

CS 565 Computer Vision – Assignment 4

Dr. Nazar Khan

Assigned	Monday, December 19, 2016
Due	Friday, December 23, 2016 before 5:30 pm.

1 Programming

1. **(10 marks): Recovering Best Affine Transform.** Incomplete code for recovering the best affine transform from corresponding points is available in the file **recover_affine_transform.m**. Wherever the file contains the following line

-----ADD_CODE_HERE-----

add the missing code.

2. **(10 marks): Image Warping.** Incomplete code for warping an image using a 3×3 transformation matrix is available in the file **warp_image.m**. Wherever the file contains the following line

-----ADD_CODE_HERE-----

add the missing code.

3. **BONUS (10 marks): Homography Estimation.** Write a program to recover the homography between two corresponding point sets P1 and P2. Generate results that verify the correctness of your program.

2 Generating Results

To generate all required results for this assignment, just run the script **get_results.m**. Please read the script in order to understand what it does. It does 2 things:

1. Affine Recovery

- (a) Generate random pixel locations **P1**.
- (b) Setup a transformation matrix **T**.
- (c) Transform **P1** by **T** to obtain new locations **P2**.
- (d) Recover the affine transformation **estimatedT** from only **P1** and **P2**. (If your code is correct, then the recovered transformation **estimatedT** should be the same as the original transformation **T**).
- (e) Transform **P1** by **estimatedT** to obtain new locations **P3**.
- (f) Plot scatter diagram showing point set **P1**, **P2** and **P3**. (If your code is correct, then **P3** will be plotted on the same locations as **P2**).
- (g) Store the scatter plots as the image **affine_transformation.png**.

2. Warp Image

- (a) Read in image **illusory_square.jpg** and add a small white mark to it.
- (b) Generate a $2D$ affine transform **A** and a $2D$ projective transform (homography) **H**.
- (c) Transform the image using **A**. Store result in **illusory_square_affine_warped.png**.
- (d) Transform the image using **H**. Store result in **illusory_square_projective_warped.png**.

To verify correctness, you can compare your results with the official solution in Figure 1. **Please note that your solution will be similar but not exactly the same as Figure 1.**

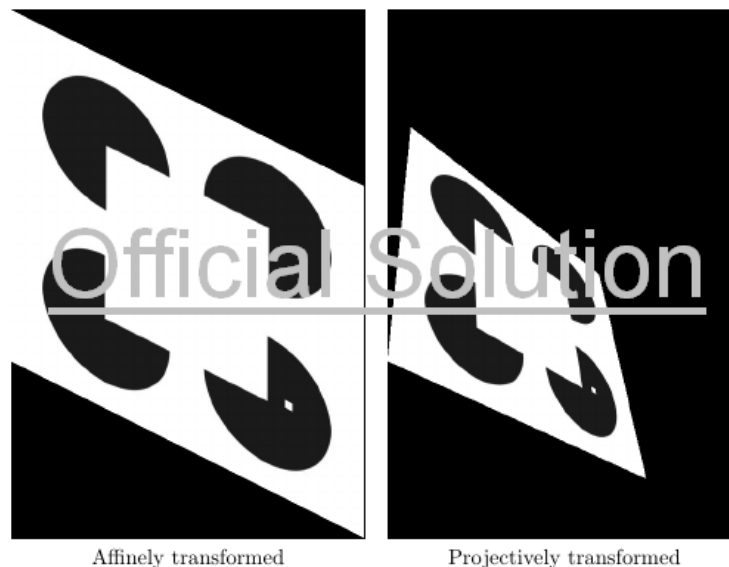


Figure 1: Official results.

Submission

This assignment is to be done in **groups of 3 for undergraduate students** and **individually for graduate students**. It is highly recommended that you try this assignment individually at first and then combine your results. Paste your submission as a .zip file into the following folder on \\printsrv:

```
\\printsrv\Teacher Data\Dr.Nazar Khan\Teaching\Fall2016\CS 565 Computer Vision\Submissions\  
Assignment4\SECTION
```

where

SECTION=Morning or Afternoon or MPhilPhd

Write access to these folders will be disabled after the submission deadline.

The .zip file should have the following naming convention

RollNumber1_RollNumber2_RollNumber3_Assignment4.zip

For example, if roll numbers of your group members are BCSF11M997, BCSF11M998 and BCSF11M999, then the .zip file should be named

BCSF11M997_BCSF11M998_BCSF11M999_Assignment4.zip

The .zip file should *only* contain

- completed **recover_affine_transform.m**
- completed **warp_image.m**

and the result files

- **affine_transformation.png**,
- **illusory_square_affine_warped.png**, and
- **illusory_square_projective_warped.png**.

Please follow naming conventions. If conventions are not followed, you will not receive any credit.