

## Program 1: Camera Calibration and Pose Estimation

This program includes two aspects: the first step is to recover the intrinsic and extrinsic parameters of camera by using calibration board. After that, the calibration board is translated and rotated by some amount. The second step is to estimate the relative pose transformation.

Data: Two images are taken while the calibration board is moving from one position to the other position. The 3D data points are given; and the students should find the 2D image coordinates for the corresponding 3D data points.

Assumptions:

1. The world origin is located at the folded corner of the calibration board before the board moving.
2. The principal point,  $(o_x, o_y)$ , is located on the center of the image.
3. The folded angle of calibration board is  $90^\circ$ .
4. The total length and width of the calibration board are 9 inch and 7 inch respectively. You can compute the 3D coordinates of the grid according to these parameters.

Reference:

Chapter 6 in “introductory techniques for 3D computer vision”.  
Chapter 1.1 in Dr. Shah’s book.

Code and Report:

Source code and binary code to run the program, which can accept input 3D data coordinates and 2D image coordinates and give the camera parameters and pose transformation.

In your report (at least 3-4 pages), you are required to describe the detailed step of your approach, and write down the problem you met and analyze its possible reason.

You have **two weeks** to finish this program.

Note:

In this program, you can use matlab, C, or C++ to write you program. The visualized results for pose estimation are also required. (hint: using matlab to plot 3D figure.)

Image I/O source code for matlab and C is available on the website:

<http://www.cs.ucf.edu/courses/cap6411/cap5415-2004/>