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06EC756

Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014

Image Processing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a neat block diagram, describe various components used in general purpose image processing system. **(08 Marks)**

b. Briefly explain the principle of image formation in Human eye. **(08 Marks)**

c. Let p and q be the pixels at coordinates (5, 5) and (10, 15) respectively. Find out which distance measure gives the minimum distance between the pixels. **(04 Marks)**

2 a. Explain the process of image sampling and quantization in digital image formation. **(10 Marks)**

b. Explain: i) False contouring, ii) Checkerboard pattern. **(05 Marks)**

c. Consider the image segment shown in Fig.Q2(c). Let V = {2, 3, 4}, compute the length of shortest 4-, 8- and m- path between p and q. If any particular path does not exist between these two points, explain why? **(05 Marks)**

(p)

3	4	1	2	0
0	1	0	4	2
2	2	3	1	4
3	0	4	2	1
1	2	0	3	4

(q)

3 a. Consider a 2 × 2 transform matrix A and the image U, given below:

$$A = \frac{1}{2}\begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix} \qquad U = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$$

Calculate the transformed image V and the basis images. Check the image U using basis images and transformed image V. **(10 Marks)**

b. Define Haar transform. Find Haar matrix for N = 8 and explain how it is constructed. State its properties. **(10 Marks)**

4 a. Explain the importance of discrete cosine transform with its equations and properties. **(08 Marks)**

b. Write a short note on KL transform. **(06 Marks)**

c. Prove that Hadamard transform is a fast transform. **(06 Marks)**

PART – B

5 a. Consider 8-level grey scale image of size 8 × 8 shown in Fig.Q5(a). Show histogram of the image. Compute equalized histogram and display graphically. **(10 Marks)**

0	1	1	0	0	1	1	0
0	1	2	3	3	2	1	0
0	4	5	3	3	5	4	0
0	1	2	7	7	2	1	0
0	1	2	6	6	2	1	0
0	4	5	3	3	5	4	0
0	1	2	3	3	2	1	0
0	1	1	0	0	1	1	0

Fig.Q5(a)

5 b. Using the second derivative, develop a Laplacian mask for image sharpening. **(06 Marks)**
c. Explain in brief any point processing technique implemented in image processing. **(04 Marks)**

6 a. Discuss the characteristics of high boost filter for both frequency and spatial domain. Explain how high boost filtering increases the enhancement of the image. **(10 Marks)**
b. With the help of block diagram, explain homomorphic filters for image enhancement. **(10 Marks)**

7 a. Explain different image degradation models. **(06 Marks)**
b. Explain in brief, the inverse filtering approach and its limitations. Explain how the limitations can be overcome using Wiener filtering. **(10 Marks)**
c. What is an order statistics filter? Explain any one such filter. **(04 Marks)**

8 a. Explain the following color models:
i) RGB color model
ii) HSI color model **(10 Marks)**
b. Write steps involved in converting colors from HSI to RGB. **(05 Marks)**
c. Explain pseudo color image processing in brief. **(05 Marks)**

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