NGM COLLEGE
PG DEPARTMENT OF COMPUTER SCIENCE

17PCS312-DIGITAL IMAGE PROCESSING

UNIT-I

1.A continuous image is digitized at _____ points.
a) random
b) vertex
c) contour
d) sampling
Answer: d

2.The transition between continuous values of the image function and its digital equivalent is called _____
a) Quantization
b) Sampling
c) Rasterisation
d) None of the Mentioned
Answer: a.

3.Images quantized with insufficient brightness levels will lead to the occurrence of _____
a) Pixilation
b) Blurring
c) False Contours
d) None of the Mentioned
Answer: c

4.The smallest discernible change in intensity level is called _____
a) Intensity Resolution
b) Contour
c) Saturation
d) Contrast
Answer: a

5.What is the tool used in tasks such as zooming, shrinking, rotating, etc.?
a) Sampling
b) Interpolation

c) Filters
d) None of the Mentioned
Answer: b

6.The type of Interpolation where for each new location the intensity of the immediate pixel is assigned is _____
a) bicubic interpolation
b) cubic interpolation
c) bilinear interpolation
d) nearest neighbour interpolation
Answer: d.

7.The type of Interpolation where the intensity of the FOUR neighbouring pixels is used to obtain intensity a new location is called _____
a) cubic interpolation
b) nearest neighbour interpolation
c) bilinear interpolation
d) bicubic interpolation
Answer:b

8.Dynamic range of imaging system is a ratio where the upper limit is determined by
a) Saturation
b) Noise
c) Brightness
d) Contrast
Answer: a

9.For Dynamic range ratio the lower limit is determined by
a) Saturation
b) Brightness
c) Noise
d) Contrast
Answer: c

10. Quantitatively, spatial resolution cannot be represented in which of the following ways
a) line pairs
b) pixels
c) dots
d) none of the Mentioned

Answer: d

UNIT-II

11.The most familiar single sensor used for Image Acquisition is
a) Microdensitometer
b) Photodiode
c) CMOS
d) None of the Mentioned
Answer: b.

12.A geometry consisting of in-line arrangement of sensors for image acquisition
a) A photodiode
b) Sensor strips
c) Sensor arrays
d) CMOS
Answer: b

13.CAT in imaging stands for
a) Computer Aided Telegraphy
b) Computer Aided Tomography
c) Computerised Axial Telegraphy
d) Computerised Axial Tomography

Answer: d

14. The section of the real plane spanned by the coordinates of an image is called the _____
a) Spacial Domain
b) Coordinate Axes
c) Plane of Symmetry
d) None of the Mentioned
Answer: a.

15. The difference is intensity between the highest and the lowest intensity levels in an image is _____

a) Noise
b) Saturation
c) Contrast
d) Brightness

Answer: c

16._____ is the effect caused by the use of an insufficient number of intensity levels in smooth areas of a digital image.
a) Gaussian smooth
b) Contouring
c) False Contouring
d) Interpolation
Answer: c

17.The process of using known data to estimate values at unknown locations is called
a) Acquisition
b) Interpolation
c) Pixelation
d) None of the Mentioned

Answer: b

18. Which of the following is NOT an application of Image Multiplication?
a) Shading Correction
b) Masking
c) Pixelation
d) Region of Interest operations
Answer: c

19. The procedure done on a digital image to alter the values of its individual pixels is
a) Neighbourhood Operations
b) Image Registration
c) Geometric Spacial Transformation
d) Single Pixel Operation

Answer: d

20.In Geometric Spacial Transformation, points whose locations are known precisely in input and reference images.
a) Tie points
b) Réseau points
c) Known points
d) Key-points

Answer: a

UNIT-III

21.Which of the following is the primary objective of sharpening of an image?
a) Blurring the image
b) Highlight fine details in the image
c) Increase the brightness of the image
d) Decrease the brightness of the image

Answer: b

22.In spatial domain, which of the following operation is done on the pixels in sharpening the image?
a) Integration
b) Average
c) Median
d) Differentiation

