EECE 5554
Lab 5: Camera Mosaic

In this lab we will look at the role and use of calibrated cameras for simple photomosaicing. We assume throughout that you will be using your camera phone for all the imaging associated with this homework.

1. Go through the Matlab example on feature based panoramic image stitching. We will use this as a template for our work
   https://www.mathworks.com/help/vision/ug/feature-based-panoramic-image-stitching.html?searchHighlight=panorama&s_tid=doc_srchtitle

2. Download the Caltech Camera Calibration toolbox.
   https://data.caltech.edu/records/20164.

3. Look at index.html and own_calib.html. Print out a calibration pattern and stick it firmly to a really flat object. (calib_doc\download\TOOLBOX_calib \calibration_pattern\pattern.pdf)

4. Take pictures of the calibration pattern from different angles while making sure that the calibration object fills most of the image. Try and make sure that the reprojection error after calibration is reasonable.

5. On Forsyth street, take multiple, overlapping images of the mural on the Latino Students Center (LSC) building. You should have 6+ images.

6. Play with the harris feature detector file and the convolve2 file provided on Piazza to get features well distributed across the image.

7. Use the Matlab example code to figure out how to make a panoramic mosaic of the entire building. Please use the harris detector that has been provided as opposed to the feature detector the Matlab example uses.

8. Repeat the mosaicing exercise with images of a cinder block wall just like the example shown in class (again use 5-6 images that overlap by about 50%).

9. Collect two sets of images (any other piece of graffiti, public art, or other large format) where the overlap is considerably smaller (say 15%) as well as larger (about 50%). Does the mosaicing algorithm still work? What changes, if any, did you have to make?

Learning Objectives:
Upon completion of this assignment, a well-prepared student should be able to:
- Describe how a Harris corner detector works
- Identify (qualitatively), corner features in an image
- Discuss how image mosaic algorithms (e.g., ICP) work
- Apply image mosaic algorithms to stitch together a mural photograph
- Articulate what scenes/images will work well or poorly for image mosaicing

Assessment Rubric

Criterion	Points
Camera calibration	
Camera images used for calibration	5
Reprojection pixel error in report	5
Calibration parameters in report	5
An image before and after calibration is in report	5
LSC mosaic	
LSC image set	5
Distribution of Harris corners across LSU image set	5
Final LSC mosaic	5
Discussion of adjustment/intermediate image steps you took	5
.m files you used for this mosaic	5
Cinder block/brick wall "mosaic"	
Initial images with Harris corners	5
Final cinder block image	5
Explanation of cinder block/brick wall performance compared to the LSC mural (2-3 sentences)	10
Third "mosaic"	
Initial images with Harris corners with 15% overlap	5
Initial images with Harris corners with 50% overlap	5
Final mosaic with 15% overlap	5
Final mosaic with 50% overlap	5
Discussion of performance with 15% and 50% overlap	5
Description of any adjustments/modifications you made	5
.m files you used for this mosaic	5

Please check everything (report, m files) into a folder (called Lab5) in your gitlab directory and post your report to Canvas.