

## Assignment 1

Topic: Image Enhancement, Spatial Filtering, Edge Detection, Image Segmentation,...

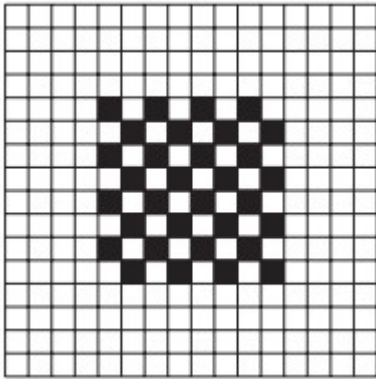
**Due Date: 15/02/2021**

**Maximum Marks: 10**

### General Objectives

The assignment is intended to provide the students with an opportunity to take the initiative, have a hands-on and develop the works independently.

1. You are asked to segment the image of figure into object and background. Black pixels in the image have value 0 and white pixels have value 1. Define a scalar that may be used to characterize each pixel and segment the image by thresholding the values of this scalar. [1]



2. Superimpose the image `text.tif` onto the image `cameraman.tif`. You can do this with:

```
>> t = imread('text.tif');
>> c = imread('cameraman.tif');
>> m = uint8(double(c)+255*double(t));
```

Segment the new image *m* to isolate the text using threshold-based algorithm. [1]

3. Try the same problem as above, but define *m* as: [1]

```
>> m = uint8(double(c).*double(~t));
```

4. A snip of a MATLAB program is given below:

```
>> t = imread('circles.tif');
>> [x,y] = meshgrid(1:256,1:256);
>> t2 = double(t).*((x+y)/2+64)+x+y;
>> t3 = uint8(255*mat2gray(t2));
```

Attempt to threshold the image *t3* to obtain the circles alone, using adaptive thresholding and CLAHE (contrast limited adaptive histogram equalization) method.

What sized blocks produce the best result? [2]

5. Read the `cameraman.tif` image in MATLAB and add some noise to it. [1]

- i. Add salt & pepper noise of noise density 0.1 and store in the variable `c1`.
- ii. Add zero mean white Gaussian noise of variance 0.02 and store in the variable `c2`.

Now apply the edge finding techniques to each of the “noisy” images `c1` and `c2`.

Which technique seems to give

- (a) the best results in the presence of noise?
- (b) the worst results in the presence of noise?

6. A. Open up the image `cameraman.tif` in MATLAB, and apply each of the following edge finding techniques in turn:

- (a) Roberts
- (b) Prewitt
- (c) Sobel
- (d) Laplacian
- (e) Zero-crossings of a Laplacian

Which seems to you to provide the best looking result?

B. Repeat the above problem, but use the image `tire.tif`. Comment on the results of both problems (6.A and 6.B). [2]

7. Open your own face (front facing grayscale image) in MATLAB. Segment the image into multiple segments like eyes, nose, mouth, chin, etc. [2]

**Note: You do not need to use advanced image processing techniques or the topics that are not discussed yet in the classes.**