

**Lab 2: Assignment is done individually**

Due date: February 2, 2024

**Total Marks: 20 Marks**

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Question 1:

[5 marks]: Use Hough transform in Matlab to find the biggest two circles in the image and specify their radii and locations (see example below –radii values could be a bit different from mine, but should be close enough).

$r_1=45.7$  at (210,121),  $r_2=49.6$  at (61,199)

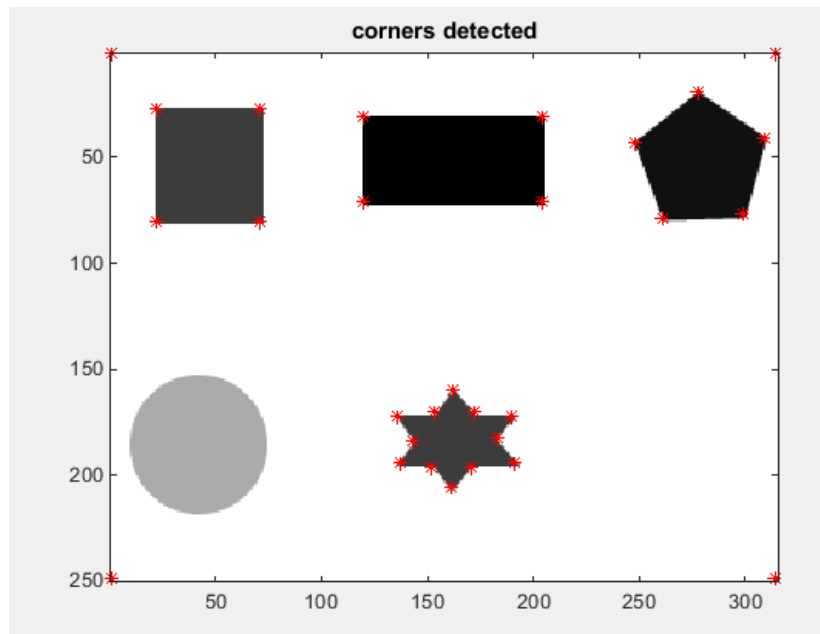


Question 2:

[5 marks] Harris Corner Detection

The goal of this question is to write a code to detect corner points as explained in the lecture. Below is the result of applying this question complete code.

- Start with image shapes23.png and write your code to test this image
- Now repeat the same code for image office3027.jpg. You will notice that there are large number of corners detected. Try to change the parameters to reduce the number of corners and only detect strong corners
- Report what parameters you used and what was the result in the table below



|         |                  |         |             |
|---------|------------------|---------|-------------|
| sigma=  | <b>1</b>         | radius= | <b>4</b>    |
| thresh= | <b>150000000</b> | alpha=  | <b>0.06</b> |

### Results:



### Intuitive Explanation:

#### Describe here your interpretation and discussion of the results

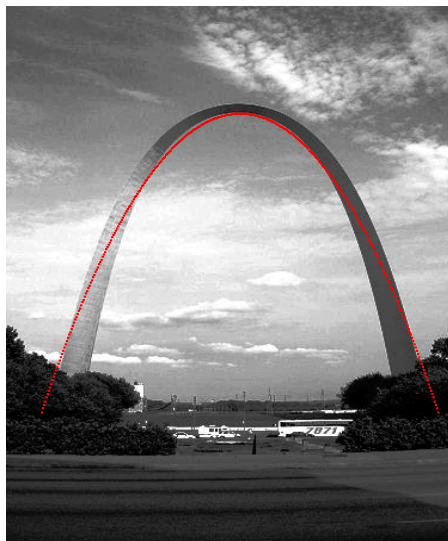
The higher the sigma value the smoother the image is, but some details are lost. For better detection of corner points the sigma value is 1. Similarly, radius is the detection interval, and after extensive testing I decided that 4 was more appropriate and kept it. The higher the threshold, the fewer and more significant corners will be detected. So I used a very high threshold. But it is still difficult to recognize the corner points in the paper box, the rest of the result is OK.

Question 3:

1. **[10 marks]**: Implement Hough transform to find and show the parabola representing the arch in the image. You may copy the partial code from the lecture notes and extend it in order to (i) find local maxima and (ii) draw the parabola. *Hint: In order to draw the parabola in Matlab: Run loops and compute the location of each point using the parabola standard equation. Then, draw that point as a rectangle (or another standard Matlab shape).*

The output should be similar to the figure below.

**+1 Bonus marks:** see if you can have a better fit of the parabola by playing with the problem settings.



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## Submission Instructions

Solve Q1 and Q2 in one Matlab program (or in two separate programs if you prefer to do that). Submit everything as one zip file **to canvas**. Note that you can resubmit an assignment, but the new submission overwrites the old submission and receives a new timestamp.

### General Guidelines for Programming Assignments:

- The marking of the implemented functions is done following this general scheme:
  - Correctness and logic 80% - the program logic and algorithm behind it is correct and it performs according to the post conditions in each function and the code do compile with no errors
  - Style 10% - code has comments and properly formatted/indented
  - Optimization and simplicity 10% - The code has reasonable optimization and is not awkward nor too complicated
- Marks can be deducted if the student does not implement any specific requests in the assignment