IV B.Tech I Semester(R05) Regular & Supplementary Examinations, December 2009
DIGITAL IMAGE PROCESSING
(Electronics & Communications Engineering)
Time: 3 hoursMax Marks: 80
Answer any FIVE Questions
All Questions carry equal marks

KOTTAM
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1. A common measure of transmission for digital data is the baud rate, defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of starting bit, a byte of information, and a stop bit. Using this approach, answer the following.

    (a) How many minutes would it take to transmit a 512×512 image with 128 grey levels at 300 baud?

    (b) What would the time be at 9600 baud?

    (c) Repeat
       (a) and (b) for a 1024×1024 image 128 grey levels.   [16]

2. Formulate 1D Walsh transform kernel for N=8.   [16]

3. Explain following spatial filters.

    (a) Median filter

    (b) High pass filter

    (c) Low pass filter.   [16]

4. Distinguish between spatial domain techniques and frequency domain techniques of Image enhancement.[16]

5. Show that the saturation component of the complement of a color image cannot be computed from the saturation component of the input image alone.[16]

6. Describe the following:

    (a) Discrete functions

    (b) Points spread function.   [8+8]

7. What is Thresholding? Explain about Global Thresholding.   [16]

8. An 8 level image has the gray level distribution given in table.

rk	Pr (rk)	Code 1	L1 (rk)	Code 2	L2 (rk)
r0 = 0	0.19	000	3	11	2
r1 =1/7	0.25	001	3	01	2
r2 =1/7	0.21	010	3	10	2
r3 =3/7	0.10	011	3	001	3
r4 =4/7	0.08	100	3	0001	4
r5 =5/7	0.06	101	3	00001	5
r6 =6/7	0.03	110	3	000001	6
r7 =1	0.02	111	3	000000	6

    (a) compute the average word length for each code and compare the to entropy form part

    (b) compute entropy of the source.   [16]

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1. (a) Discuss purpose of perspective transformations.

   (b) Explain camera model. [8+8]

2. Formulate 1D Walsh transform kernel for N=8. [16]

3. (a) Develop a procedure for computing the median of an nxn neighborhood.

   (b) Propose a technique for updating the median as the center of the neighborhood is moved from pixel to pixel.[16]

4. Suppose that you form a Low pass spatial filter that averages the 4- neighbors of point (x,y), but excludes the point (x,y) itself

   (a) Find the equivalent filter H(u,v) in the frequency domain

   (b) Show that your result a low pass filter. [16]

5. Derive the CMY transformations to generate the complement of a color image. [16]

6. Explain about Adaptive, local noise reduction filter. [16]

7. Show that the digital laplacian given in the of Equation $2f = 4z_5 - (z_2 + z_4 + z_6 + z_8)$ is proportional to subtracting from f(x, y) an average of 4- neighbors of f(x, y).[16]

8. Explain about Fidelity Criteria. [16]

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1. (a) Distinguish between uniform sampling and non uniform sampling with respect to Images.

    (b) What are the advantages of non uniform sampling.   [10+6]

2. Obtain Slant transform matrix for N=8.   [16]

3. Discuss following intensity transformations.

    (a) Grey level slicing

    (b) Bit plane slicing.   [16]

4. Suppose that you form a Low pass spatial filter that averages the 4- neighbors of point (x,y), but excludes the point (x,y) itself

    (a) Find the equivalent filter H(u,v) in the frequency domain

    (b) Show that your result a low pass filter.   [16]

5. Show that the saturation component of the complement of a color image cannot be computed from the saturation component of the input image alone.[16]

6. Explain the following Order-Statistics Filters.

    (a) Max and min filters

    (b) Median filter

    (c) Alpha-trimmed mean filter.   [16]

7. Explain about Line detection using the Hough Transform.   [16]

8. (a) Draw and explain a general compression system model.

    (b) Draw the relevant diagram for source encoder and source decoder.   [8+8]

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1. (a) Discuss purpose of perspective transformations.

    (b) Explain camera model. [8+8]

2. (a) Find Fourier transform 2 -D sinusoidal function $n(x,y) = A \sin(u_0 x + v_0 y)$

    (b) Obtain the spectrum in above case. [10+6]

3. What is spatial filtering? How it is useful for Image enhancement, also discuss different types spatial filters used in Image enhancement.[16]

4. Suppose that you form a Low pass spatial filter that averages the 4- neighbors of point (x,y), but excludes the point (x,y) itself

    (a) Find the equivalent filter H(u,v) in the frequency domain

    (b) Show that your result a low pass filter. [16]

5. Explain about the CMY and CMYK color models in detail? [16]

6. Explain the following Order-Statistics Filters.

    (a) Max and min filters

    (b) Median filter

    (c) Alpha-trimmed mean filter. [16]

7. Propose a technique for detecting gaps of length ranging between 1 and L pixels in line segments of gradient image. Assume that the background is constant, that all lines have been coded with the same intensity level, and that the lines are 1 pixel thick. Base your technique on 8- neighbor connectivity analysis.[16]

8. (a) Draw and explain a general compression system model.

    (b) Draw the relevant diagram for source encoder and source decoder. [8+8]