CS 682

Fundamental Matrix Estimation and Camera Calibration

You will be using these two image pairs:

Source of Lab image pair: GeorgiaTech CS4476/6476

Download all the files for the assignment hw4.zip

Part 1 (5 points)

- **Fundamental matrix estimation.** Load each image pair and matching points file using the provided `sample_code_python.py` . Add your own code to fit a fundamental matrix to the matching points and use the sample code to visualize the results. You need to implement and compare the **normalized** and the **unnormalized** algorithms (see Epipolar Geometry Lecture for the methods). For each algorithm and each image pair, report your residual, or the mean squared distance *in pixels* between points in both images and the corresponding epipolar lines.

Part 2 (5 points)

- **Camera calibration.** For the lab pair, calculate the camera projection matrices by using 2D matches in both views and 3-D point coordinates given in **lab_3d.txt** in the data file. Refer to Camera Calibration lecture for the method. Once you have computed your projection matrices, you can evaluate them using this `projection_matrix.py` sample function, which will provide you the projected 2-D points and residual error. (**Hint:** For a quick check to make sure you are on the right track, empirically this residual error should be < 20 and the squared distance of your projected 2-D points from actual 2-D points should be < 4.)

Grading checklist

Be sure to include the following in your report:

1. For the lab image pair, display your result (points and epipolar lines) and report your residual for both unnormalized and normalized fundamental matrix estimation. For the lab image pair, show your estimated 3x4 camera projection matrix. Report the residual between the projected and observed 2D points.

Instructions for turning in the assignment

You must upload the files to GMU Blackboard.

1. All your **in a SINGLE zipped file**. The filename should be **netid_hw4_code.zip**. There is no need for PDFs of any ipython notebook output, just make sure you include the notebooks themselves in the zip file and show any required outputs in the report.
2. A single report in PDF format. The filename should be **netid_hw4_report.pdf**.