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05SCS/SCE143

First Semester M.Tech. Degree Examination, Dec.08/Jan.09
Digital Image Processing and Computer Vision

Time: 3 hrs. Max. Marks:100

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

1 a. Explain in detail the basic components comprising a typical general purpose system used for digital image processing. **(10 Marks)**

b. Consider the two image subsets S1 and S2 shown in figure Q1 (b). For V = {1}, determine whether these two subsets are i) 4-adjacent, ii) 8-adjacent or iii) m-adjacent. **(05 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. Discuss the first order derivatives for the detection of edges in an image. **(05 Marks)**

2 a. Explain in detail the processes of converting continuous sensed data into digital form to create an image. **(10 Marks)**

b. Discuss in brief on how to zoom and shrink a digital image. **(05 Marks)**

c. Explain the use of two dimensional second order derivatives for image enhancement. **(05 Marks)**

3 a. Discuss how arithmetic / logic operations involving images are performed on a pixel-by-pixel between two or more images. **(10 Marks)**

b. An image has gray level PDF $P_r(r)$ shown in the figure Q3 (b). It is desired to transform the gray levels of this image so that they will have the specified $P_z(z)$ shown. Assume continuous quantities and find the transformation in terms of r and z that will accomplish this. **(05 Marks)**

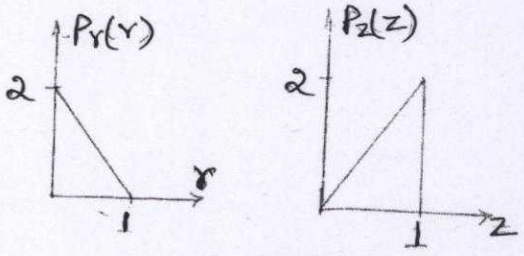

Fig. Q3 (b)

c. Explain how noise reduction can be accomplished by blurring with linear and non linear filtering. **(05 Marks)**

4 a. 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)**

b. Explain in detail three types of Lowpass filters that cover the range from very sharp to very smooth filter functions. **(10 Marks)**

5 a. Explain some important noise probability density functions found in image processing applications. **(12 Marks)**

b. Explain three principal ways to estimate the degradation function for use in image restoration. **(08 Marks)**

6 a. Derive an expression to convert:

i) RGB to HSI

ii) HSI to RGB **(10 Marks)**

b. Discuss in brief the processing techniques applicable to full color images that are handled for a variety of image processing tasks. **(05 Marks)**

c. Show that scaling function,

$$\phi(x) = \begin{cases} 1 & 0.25 \le x \le 0.75 \\ 0 & \text{elsewhere} \end{cases}$$

does not satisfy the second requirement of multi resolution analysis. **(05 Marks)**

7 a. Explain in brief three basic data redundancies which can be identified and exploited in digital image compression. **(10 Marks)**

b. Discuss in detail opening and closing which are important morphological operations. **(10 Marks)**

8 Write short notes on:

a. Edge linking and boundary detection.

b. Lossy compression.

c. The Haar transform.

d. Pattern and pattern classes. **(20 Marks)**

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