Answer: d

23.Which of the following is the valid response when we apply a first derivative?
a) Non-zero at flat segments
b) Zero at the onset of gray level step
c) Zero in flat segments

d) Zero along ramps

Answer: c

24.Which of the following make an image difficult to enhance?
a) Narrow range of intensity levels
b) Dynamic range of intensity levels
c) High noise
d) All of the mentioned

Answer: d

25.Which of the following is a second-order derivative operator?
a) Histogram
b) Laplacian
c) Gaussian
d) None of the mentioned
Answer: b

26.Dark characteristics in an image are better solved using _____
a) Laplacian Transform
b) Gaussian Transform
c) Histogram Specification
d) Power-law Transformation
Answer: d

27.The histogram of a digital image with gray levels in the range [0, L-1] is represented by a discrete function:
a) h(r_k)=n_k
b) h(r_k)=n/n_k
c) p(r_k)=n_k
d) h(r_k)=n_k/n
Answer: a

28.Histogram equalization or Histogram linearization is represented by of the following equation:

a) sk =∑k j =1 nj/n k=0,1,2,……,L-1
b) sk =∑k j =0 nj/n k=0,1,2,……,L-1
c) sk =∑k j =0 n/nj k=0,1,2,……,L-1
d) sk =∑k j =n nj/n k=0,1,2,……,L-1
Answer: b

29.In a dark image, the components of histogram are concentrated on which side of the grey scale?
a) High
b) Medium
c) Low
d) Evenly distributed
View Answer

Answer: c

30..The histogram of a digital image with gray levels in the range [0, L-1] is represented by a discrete function:
a) h(r_k)=n_k
b) h(r_k)=n/n_k
c) p(r_k)=n_k
d) h(r_k)=n_k/n

Ans:a

UNIT-IV

31..How is the expression represented for the normalized histogram?
a) p(r_k)=n_k
b) p(r_k)=n_k/n
c) p(r_k)=nn_k
d) p(r_k)=n/n_k

Ans:b

32.The inverse transformation from s back to r is denoted as:
a) $s=T^{-1}(r)$ for $0 \leq s \leq 1$
b) $r=T^{-1}(s)$ for $0 \leq r \leq 1$
c) $r=T^{-1}(s)$ for $0 \leq s \leq 1$
d) $r=T^{-1}(s)$ for $0 \geq s \geq 1$

Ans:c

33. What is the method that is used to generate a processed image that have a specified histogram?
a) Histogram linearization
b) Histogram equalization
c) Histogram matching
d) Histogram processing

Ans:c

34. In a dark image, the components of histogram are concentrated on which side of the grey scale?
a) High
b) Medium
c) Low
d) evenly distributed

Ans:c

35. What is the basis for numerous spatial domain processing techniques?
a) Transformations
b) Scaling
c) Histogram
d) None of the Mentioned

Ans:c

36. What is Histogram Equalization also called as?
a) Histogram Matching
b) Image Enhancement
c) Histogram linearisation
d) None of the Mentioned

Ans:c

37. What does SEM stands for?
a) Scanning Electronic Machine
b) Self Electronic Machine
c) Scanning Electron Microscope
d) Scanning Electric Machine

Ans:a

38.In uniform PDF, the expansion of PDF is _____
a) Portable Document Format
b) Post Derivation Function
c) Previously Derived Function
d) Probability Density Function

Ans:d

39. The filter that rejects (or passes) frequencies in predefined neighborhoods about a center frequency is called

a)Mean filter

b) band reject filter

c) band pass filter

d) Notch filter

ans:

40. The process of inserting visible and invisible data in to images is called

a) Digital Image mining

b) Digital image processing

c) Digital image watermarking

d) Image compression

UNIT-V

41. Which process expands the range of intensity levels in an image so that it spans the full intensity range of the display?
a) Shading correction
b) Contrast sketching

c) Gamma correction
d) None of the Mentioned
View Answer

Answer: b

42. Highlighting a specific range of intensities of an image is called _____
a) Intensity Matching
b) Intensity Highlighting
c) Intensity Slicing
d) None of the Mentioned
Answer: c

43. Highlighting the contribution made to total image by specific bits instead of highlighting intensity-level changes is called _____
a) Intensity Highlighting
b) Byte-Slicing
c) Bit-plane slicing
d) None of the Mentioned

