University of Central Florida

Assignment 3
CAP 6419 - 3D Computer Vision

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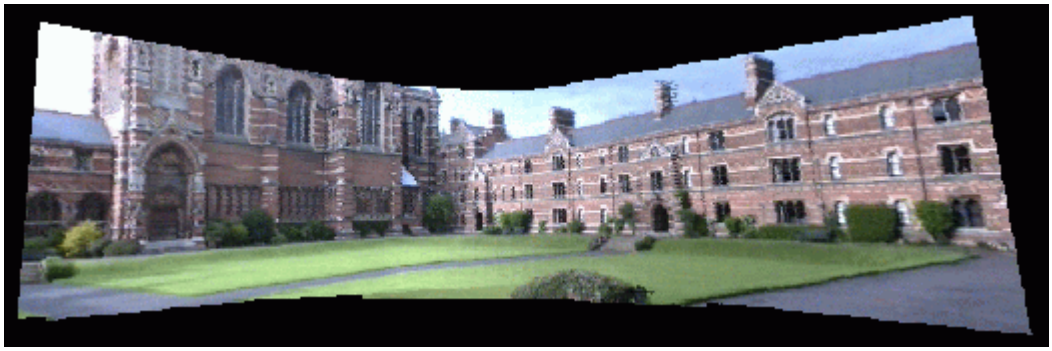

In this assignment, you are required to take a sequence of images and create an image mosaic by registering, warping, and compositing them into a single panoramic image. First read the entire chapter 4 and Section 8.4 of your textbook.

The following describes the steps that you need to take in order to complete this assignment.

1. Obtain an image sequence such that the camera projection center does not change (or change much) during the entire sequence, and where adjacent pairs of images significantly overlap each other. Other video sequences you may use are included in the course web site. You may use any of the provided sequences, but you are required to try your code on at least one image set that you have taken yourself. You should mosaic a minimum of four images together in a given data set and apply your method to at least 2 different sequences. All your results should be reproducible, i.e. I must be able to reproduce your results by running your code.
2. Use a feature point correspondence algorithm such as SIFT with RANSAC to automatically track point correspondences. Set the number of features to track as you see fit (e.g. 100). If you change any of the other parameters of the method, document these changes and justify your choices. Run this point correspondence algorithm with your image sequence to create a sequence of point correspondences. In this part, you are also allowed to use manually picked point correspondences. The only issue with manual is that it is tedious.
3. To compute the infinite homography between each pair of adjacent frames, you must write a program that computes the forward or backward homography mapping associated with each candidate set of point correspondences. Use RANSAC to make sure that the computed homography is the best fit in the presence of outliers (if you are using SIFT). Peter's matlab

functions includes a RANSAC fit homography function (http://www.csse.uwa.edu.au/~pk/Research/MatlabFns/). Read the normalized GOLD standard algorithm and the robust version using RANSAC that we discussed in the class.

4. Warp each image into the infinite homography associated with one of the frames (ideally one in the middle of the sequence) using the backward mapping method. Use bilinear interpolation for pixel resampling. Matlab also provides image transformation functions, which you are allowed to use.
5. Composite all the images into a single panoramic image. If you want to (not required) you can use a *feathering* algorithm that uses a bilinear weighting function for all of the pixels contributing at a given point. This method is described in Equation (9) in the paper by R. Szeliski, Video mosaics for virtual environments, *IEEE Computer Graphics and Applications* 16(2), 22-30, 1996. Your result image would not then show noticeable seams.

What to Submit (in a single zip file)

- All source codes, including the ones that you used from other people.
- A report including
    1. A description of the methods you implemented for accomplishing each of the above steps,
    2. A description of the parameter values used (if any) and how you selected them, e.g. for the SIFT and the RANSAC algorithm
    3. Results showing at least two of your input images and the output mosaic image.
- All the source images (especially the ones different from those provided). Your report must show these input images and the corresponding panorama.