EC2029 DIGITAL IMAGE PROCESSING

UNIT I

IMPORTANT TWO MARKS QUESTIONS

1. Define subjective brightness and brightness adaptation?

Subjective brightness means intensity as preserved by the human visual system. Brightness adaptation means the human visual system can operate only from scotopic to glare limit. It cannot operate over the range simultaneously. It accomplishes this large variation by changes in its overall intensity.

2. Define Weber ratio

The ratio of increment of illumination to background of illumination is called as weber ratio.(ie) i/i

If the ratio (i/i) is small, then small percentage of change in intensity is needed (ie) good brightness adaptation.

If the ratio (i/i) is large , then large percentage of change in intensity is needed (ie) poor brightness adaptation.

3. What is meant by machband effect?

Machband effect means the intensity of the stripes is constant. Therefore it preserves the brightness pattern near the boundaries, these bands are called as machband effect.

4. What is simultaneous contrast?

The region reserved brightness not depend on its intensity but also on its background. All centre square have same intensity. However they appear to the eye to become darker as the background becomes lighter.

5. What is meant by illumination and reflectance?

Illumination is the amount of source light incident on the scene. It is represented as i(x, y).Reflectance is the amount of light reflected by the object in the scene. It is represented by r(x, y).

6. Define sampling and quantization

Sampling means digitizing the co-ordinate value (x, y).

Quantization means digitizing the amplitude value.

7. Find the number of bits required to store a 256 X 256 image with 32 gray levels?

32 gray levels = 2^5

= 5 bits

256 * 256 * 5 = 327680 bits.

8. What do you meant by Zooming of digital images?

Zooming may be viewed as over sampling. It involves the creation of new pixel locations and the assignment of gray levels to those new locations.

9. What do you meant by shrinking of digital images?

Shrinking may be viewed as under sampling. To shrink an image by one half, we delete every row and column. To reduce possible aliasing effect, it is a good idea to blue an image slightly before shrinking it.

10. What is geometric transformation?

Transformation is used to alter the co-ordinate description of image.

The basic geometric transformations are

1. Image translation
2. Scaling
3. Image rotation

11. What is image translation and scaling?

Image translation means reposition the image from one co-ordinate location to another along straight line path.

Scaling is used to alter the size of the object or image (ie) a co-ordinate system is scaled by a factor.

12. What is the need for transform?

The need for transform is most of the signals or images are time domain signal (ie) signals can be measured with a function of time. This representation is not always best. For most image processing applications anyone of the mathematical transformation are applied to the signal or images to obtain further information from that signal.

<u>16 MARKS QUESTIONS</u>

1. A. Explain the steps involved in digital image processing.
B.Explain various functional block of digital image processing

2. Describe the elements of visual perception.

3. Describe image formation in the eye with brightness adaptation and Discrimination

4. Write short notes on sampling and quantization.

5. Describe the functions of elements of digital image processing system with a diagram.

6. Explain the basic relationships between pixels?

7. Explain the properties of 2D Fourier Transform.

8. (i)Explain convolution property in 2D fourier transform.
(ii) Find F (u) and |F (u)|

9. Explain Fast Fourier Transform (FFT) in detail.

10. Explain in detail the different separable transforms

UNIT II

IMPORTANT TWO MARKS QUESTIONS

1. Specify the objective of image enhancement technique.

The objective of enhancement technique is to process an image so that the result is more suitable than the original image for a particular application.

2. Name the different types of derivative filters?

1. Perwitt operators
2. Roberts cross gradient operators
3. Sobel operators

3. What is contrast stretching?

Contrast stretching reduces an image of higher contrast than the original by darkening the levels below m and brightening the levels above m in the image.

4What is grey level slicing?

Highlighting a specific range of grey levels in an image often is desired. Applications include enhancing features such as masses of water in satellite imagery and enhancing flaws in x-ray images.

5.Define image subtraction.

The difference between 2 images f(x,y) and h(x,y) expressed as, g(x,y)=f(x,y)-h(x,y) is obtained by computing the difference between all pairs of corresponding pixels from f and h.

6. What is the purpose of image averaging?

An important application of image averaging is in the field of astronomy, where imaging with very low light levels is routine, causing sensor noise frequently to render single images virtually useless for analysis.

7.What is meant by masking?

