) using simple geometry and/or trigonometry.

   - Take an off-the-shelf camera. You can use any kind of camera you wish. Take one image of the calibration rig and extract corners with one of the following methods:

     i. Harris corner detection
     ii. Intersections of Hough lines
     iii. Intersections of the best fitting lines to the edge pixels of the squares

   - You should use sufficient number of corner points (e.g. 30-50 points from both planes) in order to increase the accuracy of the parameter estimation.

   - Calibrate your camera using the calibration method from the camera projection matrix covered in the class.

   - Explore Camera Calibration Toolbox for Matlab in the following link:

     http://www.vision.caltech.edu/bouguetj/calib_doc/

     and calibrate your camera using this toolbox.

2. Discuss your results, comment on the performance of each method and compare them.

3. Please don't submit results directly taken from the web. I want you to develop your own implementations. Don't worry about excellence, just do your best!