Answer: c

44. Gaussian noise is referred to as

a) Red noise

b) Black noise

c) White noise

d) Normal noise

Answer:d

45. Filter that replaces pixel value with medians of intensity levels is

a) Arithmetic mean filter

b) Geometric mean filter

c) Median filter

d) Sequence mean filter

Answer:d

46. The most popular technique for removing coding redundancy

a) Huffman coding

b) Golomb coding

c) LZW coding

d) Arithmetic coding

answer:a

47. A gradient operator for edge detection is

a) Roberts

b) Second order derivative

c) Zero crossing operators

d) None

Answer:d

48. Compressed image can be recovered back by

a) Image enhancement

b) Image decompression

c) Image contrast

d) Image equalization

answers:b

49. Information is the

a) Data

b) Meaningful data

c) Raw data

d) Both A and B

Answer:b

50. Digital video is sequence of

a) Pixels

b) Matrix

c) Frames

d) Coordinates

Answer:c

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Unit 1

1. Define Image

An image may be defined as two dimensional light intensity function f(x, y) where x andy denote spatial co-ordinate and the amplitude or value of f at any point (x, y) is calledintensity or grayscale or brightness of the image at that point.

2. Define Brightness

Brightness of an object is the perceived luminance of the surround. Two objectswith different surroundings would have identical luminance but different brightness.

3. What do you meant by Gray level?

Gray level refers to a scalar measure of intensity that ranges from black to graysand finally to white.

4. What do you meant by Color model?

A Color model is a specification of 3D-coordinates system and a subspace withinthat system where each color is represented by a single point.

5. List the hardware oriented color models

1. RGB model 2. CMY model 3. YIQ model 4. HSI model

6. What is Hue and saturation?

Hue is a color attribute that describes a pure color where saturation gives a measure of the degree to which a pure color is diluted by white light.

7. Define Resolutions

Resolution is defined as the smallest number of discernible detail in an image.Spatial resolution is the smallest discernible detail in an image and gray level resolutionrefers to the smallest discernible change is gray level.

8. What is meant by pixel?

A digital image is composed of a finite number of elements each of which has a particular location or value. These elements are referred to as pixels or image elements or pictureelements or pels elements.

9. Define Digital image

When x, y and the amplitude values of f all are finite discrete quantities, we callthe image digital image.

10. What are the types of light receptors?

The two types of light receptors are

•Cones and

•Rods

UNIT II

1 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.

12 .List the 2 categories of image enhancement.
•Spatial domain refers to image plane itself & approaches in this category are based on direct manipulation of picture image.
•Frequency domain methods based on modifying the image by fourier transform.

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

14.What is meant by masking?
•Mask is the small 2-D array in which the values of mask co-efficient determinesthe nature of process.
•The enhancement technique based on this type of approach is referred to as mask processing.

15.Define histogram.
The histogram of a digital image with gray levels in the range [0, L-1] is adiscrete function h(rk)=nk.rk-kth gray levelnk-number of pixels in the image having gray level rk.
16. What do you mean by Point processing?
Image enhancement at any Point in an image depends only on the gray level atthat point is often referred to as Point processing.

17. Define spatial filtering

Spatial filtering is the process of moving the filter mask from point to point in animage. For linear spatial filter, the response is given by a sum of products of the filter coefficients, and the corresponding image pixels in the area spanned by the filter mask.

18. What is a Median filter?

The median filter replaces the value of a pixel by the median of the gray levels inthe neighborhood of that pixel.

19. What is maximum filter and minimum filter?

The 100^{th} percentile is maximum filter is used in finding brightest points in animage. The 0^{th} percentile filter is minimum filter used for finding darkest points in an image.

20. Write the application of sharpening filters

1. Electronic printing and medical imaging to industrial application 2. Autonomous target detection in smart weapons.

UNIT III

21. Name the different types of derivative filters

1. Perwitt operators2. Roberts cross gradient operators3. Sobel operators

22. What is meant by Image Restoration?

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

23. What are the two properties in Linear Operator?

•Additivity
•Homogenity

24. How a degradation process is modeled?

A system operator H, which together with an additive white noise term $\eta(x,y)$ aoperates on an input image f(x,y) to produce a degraded image g(x,y).

