[Total No. of Questions - 8] [Total No. of Printed Pages - 3] (2064)

14754

M. Tech 2nd Semester Examination

Image Processing

EC-202

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions. All questions carry equal marks

1. (a) Draw the schematic showing the components of an image processing system. Explain each component in brief. (10)

   (b) Explain image acquisition using different types of sensors arrangements. Also, describe different types of resolutions used in digital images. (10)

2. (a) What do you understand by image enhancement? Explain briefly various methods used for achieving enhancement in spatial and frequency domain. (8)

   (b) Exponentials of the form e^{-ar^2}, with 'a' as positive constant, are useful for constructing smooth gray-level transformation functions. Start with this basic function and construct transformation functions having the general shapes shown in Fig. 1. The constants shown are input parameters, and your proposed transformations must include them in their specification. (12)

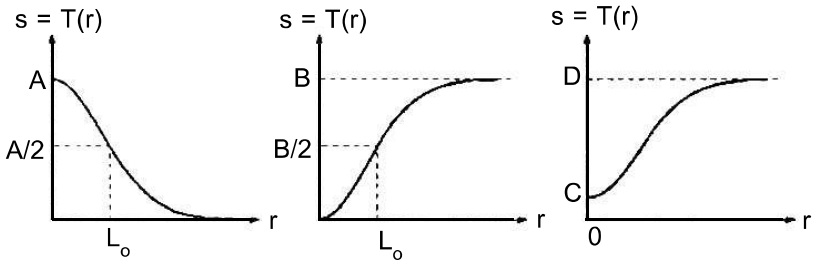

Fig. 1

3. Two images, f(x, y) and g(x, y) have histograms h_f and h_g. Give the conditions under which you can determine the histograms of

   (i) f(x,y) + g(x,y)

   (ii) f(x,y)–g(x,y)

   (iii) f(x,y)×g(x,y)

   (iv) f(x,y)/g(x,y)

   in terms of h_f and h_g. Explain how to obtain the histogram in each case. (20)

4. (a) Describe the process of inverse filtering citing its application in removal of blur by Wiener filter. (10)

   (b) Consider a linear, position-invariant image degradation system with impulse response $h(x-\alpha, y-\beta) = e^{-\left[(x-\alpha)^2+(y-\beta)^2\right]}$. Suppose that the input to the system is an image consisting of a line of infinitesimal width located at x = a, y = b and modeled by f(x,y) = δ(x–a, y–b), where δ is the impulse function. Assuming no noise, what is the output image g(x, y)? (10)

5. (a) Define point spread function. Explain in detail and derive different types of point spread functions and explain their physical significance. (10)

(b) Enumerate various methods for estimating the degradation function. Describe any one of them in detail (10)

6. Describe JPEG 2000 standard of image compression in detail citing suitable examples. Also explain how it is different from JPEG? (20)

7. What do you understand by descriptors? Why they are useful in recognising the image patterns and characteristics? Enumerate various types of descriptors used and explain any one of them in detail with the help of suitable examples. (20)

8. Write short notes on any two of the following:

   (a) Image noise models

   (b) Blurring and de-blurring algorithms

   (c) Interpixel redundancy

   (d) Hough transforms. (20)