Mask is the small 2-D array in which the values of mask co-efficient determines the nature of process.The enhancement technique based on this type of approach is referred to as mask processing.

8Give the formula for negative and log transformation.

Negative: S=L-1-r

Log: S = c log(1+r)

Where c-constant and r=0

9.What is meant by bit plane slicing?

Instead of highlighting gray level ranges, highlighting the contribution made to total image appearance by specific bits might be desired. Suppose that each pixel inan image is represented by 8 bits. Imagine that the image is composed of eight 1-bit planes, ranging from bit plane 0 for LSB to bit plane-7 for MSB.

10. Define histogram.

The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function h(rk)=nk.

rk-kth gray level

nk-number of pixels in the image having gray level rk.

EXPECTED 16 MARKS QUESTIONS

1. Explain the types of gray level transformation used for image enhancement.

(OR)

2. What is histogram? Explain histogram equalization.

3. Discuss the image smoothing filter with its model in the spatial domain.

(OR)

4. What are image sharpening filters? Explain the various types of it.

5. Explain spatial filtering in image enhancement.

(OR)

6. Explain image enhancement in the frequency domain.

7. Explain Homomorphic filtering in detail.

UNIT III

IMPORTANT TWO MARKS QUESTIONS

1. What is meant by Image Restoration?

Restoration attempts to reconstruct or recover an image that has been degraded by using a clear knowledge of the degrading phenomenon.

2. What are the two properties in Linear Operator?

1. Additivity
2. Homogenity

3. Explain additivity property in Linear Operator?

$H[f_1(x,y)+f_2(x,y)]=H[f_1(x,y)]+H[f_2(x,y)]$

The additive property says that if H is the linear operator, the response to a sum of two is equal to the sum of the two responses.

4. What is concept algebraic approach?

The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.

5. What are the two methods of algebraic approach?

1. Unconstraint restoration approach
2. Constraint restoration approach

6. Define Gray-level interpolation?

Gray-level interpolation deals with the assignment of gray levels to pixels in the spatially transformed image

7. What is meant by Noise probability density function?

The spatial noise descriptor is the statistical behavior of gray level values in the noise component of the model.

8. Why the restoration is called as unconstrained restoration?

In the absence of any knowledge about the noise _n', a meaningful criterion function is to seek an f^ such that H f^ approximates of in a least square sense by assuming the noise term is as small as possible.

Where H = system operator.

f^ = estimated input image.

g = degraded image.

9. Which is the most frequent method to overcome the difficulty to formulate the Spatial relocation of pixels?

The point is the most frequent method, which are subsets of pixels whose location in the input (distorted) and output (corrected) imaged is known precisely.

10. What are the three methods of estimating the degradation function?

1. Observation
2. Experimentation
3. Mathematical modeling.

16 MARKS QUESTIONS

1. Explain the algebra approach in image restoration.
(OR)

2. What is the use of wiener filter in image restoration? Explain.

3. What is meant by Inverse filtering? Explain.
(OR)

4. Explain singular value decomposition and specify its properties.

5. Explain image degradation model /restoration process in detail.

(OR)

6. What are the two approaches for blind image restoration? Explain in detail.

UNIT IV

TWO MARKS QUESTIONS

1. What is segmentation?

Segmentation subdivides on image in to its constitute regions or objects. The level to which the subdivides is carried depends on the problem being solved .That is segmentation should when the objects of interest in application have been isolated.

2. Write the applications of segmentation

. * Detection of isolated points. * Detection of lines and edges in an image.

3. What are the three types of discontinuity in digital image?

Points, lines and edges.

4.How the derivatives are obtained in edge detection during formulation?

The first derivative at any point in an image is obtained by using the magnitude of the gradient at that point. Similarly the second derivatives are obtained by using the laplacian.

5.Write about linking edge points.

The approach for linking edge points is to analyze the characteristics of pixels in a small neighborhood (3x3 or 5x5) about every point (x,y)in an image that has undergone edge detection. All points that are similar are linked, forming a boundary of pixels that share some common properties.

6.What are the two properties used for establishing similarity of edge pixels?

(1) The strength of the response of the gradient operator used to produce the edge pixel.

(2) The direction of the gradient.