25. What is the concept algebraic approach?

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

26. What are the two methods of algebraic approach?

•Unconstrained restoration approach
•Constrained restoration approach

27. Define Gray-level interpolation

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

28. What is meant by Noise probability density function?
The spatial noise descriptor is the statistical behavior of gray level values in thenoise component of the model.

28. Which is the most frequent method to overcome the difficulty to formulate thespatial relocation of pixels?
The point is the most frequent method, which are subsets of pixels whose locationin the input (distorted) and output (corrected) imaged is known precisely.

29. What are the three methods of estimating the degradation function?
1. Observation b. Experimentation 3. Mathematical modeling.

30. What are the types of noise models?
•Guassian noise
•Rayleigh noise
•Erlang noise
•Exponential noise
•Uniform noise
•Impulse noise

UNIT IV

31.What is meant by least mean square filter?
The limitation of inverse and pseudo inverse filter is very sensitive noise. The wiener filtering is a method of restoring images in the presence of blurr as well as noise.

32. Give the difference between Enhancement and Restoration
•Enhancement technique is based primarily on the pleasing aspects it might present to the viewer. For example: Contrast Stretching, Where as Removal of image blur by applying a deblurrings function is considered a restoration

33. 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.

34. Write the applications of segmentation.
• Detection of isolated points.
• Detection of lines and edges in an image.

35. What are the three types of discontinuity in digital image?
Points, lines and edges.

36. 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.

37. 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.

38. 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.

39. What is edge?
An edge isa 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.

40. 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.

UNIT V

41. What is global, Local and dynamic or adaptive threshold?
When Threshold T depends only on f(x,y) then the threshold is called global . If T depends both on f(x,y) and p(x,y) is called local. If T depends on the spatial coordinates x and y the threshold is called dynamic or adaptive where f(x,y) is the original image.

42. 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.

43. Specify the steps involved in splitting and merging?
Split into 4 disjoint quadrants any region Ri for which P(Ri)=FALSE.
Merge any adjacent regions Rj and Rk for which P(RjURk)=TRUE.
Stop when no further merging or splitting is positive.

44. 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.

45. 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.

46. 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.

47. What are different Compression Methods?
Run Length Encoding (RLE)
Arithmetic coding
Huffman coding and
Transform coding

48. 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.

49. 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

50. 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.

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17PCS312-DIGITAL IMAGE PROCESSING

K3 level questions

UNIT-I

1. Explain with neat diagram,the elements of visual perception.
2. Explain any four basic relationships between pixels.
3. Explain Brightness adaptation and Discrimination
4. Explain sampling and quantization:
5. Explain color image fundamentals.
6. Why does the noise always considered to be additive in images?
7. Describe the fundamental steps in image processing?
8. Explain the basic Elements of digital image processing:
9. Explain the Structure of the Human eye
10. Write an algorithm for obtaining the average of four images of same size .

UNIT-II

11. Explain homomorphic filtering.
12. How image subtraction and image averaging are is used to enhance the image?
13. Explain the various sharpening filters used in spatial domain.
14. Explain the spatial domain methods for image enhancement.
15. How is a monochrome image enhanced by histogram equalization?
16. How is an image identified as an over segmented?
17. What is the principle of region growing based image segmentation
18. Explain the RGB model
19. Describe the basic relationship between the pixels2-D Mathematical preliminaries
20. Write short notes on Discrete Cosine Transform (DCT)

UNIT-III

21. Describe Fast Fourier Transform
22. Explain the Properties of 2D discrete Fourier Transform.
23. Explain the concept of Laplacian filter
24. Discuss different mean filters
25. Draw the degradation model and explain.

