

ECE661: Homework 2

Fall 2016
Deadline : September 6, 2016

Turn in typed solutions via Blackboard. Additional instructions can be found at [1]

1 Introduction

This assignment deals with projective distortion in camera images and with estimating homographies between images. You are given four images, Figures 1a, 1b, 1c, and 1d. Your homework involves transforming them in the manner described below. In case you did not know, Figure 1d is a photo of Jerry Seinfeld, one of the most famous comedians of our time.



Figure 1

2 Tasks

Using Homography calculations

1. Create an image such that the face in Figure 1d is now placed inside the indicated frame PQRS in Figures 1a, 1b, and 1c. Obviously, the final projected face will have distortion in this case.
2. Find homography first between 1a and 1b, and then between 1b and 1c. Then apply the product of the two homographies to the image of 1a and see if it looks similar to 1c.
3. Show results on your own images. Capture the three images from the different viewpoints which contain planar surfaces. The last image can be of a person. (If you are using a photo that you have taken, kindly get the consent of the person before using their face image).

2.1 Notes

1. To project the face from 1b into the frame, you can draw a bounding box around the face and compute the Homography between the correspond-

ing points. However using just four points for computing homographies might yield poor results. Hence you can use the perpendicular bisectors of the bounding box to obtain additional points in order to compute the Homography. Refer Figure 1c.

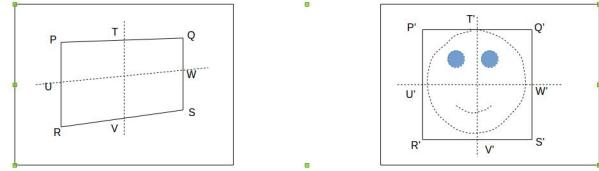


Figure 2

2. You can use any image editor such as GIMP to determine the pixel coordinate values in the image.
3. You can use the OpenCV C++/Python libraries to handle low-level image and matrix operations. However you cannot use the built-in opencv functions such as findHomography or warpPerspective.
4. You can find the images at [I]

2.2 Submission

1. Turn in a typed pdf of your report via Blackboard.
2. Your pdf must include a description of
 - The logic that you used to solve the given Tasks.
 - The steps that you used to compute the homographies including equations (Matrix form of the equations as well)
 - The steps that you used to calculate the Image to World Plane Homographies and to project the images into the world plane (with suitable illustrations).
 - The required final images for the tasks.
 - Your source code.
3. Indicate the points that you used on each image to obtain the homographies.
4. You are permitted to look at sample solutions from previous years to get an understanding of how to solve the problems. **Your final report must be your own .**

References

- [I] <http://web.ics.purdue.edu/~sakbar/ECE661>
[II] The image of Jerry Seinfeld was obtained from http://www.eventsfy.com/assets/images/artists/Jerry_Seinfeld_1.jpg