7. What is edge?

An edge is a set of connected pixels that lie on the boundary between two regions

edges are more closely modeled as having a ramplike profile. The slope of the ramp is inversely proportional to the degree of blurring in the edge.

8. Give the properties of the second derivative around an edge?

* The sign of the second derivative can be used to determine whether an edge pixel lies on the dark or light side of an edge.

* It produces two values for every edge in an image.

* An imaginary straightline joining the extreme positive and negative values of the second derivative would cross zero near the midpoint of the edge.

9. Define region growing?

Region growing is a procedure that groups pixels or subregions in to layer regions based on predefined criteria. The basic approach is to start with a set of seed points and from there grow regions by appending to each seed these neighbouring pixels that have properties similar to the seed.

10. Define chain codes?

Chain codes are used to represent a boundary by a connected sequence of straight line segment of specified length and direction. Typically this representation is based on 4 or 8 connectivity of the segments . The direction of each segment is coded by using a numbering scheme.

EXPECTED 16 MARKS QUESTIONS

1. What is image segmentation. Explain in detail
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(OR)

2. Explain Edge Detection in details?

3. Define Thresholding and explain the various methods of thresholding in detail?

(OR)

4. Discuss about region based image segmentation techniques. Compare threshold region based techniques.

5. Define and explain the various representation approaches?

(OR)

6. Explain Boundary descriptors.

7. Explain regional descriptors

(OR)

8. Explain the two techniques of region representation
.

9. Explain the segmentation techniques that are based on finding the regions directly

(OR)

10. How is line detected? Explain through the operators

UNIT V

TWO MARKS QUESTIONS

1. What is image compression?

Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image. The basis of reduction process is removal of redundant data.

2. What is Data Compression?

Data compression requires the identification and extraction of source redundancy. In other words, data compression seeks to reduce the number of bits used to store or transmit information.

3. What are two main types of Data compression?

Lossless compression can recover the exact original data after compression. It is used mainly for compressing database records, spreadsheets or word processing files, where exact replication of the original is essential.

Lossy compression will result in a certain loss of accuracy in exchange for a substantial increase in compression. Lossy compression is more effective when used to compress graphic images and digitised voice where losses outside visual or aural perception can be tolerated.

4.What is the need for Compression?

In terms of storage, the capacity of a storage device can be effectively increased with methods that compress a body of data on its way to a storage device and decompresses it when it is retrieved. In terms of communications, the bandwidth of a digital communication link can be effectively increased by compressing data at the sending end and decompressing data at the receiving end. At any given time, the ability of the Internet to transfer data is fixed. Thus, if data can effectively be compressed wherever possible, significant improvements of data throughput can be achieved. Many files can be combined into one compressed document making sending easier.

5. What are different Compression Methods?

Run Length Encoding (RLE) Arithmetic coding Huffman coding and Transform coding

6. Define is coding redundancy?

If the gray level of an image is coded in a way that uses more code words than necessary to represent each gray level, then the resulting image is said to contain coding redundancy.

7. Define interpixel redundancy?

The value of any given pixel can be predicted from the values of its neighbors. The information carried by is small. Therefore the visual contribution of a single pixel to an image is redundant. Otherwise called as spatial redundant geometric redundant or interpixel redundant. Eg: Run length coding

8. What is run length coding?

Run-length Encoding, or RLE is a technique used to reduce the size of a repeating string of characters. This repeating string is called a run; typically RLE encodes a run of symbols into two bytes, a count and a symbol. RLE can compress any type of data regardless of its information content, but the content of data to be compressed affects the compression ratio. Compression is normally measured with the compression ratio:

9. Define compression ratio.

Compression Ratio = original size / compressed size: 1

10.Define psycho visual redundancy?

In normal visual processing certain information has less importance than other information. So this information is said to be psycho visual redundant.

EXPECTED 16 MARKS QUESTIONS

1. What is data redundancy? Explain three basic data redundancy?

(OR)

2. What is image compression? Explain any four variable length coding compression schemes.

3. Explain about Image compression model?

(OR)

4. Explain about Error free Compression?

5. Explain about Lossy compression?

(OR)

6. Explain the schematics of image compression standard JPEG.

7. Explain how compression is achieved in transform coding and explain about DCT

(OR)

8. Explain arithmetic coding

9. Explain about Image compression standards?

(OR)

10. Discuss about MPEG standard and compare with JPEG