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10SCS151

First Semester M.Tech. Degree Examination, December 2011
Advances in Digital Image Processing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain any two fields that use digital image processing. **(08 Marks)**

b. Consider the two image subsets S_1 and S_2 shown in the following Fig. Q1(b). For v= { 1 }, determine whether these two subsets are
i) 4 – adjacent ii) 8–adjacent iii) m–adjacent. **(06 Marks)**

	S_1				S_2				
0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	1	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1

Fig. Q1(b)

c. Briefly explain the following :
i) Webers ratio
ii) Image analysis
iii) Brightness adaptation and discrimination. **(06 Marks)**

2 a. Discuss how arithmetic/logic operators involving images are performed on a pixel – by–pixel between two or more images. **(10 Marks)**

b. What is the prominent advantage of piecewise linear transformation functions? List and explain in detail, the different piecewise linear transformation functions. **(10 Marks)**

3 a. Derive and explain the two dimensional discrete Fourier transform and its inverse. **(10 Marks)**

b. Using illumination–reflectance model develop a frequency domain procedure for improving the appearance of an image by simultaneous gray level range compression and contrast enhancement. **(10 Marks)**

4 a. Discuss in detail, the important noise probability density functions found in image processing applications. **(10 Marks)**

b. Explain in brief, the three principal ways to estimate the degradation function for use in image restoration. **(10 Marks)**

5 a. Explain in detail, the geometric interpretation of the intensity–slicing technique in pseudocolor image processing. **(05 Marks)**

b. Explain the RGB color model with a schematic diagram. Also explain the conversion of colors from RGB to HSI. **(10 Marks)**

c. Compute the :
i) Haar transform of the 2 × 2 image

$$F = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$$

ii) The inverse Haar transform is $F = H^{-1}TH^{-1}$ where T is the Haar transform and H^{-1} denotes the matrix inverse of Haar transformation matrix H. Find H_2^{-1} for Haar transformation matrix H_2 and use it to compute the inverse Haar transform of the result in (i). **(05 Marks)**

6 a. Explain in detail, a general compression system model. **(08 Marks)**

b. Explain the Lossless predictive coding technique, with neat diagram and expressions. **(06 Marks)**

c. Consider an 8–pixel line of gray scale data {12, 12, 13, 13, 10, 13, 57, 54} which has been uniformly quantized with 6–bit accuracy. Construct its 3 bit IGS code. **(06 Marks)**

7 a. Discuss with neat diagram, the important operations opening and closing in morphological image processing. **(10 Marks)**

b. Explain the boundary extraction and region filling in morphological algorithms. **(10 Marks)**

8 Write short note on :

a. Sampling and quantization

b. Video compression techniques

c. Object recognition

d. Thresholding. **(20 Marks)**

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