26. Write short notes on Median Filters
27. Write short notes on Wiener Filtering.
28. Explain Histogram processing
29. Explain Spatial Filtering

30. Explain the Geometric Transformations used in image restoration

UNIT-IV

31. .Explain the different Noise Distribution in detail
32. Write short notes on image segmentation
33. Write short notes on edge detection
34. Write short notes on edge detection
35. Write short notes on the applications of artificial neural networks in image processing
36. Discuss region oriented segmentation in detail.
37. Define Compression and explain data Redundancy in image compression
38. Explain Huffman coding with an example
39. Define Compression and Explain the general compression system model Compression
40. Discuss MPEG compression standard

UNIT-V

41. Explain Arithmetic coding with an example Algorithm Implementation
42. Explain about JPEG compression scheme in detail.
43. Explain the MPEG encoder.
44. Explain the methods of constructing the masking function based on maximum variance and maximum magnitude. \
45. Explain the image compression standards.
46. Explain the boundary descriptors in image representation.
47. Explain the regional descriptors in image representation.
48. Explain segmentation by morphological watersheds
49. What are the operations performed by error free compression?
50. Explain the block diagram of the lossy predictive coding with delta modulation technique

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17PCS312-DIGITAL IMAGE PROCESSING

K4 level questions

UNIT- 1BASICS OF IMAGE PROCESSING

1. What are the elements of image processing system? Describe its working.
2. Write the categories of digital storage for image processing applications.
3. Explain with neat diagram, the elements of visual perception.
4. Explain any four basic relationships between pixels.
5. Color Image Fundamentals- RGB, HSI models

UNIT –II IMAGE ENHANCEMENT

6. List the types of image enhancement.
7. Write the objectives of image enhancement technique. Noise Distributions
8. Why does the noise always considered to be additive in images?
9. List the different types of derivative filters.
10. State the principle of directional smoothing.

UNIT –IIIIMAGE SEGMENTATION

11. What is edge detection? Describe the types of edge detection operations.

12. Explain theWiener filtering approach for image restoration.

13. What is gray level interpolation? Explain the schemes involved in it

14. What is rubber sheet transformation? Explain the basic operations involved in it.

15. Explain the blind image restoration

UNIT –IVIMAGE COMPRESSION

16. Explain the image compression model with a neat diagram.
17. Explain the need for image compression. How run length encoding approach is used for compression?
18. Differentiate lossless compression from lossy compression and explain transform coding system.
19. Explain in detail, the Huffman coding procedure with an example.
20. Explain the wavelet coding of images.

UNIT V-IMAGE RESTORATION

21. What is blind image restoration? Removal of blur caused by linear motion, Wiener filtering
22. How is edge detection used for detecting discontinuities in a digital image?
23. What are the three types of discontinuity in digital image?
24. How is an image identified as an over segmented?
25. What is the principle of region growing based image segmentation?

K5- level questions

UNIT- 1 BASICS OF IMAGE PROCESSING

1. Explain the principle of sampling and quantization. Discuss the effect of increasing the a) Sampling frequency b) Quantization levels on image
2. Explain the computation of DFT for a given 2D image.
3. Explain the different transforms in DIP and explain any one in detail
4. What are the types of light receptors?
5. How cones and rods are distributed in retina?

UNIT –II IMAGE ENHANCEMENT

6. Compare spatial and frequency domain methods.
7. What are the effects of applying Butterworth low pass filter to the noisy image?
8. Define–Contrast Stretching 7. What is gray level slicing?
9. How is edge detection performed? Write a suitable algorithm and explain the edge point linking.
10. Explain the various sharpening filters used in spatial domain.

UNIT –III IMAGE SEGMENTATION

11. How is edge detection performed?
12. Write a suitable algorithm and explain the edge point linking.
13. What is edge detection? Describe the types of edge detection operations.
14. What is geometric transformation? Elements of visual perception, brightness, contrast, hue, saturation, mach band effect
15. Explain the following a) Inverse filtering b) Least square error filtering

UNIT –IV IMAGE COMPRESSION

16. Explain in detail, the method of zonal and threshold coding.

17. Explain the following lossless compression coding. i. LZW coding ii. Predictive coding
18.How are region growing, region splitting and merging approaches used for image segmentation
19. What are the types of decoder?
20 Explain the lossy compression wavelet coding

UNIT V-IMAGE RESTORATION

21. What is image restoration? Explain the degradation model for continuous function.
22. Explain the constrained least square restoration
23. Explain the digital image restoration system and the image observation models. 24.
24. Explain the Wiener filtering approach for image restoration.
25 What is gray level interpolation? Explain the schemes involved in it.