ECE661: Homework 3

Fall 2014
Deadline : September 18, 2014 , 1:30 pm

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

1 Introduction

In the previous assignment, you used point-to-point correspondences to estimate homographies and correct projective distortion in an image. This assignment deals with correcting projective distortion and affine distortion in camera images using parallel and orthogonal lines in the image. To do this, you will implement and compare 2 different strategies as described below.

2 Tasks

2.1 2-Step Method

You are provided with 4 sets of images. Each set consists of 2 images of the same scene taken at different angles. Your task is to correct both projective and affine distortion in the images. For each set do the following

1. In the first step, remove projective distortion. To do this, estimate the homography that will project the vanishing line in the image back to infinity. Do you expect the vanishing lines for two images of the same scene to be identical or different ? Can you correct the projective distortion in one image of a scene using the vanishing line from another image of the same scene ?
2. After removing the projective distortion, remove affine distortion using 2 sets of orthogonal lines.

2.2 Single Step Method

- In this method estimate the dual conic C^*_∞ directly using the minimum necessary number of pairs of orthogonal lines.

2.3

1. Compare the output results from the two methods tasks above. Which do you think is more robust ?

2. Show output on at least 3 images of your own choice. Note - The images you take should have significant projective and affine distortion for you to visually see the corrections.

2.4 Notes

1. You can find the provided images on the course website [I]
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.

2.5 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 for each of the Tasks with relevant equations
   - The input and output images for each task. **Illustrate clearly the parallel / orthogonal lines that you chose in the input image**.
   - Your source code.
   - Your observations on the relative performance of the two methods.
3. 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/`