GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII • EXAMINATION – SUMMER 2013

Subject Code: 182006   **Date: 09-05-2013**

Subject Name: Machine Vision

Time: 10.30 am - 01.00 pm   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary and clearly mention the same.**
3. **Figures to the right indicate full marks.**
4. **Draw neat diagrams. Shabbily drawn diagrams may not be awarded any credit.**

Q.1 **(a)** 1. Brightness discrimination is not a simple function of intensity or illumination. ó Evaluate the statement and support your answer with suitable example.   **04**
      2. Explain the effect of False Contouring.   **03**

    (b) 1. Explain the logical operations AND and OR that can be performed on a digital image with the help of neat diagrams.   **04**
      2. Produce the block diagram of image degradation and restoration process and describe the same.   **03**

Q.2 **(a)** With the help of neat sketches describe the following smoothing filters: **4+3**
      1. Butterworth Low Pass Filter
      2. Gaussian Low Pass Filter
     Also enumerate the applications of smoothing filters in real life.

    (b) 1. Briefly describe the following properties of 2-D Fourier Transform: Translation and Distributivity   **04**
      2. Differentiate between the convolution and correlation process of digital image processing.   **03**

OR

    (b) Differentiate amongst 4-adjacency, 8-adjacency and m-adjacency for distance measurement in a digital image.   **07**

Q.3 **(a)** Explain the following terms in context of digital image: **4+3**
      1. Sampling and Quantization
      2. Zooming and Shrinking

    (b) Justify the following statement: **4+3**
      1. Bit plane slicing is used for image compression.
      2. Gray level slicing is used to highlight a region of interest in the image.

OR

Q.3 **(a)** Explain histogram equalization and histogram matching process for enhancement of digital image.   **07**

(b) 1. Show that the 2-D DFT can be computed by successive computations of **07** two 1-D DFTs, one after the other, one for all rows and the other for all columns.
2. Show that the Forward Fourier Transform algorithm can be utilized to compute Inverse Fourier Transform.

Q.4 **(a)** List out various noise functions and explain them briefly with neat schematic **07** diagrams.

(b) Explain the working of Laplacian filter and Median filter with suitable examples **07** and respective masks.

OR

Q.4 **(a)** Evaluate the following statements: **3+4**
1. Although there are areas of overlap, image enhancement is largely a subjective process, while image restoration is an objective process.
2. A high pass filter can be constructed from two low pass filters or by subtracting the low pass filter from unity.

(b) With the help of derivation and block diagram, describe the procedure used in **07** homo-morphic filtering for image enhancement. How is gray level compression achieved in homo-morphic filtering?

Q.5 **(a)** Construct Huffman coding for the following data of an image. Also find the **07** average number of bits required to represent a pixel.

Symbol	Probability
A1	0.04
A2	0.10
A3	0.45
A4	0.11
A5	0.05
A6	0.25

(b) Briefly describe the following redundancies of digital image: **07**
1. Coding redundancy
2. Interpixel redundancy

OR

Q.5 **(a)** The symbol sequence (or message) to be coded with arithmetic coding uses the **07** half open interval [0.84, 0.8424). Find out the symbol sequence to be coded using following information of probabilities:

Source Symbols	A1	A2	A3	A4
Probabilities	0.2	0.3	0.3	0.2

(b) 1. Differentiate between opening and closing of a binary image. **07**
2. Describe any two morphological transformations.

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