

ECE661: Homework 2
Fall 2014
Deadline : September 11, 2014

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

1 Introduction

This assignment deals with projective distortion in camera images and with estimating homographies between images. You are given two images, Figures 1a and 1b, and your homework involves merging the two in the manner described below. In case you did not know, Figure 1b is a photo of Audrey Hepburn, one of the most famous movie stars of the last century.



Figure 1

2 Tasks

Using Homography calculations

1. Create an image such that the face in Figure 1b is now placed inside the indicated frame PQRS in Figure 1a. Obviously, the final projected face will have distortion in this case.
2. Create an image such that the the frame ABCD in Figure 1a now fits around the face in Figure 1b. In this case the face will have no distortion.
3. You can find the world coordinates for Figure 1a at [I]. Using this, project the resulting images from Tasks 1 and 2 above into the world plane.
4. Show results on your own pair of images, where one image will contain any frame (could be a wall too) and the other image can be a face of any individual that you want. (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 corresponding 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 2.

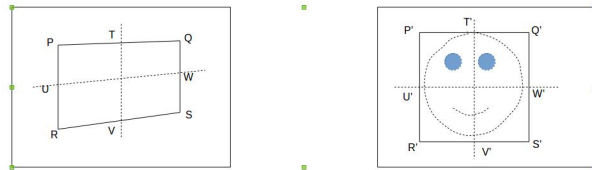


Figure 2

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/~bcomandu/ECE661/home/>
[II] The image of Audrey Hepburn was obtained from http://himg2.huanqiu.com/attachment2010/120422/zip1335058349/1335058349_11.jpg