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VI SEMESTER B.TECH (COMPUTER SCIENCE AND ENGINEERING) DEGREE
END SEMESTER EXAMINATION - MAY 2014
SUBJECT: ELECTIVE I – DIGITAL IMAGE PROCESSING (CSE 320)
DATE: 12/05/2014

TIME: 3 HOURS MAX. MARKS: 50

INSTRUCTIONS TO CANDIDATES
- ANSWER ANY **FIVE** FULL QUESTIONS.

1A. Show that summation is linear operation and addition of noisy images results in noise reduction. [04]

1B. What is image interpolation? Explain different types of interpolation. [03]

1C. Define connected component and adjacency. Describe different types of adjacencies. [03]

2A. With respect to histogram processing, explain histogram equalization. Let an image have an intensity PDF given by

$$p_r(r) = \begin{cases} \frac{2r}{(L-1)^2} & 0 \le r \le (L-1) \\ 0 & \text{otherwise} \end{cases}$$

Find the transformation function that will produce an image whose intensity PDF is

$$p_z(z) = \begin{cases} \frac{3z^2}{(L-1)^3} & 0 \le z \le (L-1) \\ 0 & \text{otherwise} \end{cases}$$

[05]

2B. Explain the following intensity transformation functions.

(i) Gamma transformations

(ii) Contrast stretching [02]

2C. Derive the Laplacian for image sharpening. How it is used in high-boost filtering? [03]

3A. Prove that 2D Fourier transform exhibits periodicity property. Explain how this property is useful in implementing Discrete Fourier transform based algorithms. [03]

3B. Develop a frequency domain procedure for improving appearance of an image by reducing uneven illumination and contrast enhancement. [04]

3C. With proper mathematical expressions, describe ideal, Butterworth and Gaussian lowpass filters in frequency domain. [03]

4A. Describe a morphological method for template matching. [03]

4B. Using Arithmetic encoding technique, encode a word ARITHMETIC. The probability of occurrence of each character and range is given as follows. [04]

SYMBOL	PROBABILITY	RANGE
A	**0.1**	**0.0 – 0.1**
C	**0.1**	**0.1 – 0.2**
E	**0.1**	**0.2 – 0.3**
H	**0.1**	**0.3 – 0.4**
I	**0.2**	**0.4 – 0.6**
M	**0.1**	**0.6 – 0.7**
R	**0.1**	**0.7 – 0.8**
T	**0.2**	**0.8 – 1.0**

4C. Elucidate three forms of redundancies and suggest at least one technique to eliminate/reduce each form of redundancy. [03]

5A. How do you detect edges using a method proposed by Canny? [05]

5B. Explain global method to detect the lines present in an edge detected image. [05]

6A. Explain the following morphological operations.

(i) Top-hat and Bottom-hat transformations

(ii) Pruning. [03]

6B. Explain the PDFs of the following types of noise.

(i) Normal noise (ii) Rayleigh noise (iii) Erlang noise (iv) Exponential noise (v) Uniform noise (vi) Impulse noise (vii) Periodic noise [07]

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