CS 301 Project 1: Image warping and mosaic
Due Feb 10, 3PM, submitted via Blackboard

This project will include homography matrix computation, image warping and image mosaic.

(1) Read in two images. Some sample images are included in the project directory on Blackboard. Please also try at least one pair of images that you find yourself (on the web or from your digital camera). Keep in mind that a good image pair should contain a predominantly planar scene structure, or else be taken from a camera that is only rotating (e.g., panning), with very little translation. Manually select corresponding points from the two images (codes provided). Compute the homography matrix using the Pseudo-inverse method (h33=1) and Singular Value Decomposition method ($\|h\| = 1$). Compare your resultant homography matrices using the two methods. Try different image pairs, different sets of corresponding points on two images and summarize your observation and understanding of homography matrix computation.

(2) Based on the computed homography matrix, use forward and backward warping to warp one image to the coordinate of another image. Try the "for-loop" method we discussed in the class and try different interpolation methods (nearest and bilinear). Then try Matlab's interp2() function. Summarize your observations.

(3) Based on the homography matrix and your warping method, create a mosaic image to combine two images. The following is an example.

Upload running code and a written report to Blackboard by the due date/time. Half of your grade will be based on the written report discussing your program, design decisions, and experimental observations, and half on the program itself and output it produces. The report should contain:

a) Brief summary of what you think the project was about (what was the task; what were you trying to achieve),

b) Brief outline of the algorithmic approach (e.g., a flowchart showing the flow of control and subroutine structure of your code),

c) Pictures of intermediate and final results that convince me that the program does what you think it does.

d) Any design decisions you had to make, for example whether using preconditioning on the homegraphy matrix estimation or not. Be sure to document any additional features you added to increase robustness or generality of your codes.

e) Experimental observations. What do you observe about the behavior of your program when you run it? Does it seem to work the way you think it should? Play around a little with different setting to see what happens.

f) A description of what each group member contributed to the final program or report, to discourage slackerism!!!

Bonus points (5%)
Capture three or more images in the MST campus and create a mosaic image on these images.

Bonus points (5%)
Use your own creativity and imagination to create other cool image warp and mosaic applications.