# CS 565 Computer Vision – Assignment 1

Dr. Nazar Khan

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| **Assigned** | Thursday, November 9, 2017 |
| **Due** | Wednesday, November 22, 2017 before 5:30 PM |

**Q1) (10 marks): Edge Detection**. Incomplete code for the Canny edge detector is available in the file **canny/canny.m**. Wherever the file contains the following line

```
------------ADD_CODE_HERE------------
```

add the missing code.

**Submission**: Submit the completed

- **canny.m**

**Q2) (10 marks): Corner Detection**. Incomplete code for corner detection is available in the file **corner/detect_corners.m**. Wherever the file contains the following line

```
------------ADD_CODE_HERE------------\\
```

add the missing code. The file requires implementations of the following 3 approaches to estimate corner strength

- **Tomasi**. Corner strength = $\lambda_{\text{small}}$ where $\lambda_{\text{small}}$ is the smaller eigen-value of the structure tensor.
- **Rohr**. Corner strength = determinant of the structure tensor.
- **Harris**. Corner strength = trace of the structure tensor.

In addition to passing a suitable corner strength threshold $T$, a corner should also be a locally maximum point in the corner strength array. You also need to add missing code in **corner/find_local_maxima.m**.

**Submission**: Submit the completed

- **detect_corners.m**, and
- **find_local_maxima.m**

**Q3) (10 marks): Line Detection**. For this part, you will need the completed **canny.m** from Question 1 and the completed **find_local_maxima.m** from Question 2. Copy them into the **hough/** folder.

(a) Fill in the missing code in **hough/draw_line_polar.m** that draws a line using its polar representation $(r, \theta)$.

(b) Fill in the missing code in **hough/hough_transform.m**.

(c) Fill in the missing code in **hough/detect_lines.m**.

**Submission**: Submit the completed

- **draw_line_polar.m**,
- **hough_transform.m**, and
- **detect_lines.m**

**Q4) BONUS (10 marks): Circle Detection**. Write a program to detect circles in an input image using the Hough transform for circles. Use your program to detect circles in **illusory_square.jpg**. To visualise your results, you might also need a program to draw a circle given its center and its radius.

To verify correctness, you can use get result script to create results and then compare your results with the official solution in Figure 1, Figure 2 and Figure 3.

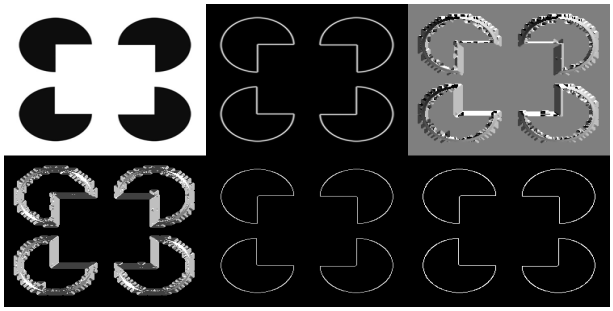

Figure 1: Edge detection official Results

Figure 2: Corner detection official Results

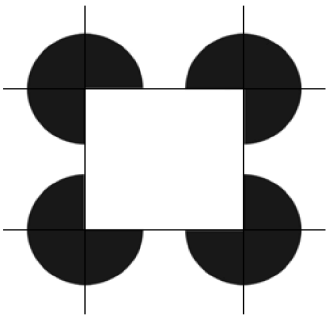

Figure 3: Line detection official Results

## 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\Fall2017\CS 565 Computer Vision\Submissions\Assignment3\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_Assignment3.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_Assignment3.zip`

The .zip file should contain the following directories:

- **canny/**
- **corner/**
- **hough/**
- **hough_circle/**