ECE 661: Homework 2

August 28, 2012

Due: September 6, 2012 (Thursday)

Problem:

The main goal of this homework is to eliminate the projective distortion from a camera image of a planar scene. A secondary goal is to take two such projective-distortion-free results for the same scene and to calculate the similarity transformation between the two.

To explain further, the two images shown in Figure 1 are for the same scene but from two different viewpoints. You are provided with the world coordinates for several of the corner pixels in the images. Remove the projective distortion from each by establishing an image-to-world homography for each. Subsequently estimate the similarity transform that takes one result into the other.

Apply your algorithm to the four pairs of images provided at `http://web.ics.purdue.edu/~kim497/ece661/homework/`. The necessary world coordinates are also given in the same website. Don't forget that you need to show the four points you selected in each image for the computation of homography. Also, obtain such results for at least one pair of images taken by your own digital camera.

You are strongly encouraged to use the OpenCV C/C++/Python library available at `http://opencv.willowgarage.com` to handle the low-level image and matrix operations. However, you are NOT permitted to use the OpenCV functions `findHomography` or `warpPerspective`.

Submission of Your Work:

You should turn in a report in pdf format of your homework solution using the blackboard. The report should include

Figure 1: A pair of sample images

1. A brief outline of your method for finding the homography including relevant equations.
2. A description and illustration of how you used the homography to transform an image to the world plane.
3. A description and illustration of how you estimated the similarity transformation between a pair of images from which you removed the projective distortion.
4. Your source code.

You are permitted to look at sample solutions form previous semesters available at `http://cobweb.ecn.purdue.edu/~kak/courses-i-teach/ECE661.08/index.htm` or `https://engineering.purdue.edu/ece661/index.htm`. However, the work you turn in must be your own!