

CE5-R3: IMAGE PROCESSING AND COMPUTER VISION

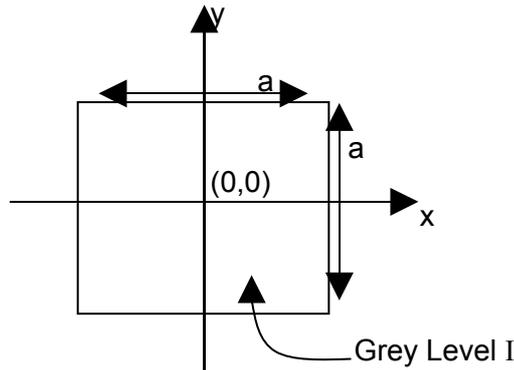
NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.
a)



Obtain Fourier transform of the above image.

- b) What is a histogram and how it is equalized?
- c) Show that in context of morphological operations – Dilation and Erosion are complimentary of each other with respect to set complementation and reflection.
- d) How is run length coding implemented? Illustrate using an example.
- e) How can the following measure used to characterize texture?

$$R = 1 - \frac{I}{I + VAR(z)}$$

where z is a discrete random variable denoting intensity.

- f) 3D vision using intensity images as input is very difficult. Justify.
- g) Explain in brief: CMYK color model.

(7x4)

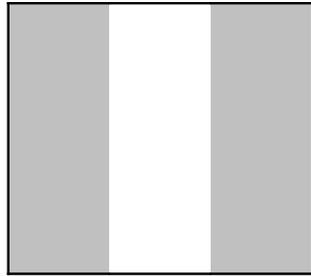
2.

- a) Explain sampling and quantization for digitizing images. How is a digital image represented?
- b) What is the aim of image preprocessing? How are pin-cushion and barrel distortions corrected?
- c) Explain the action of following mask on images.

$$\frac{1}{9} \times \begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$$

(6+6+6)

- 3.**
- a) What is convex hull? Explain morphological algorithm for obtaining convex hull. What is the shortcoming and possible solution of the algorithm?
 - b) How an edge of the image is detected? Discuss any edge detection algorithm for detecting an edge of the following image.



- c) What is optical flow and optical flow field? **(8+8+2)**

- 4.**
- a) How can contrast be stretched? Give an example of transformation to achieve the contrast stretching.
 - b) When does local enhancement in an image done? What is the procedure of enhancing an image locally?
 - c) Write steps for 4-neighbourhood and 8-neighbourhood region identification algorithm. **(6+6+6)**

- 5.**
- a) How can lines be detected using Hough transform? Why is normal representation of line useful in Hough transform?
 - b) How is skeleton of a binary image obtained using morphological operations? Illustrate using an example. **(9+9)**

- 6.**
- a) What is boundary descriptor? Explain any four different boundary descriptors?
 - b) What are the various steps to achieve JPEG compression? Why is zig-zag scanning done in JPEG? **(8+10)**

- 7.**
- a) Explain the camera calibration procedure.
 - b) The basic nature of image is characterized by the two components, called illumination and reflectance components. Is it true or false? Justify.
 - c) Explain the fundamental matrix for the geometry of two cameras. **(6+6+6)**