GANPAT UNIVERSITY
M. TECH SEM. II COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY
REGULAR EXAMINATION MAY/JUNE: 2013
3CE201/3IT201: Digital Image Processing

Time: 3 Hours]   [Total Marks: 70

Instructions: 1. Figures to the right indicate full marks of the question.
2. All questions are compulsory.
3. Each section should be written in a separate answer book.

SECTION: I

Q:1 (a) Obtain laplacian mask for image sharpening. And Discuss Unsharp masking and high boost filtering. [6]

(b) Show that laplacian is isotropic. You will need the following coordinates for axis rotation by an angle θ. Where (x, y) are unrotated and (x', y') are rotated coordinates. [6]

$$x = x'cos\theta - y'sin\theta$$
$$y = x'sin\theta + y'cos\theta$$

OR

Q:1 (a) Describe histogram equalization process. [6]

(b) Develop a procedure for computing the median of an n x n neighborhood [3]

(c) Discuss Bit plane slicing briefly. [3]

Q:2 (a) Prove the following. [4]

$$f(t) \star h(t) \Leftrightarrow H(\mu)F(\mu)$$

(b) Prove the following translation property [3]

$$f(x,y)e^{j2\pi(u_0x/M+v_0y/N)} \Leftrightarrow F(u-u_0, v-v_0)$$

(c) Describe the basic steps for filtering in frequency domain. [4]

OR

Q:2 (a) Elaborate the process of obtaining Fourier transform of sampled functions. [6]

(b) Describe the laplacian in the frequency domain [5]

Q:3 (a) Discuss various first order derivative operator for image sharpening in spatial domain [6]

(b) Explain following keywords [6]
(i) Spatial Resolution & Intensity Resolution (ii) Convolution & correlation (iii) Normalized histogram

Q:4 (a) Explain extraction of connected components algorithm and its application. [6]

   (b) Show that following two definitions of dilation are equivalent. [3]
   $$A \oplus B = \{w \in Z^2 | w = a + b, \text{ for some } a \in A \text{ and } b \in B\}$$
   $$A \oplus B = \{z | (\hat{B})_z \cap A \neq \phi\}$$

   (c) Explain what would happen in binary erosion and dilation if the structuring element is a single point, valued 1. Give the reasons for your answer. [3]

OR

Q:4 (a) Describe Convex Hull and thinning morphological operation and its usage. [6]

   (b) Prove the following. [3]
   $$(A \cdot B) \cdot B = A \cdot B$$

   (c) Derive the Laplacian of Gaussian(LoG) operator. show its mask and usage. [3]

Q:5 (a) Discuss canny edge detection procedure in detail and show its use. [6]

   (b) Explain signatures and skeletons as boundary descriptors. [5]

OR

Q:5 (a) Prove that average value of laplacian of Gaussian (LoG) operator is zero. And also show that the average value of any image convolved with this operator also is zero. [6]

   (b) Explain basic global thresholding technique. [5]

Q:6 (a) Discuss Ostu's method for global thresholding in detail. [6]

   (b) In reference of Hough transformation. Develop a procedure for obtaining the normal representation of a line from its slope-intercept form , y=a.x + b. [6]
   Also find the normal representation of the line y = -2.x + 1.

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