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06EC756

Seventh Semester B.E. Degree Examination, December 2011
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. Explain the fundamental steps in digital image processing. **(10 Marks)**

b. Explain the brightness adaptation, with the help of the related graph. **(04 Marks)**

c. Define spatial and gray level resolution. Briefly discuss the effects resulting from a reduction in number of pixels and gray levels. **(06 Marks)**

2 a. With a suitable diagram, explain how an image is acquired using a circular sensor strip. **(06 Marks)**

b. Explain the zooming. **(04 Marks)**

c. Define 4 – adjacency, 8 – adjacency and m – adjacency. **(04 Marks)**

d. Consider the image segment shown in Fig. Q2(d).
i) Let V = {0, 1}. Compute the lengths of shortest 4 – , 8 – and m – paths between p and q.
ii) Repeat for V = {1, 2}. **(06 Marks)**

	3	1	2	1	(q)
	2	2	0	2	
	1	2	1	1	
(p)	1	0	1	2	

Fig. Q2(d)

3 a. Define two – dimensional DFT. Explain the following properties of 2 – DFT.
i) Translation ii) Rotation iii) Distributivity and scaling iv) Separability **(10 Marks)**

b. What are basis vectors? **(04 Marks)**

c. For the given orthogonal matrix A and image u, obtain the transformed image and basis images.

$$A = \frac{1}{\sqrt{2}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}, u = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}.$$ **(06 Marks)**

4 a. Define discrete cosine transform and its inverse transformation. Discuss any three properties of discrete cosine transform. **(10 Marks)**

b. Develop Hadamard transform for n = 3. Discuss the properties of the Hadamard transform. (any two). **(10 Marks)**

PART – B

5 a. Explain the following image enhancement techniques, highlighting their area of application.
i) Intensity level slicing
ii) Power – law transformation
iii) Bit – plane slicing. **(10 Marks)**

b. What is histogram matching? Explain the development and implementation of the method. **(10 Marks)**

6 a. Explain the smoothing of images in frequency domain using :
   i) Ideal lowpass filter
   ii) Butterworth lowpass filter. **(10 Marks)**

   b. With a block diagram and equations, explain the homomorphic filtering. How dynamic range compression and contrast enhancement is simultaneously achieved? **(10 Marks)**

7 a. With a block diagram, briefly explain the image model of degradation – restoration process. **(06 Marks)**

   b. Explain the notch reject filters. How can we obtain the notch filter that pass rather than suppressing the frequency in the notch area? **(08 Marks)**

   c. Explain the Weiner – filtering method of restoring images. **(06 Marks)**

8 a. Explain the following order – statistics filters, indicating their uses.
   i) median filter
   ii) max filter
   iii) min filter. **(06 Marks)**

   b. Explain the RGB color model. **(06 Marks)**

   c. Write a note on the following pseudo image processing techniques :
   i) Intensity slicing
   ii) Graylevel to color transformations. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2011
Image Processing

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Write in detail the fundamental steps in digital image processing. **(10 Marks)**

b. How is image formed in the human eye? Explain with examples the perceived brightness is not a simple function of intensity. **(10 Marks)**

2 a. How many minutes would it take to transmit a 1024×1024 image with 256 gray levels using 56 k baud modem? (Baud rate is the number of bits transmitted per second. Assume each byte is one packet with a start bit and a stop bit.) **(04 Marks)**

b. Explain image sampling and quantization. **(10 Marks)**

c. Consider the image segment given in Fig.Q2(c). Let V = {0, 1}, Compute the lengths of the shortest 4, 8 and m-path between 'p' and 'q'. If path does not exists, explain why. **(06 Marks)**

3	1	2	1 (q)
2	2	0	2
1	2	1	1
(p) 1	0	1	2

Fig.Q2(c)

3 a. Derive the expression for 2D circular convolution theorem. **(10 Marks)**

b. Consider the 2×2 transform A and the image U given below:

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

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

4 a. Derive the relation between DCT and DFT. **(10 Marks)**

b. Write H matrix for the Harr transform for N = 8 and explain how it is constructed. **(05 Marks)**

c. Write four properties of Hadmard transform. **(05 Marks)**

PART – B

5 a. Explain histogram equalization technique. **(10 Marks)**

b. Explain the following with applications:
i) Contrast stretching ii) Bit plane slicing iii) Gray-level slicing
iv) AND operation v) OR operation. **(10 Marks)**

6 a. Discuss homomorphic filtering. **(08 Marks)**

b. Explain sharpening filters in the frequency domain. **(06 Marks)**

c. Explain smoothing filters in the frequency domain. **(06 Marks)**

7 a. Explain adaptive median filter and its advantages. **(06 Marks)**

b. How do you reduce the periodic noise using frequency domain filters? **(06 Marks)**

c. Derive the expression for observed image when the degradations aee linear, position invariant. **(08 Marks)**

8 a. Explain RGB and HSI colour models with their conversions. **(10 Marks)**

b. Explain pseudo colour image processing. **(05 Marks)**

c. Explain inverse filtering. **(05 Marks)**

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