

# CS 565 Computer Vision – Assignment 4

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Dec 19, 2015

**Due Date:** Wednesday, 23rd December, 2015 (2:30 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  $3 \times 3$  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, run the script `get_results.m`. This script 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 square 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.

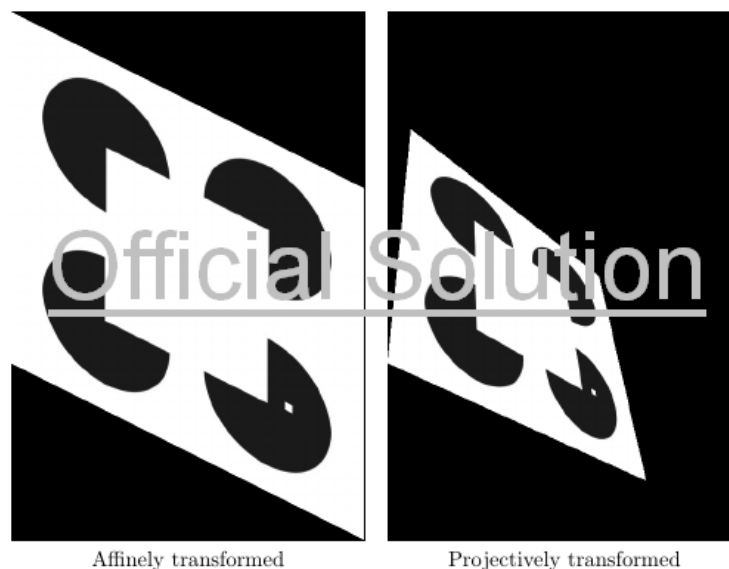


Figure 1: Official results.

## Submission

Paste your submission as a .zip file into the following folder on \\printsrv:

\\printsrv\Teacher Data\Dr.Nazar Khan\Teaching\Fall2015\CS 565 Computer Vision\Submissions\  
Assignment4

Write access to this folder will be disabled after the submission deadline. The .zip file should have the following naming convention

RollNumber\_Assignment4.zip

For example, if your roll number is MSCSF15M999, then the .zip file should be named

MSCSF15M999\_Assignment4.zip

The .zip file should 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.