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10EC763

Seventh Semester B.E. Degree Examination, June/July 2014
Image Processing

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. What is a digital image? With block diagram, explain the fundamental steps in digital image processing. (10 Marks)
- b. Write a short note on:
- Image formation in the eye.
 - Brightness adaptation in an eye. (10 Marks)
- 2 a. Explain an image acquisition using a sensor arrays. (06 Marks)
- b. Briefly explain the following terms:
- Neighbours
 - Path
 - Connectivity of pixels. (06 Marks)
- c. Consider an image segment:
- | | | | | | |
|-----|---|---|---|---|---|
| 3 | 4 | 1 | 2 | 0 | |
| 0 | 1 | 0 | 4 | 2 | |
| 2 | 2 | 3 | 1 | 4 | |
| (p) | 3 | 0 | 4 | 2 | 1 |
- Let $V = \{0, 1, 2\}$ compute the length of the shortest 4, 8m path between p and q.
 - Repeat for $V = \{2, 3, 4\}$. (08 Marks)
- 3 a. Show that the DFT of the two dimensional circular convolution of two arrays are the product of their DFT's. (10 Marks)
- b. For the given orthogonal matrix 'A' and image 'u', obtain transformed image, original image and basis image.
- $$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}, u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}. \quad (10 \text{ Marks})$$
- 4 a. Give an expression for 2D-forward and inverse discrete cosine transform and list its properties. (08 Marks)
- b. Generate Hadamard transform matrix H_n for $n = 3$ from the core matrix
- $$H_1 = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}. \quad (08 \text{ Marks})$$
- c. List the properties of Slant transform. (04 Marks)

PART – B

- 5 a. Explain the following: i) Gray-level slicing; ii) Bit plane slicing. (06 Marks)
- b. For the given 4×4 image having grey scale between [0, 9], get histogram equalized image and draw the histogram of image before and after equalization. (08 Marks)
- | | | | |
|---|---|---|---|
| 2 | 3 | 3 | 2 |
| 4 | 2 | 4 | 3 |
| 3 | 2 | 3 | 5 |
| 2 | 4 | 2 | 4 |
- c. Briefly explain how arithmetic and logic operations are used for image enhancement. (06 Marks)
- 6 a. Explain and compare ideal low pass filter and Butterworth filter for image smoothing. (10 Marks)
- b. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach for image enhancement and list the advantages. (10 Marks)
- 7 a. Draw and explain image degradation and restoration model. (06 Marks)
- b. Discuss various mean filters used in image restoration system. (06 Marks)
- c. Explain in brief the inverse filtering approach. List its limitations in image restoration. (08 Marks)
- 8 a. Briefly discuss the following:
- i) RGB colour model.
 - ii) HIS color model. (08 Marks)
- b. What is pseudo colour? Explain its processing technique. (06 Marks)
- c. $(R, G, B) = (0.683, 0.1608, 0.1922)$ convert this in to HIS model. (06 Marks)

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