6E7101

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B.Tech. VI sem. (Main) Examination, June - 2023
Computer Science & Egg.
6CS3-01 Digital Image Processing
CS,IT, AID, CAI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C .

Schematic diagram must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in from No. 205)

Part - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Define pixelization and false countering effect in images.
2. Explain shifting and convolution properties of 2-D discrete Fourier transform.
3. What is the difference between a box low pass filter and a gaussian low pass filter.
4. What is bit plane slicing in image thresholding?
5. Explain the model of image degradation and restoration process in brief.
6. What do you understand by inverse filtering in image processing?
7. What is wraparound error in frequency domain filtering?
8. Explain interpixel and psychovisual redundancies with a suitable example of each.
9. What is the need of image segmentation? Explain edge, point, and line detection processes in brief.
10. What is the difference between image enhancement and image restoration.

Part - B

(Analytical/Problem solving questions)

Attempt any five questions: **(5×4=20)**

1. Discuss sampling and quantization process in digital image processing. Also comment on the effect of quantization error on image quality.

2. Perform the operation of histogram matching for the given input image to achieve the distribution of given target image. Draw the resultant histogram.

Input Image								
r_k	10	25	60	115	140	165	210	250
$P(r_k)$	0.19	0.25	0.21	0.16	0.08	0.06	0.03	0.02

Target Image								
z_q	10	25	60	115	140	165	210	250
$P(z_q)$	0.00	0.00	0.00	0.15	0.20	0.30	0.20	0.15

Here r_k and Z_q are gray values, and $P(r_k)$ and $P(Z_q)$ are the corresponding probabilities of occurrence.

3. Compress the following simple 4×8, 8 bit image using Huffman coding. Also obtain:
   a) Average code length
   b) Coding redundancy and compression ratio
   c) Entropy of the source.

25	25	30	65	100	120	180	240	240
25	25	30	65	100	120	180	240	240
25	25	30	65	100	120	180	240	240
25	25	30	65	100	120	180	240	240

4. What is the need of homomorphic filter in image processing? Explain the steps used in homomorphic filtering with a suitable example.

5. What is the relation between relative data redundancy and compression ratio in data compression? Calculate average number of bits/pixel for the following encoded image:

Gray value (r_k)	Probability ($P(r_k)$)	Code Word
85	0.25	01
130	0.4	1
180	0.25	000
255	0.1	001
All other gary values	0	----

6. Explain the fundamental steps of region growing and region splitting algorithms in region-based segmentation.

7. Discuss different intensity transformation functions along with graphical representation of each transformation.

Part - C

(Analytical/Problem solving/ Questions))

Attempt any three questions. **(3×10=30)**

1. Discuss different types of noise probability density functions in detail. Explain the image restoration process in the presence of noise only. Give example of at least one linear and one non-linear filter that can be used for the restoration.

2. What are the differences between lossy and lossless compression techniques? Explain JPEG compression technique with an example.

3. Discuss the concept of Hough transformation along with its execution steps in edge detection? Use Hough transform to find out whether the following points(1,0), (2,1), (3,1), (4,1), (3,2) are collinear or not. Also mention the limitations of Hough transform.

4. Explain the HSI color model and compare it with RGB color model. Specify the expression used to convert colors from HSI to RBS and Vice Versa.

5. Explain image formation model. Discuss the different types of sensors used to acquire images digitally with suitable examples and illustrative diagrams.