UNIT III IMAGE RESTORATION

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?
Additivity∝
_ Homogenity

3. Explain additivity property in Linear Operator?
H[f1(x,y)+f2(x,y)]=H[f1(x,y)]+H[f2(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. How a degradation process is modeled?
A system operator H, which together with an additive white noise term _(x,y) a operates on an input image f(x,y) to produce a degraded image g(x,y).

5. Explain homogenity property in Linear Operator?
H[k1f1(x,y)]=k1 H[f1(x,y)]
The homogeneity property says that,the response to a constant multiple of any input is equal to the response to that input multiplied by the same constant.

6. Give the relation for degradation model for continuous function?
g(x,y) =-____f(_,_)§(x-_,y-_).d_d_+_(x,y)

7. What is fredholm integral of first kind?
g(x,y) = __f(_,_)h(x,_,y,_)d_ d_
which is called the superposition or convolution or fredholm integral of first kind. It states that if the response of H to an impulse is known, the response to any input f(_,_) can be calculated by means of fredholm integral.

8. Define circulant matrix?
A square matrix, in which each row is a circular shift of the preceding row and the first row is a circular shift of the last row, is called circulant matrix.
he(o) he(M-1) he(M-2)…… he(1)
he(1) he(0) he(M-1)……. he(2)
He = ..
he(M-1) he(M-2) he(M-3)……. he(0)
g(x,y)
_(x,y)

H
f(x,y)

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

10. What are the two methods of algebraic approach?
o Unconstraint restoration approach
o Constraint restoration approach

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

12. 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.

13. 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.

14. 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.

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

16. What are the types of noise models?
Guassian noise∝
Rayleigh noise∝
Erlang noise∝
Exponential noise∝

Uniform noise∝
_ Impulse noise

17. Give the relation for guassian noise?
Guassian noise:
The PDF guassian random variable Z is given by
P(Z)=e-(Z-μ)2/2_2/_2__
Z->Gray level value
_->standard deviation
_2->varianze of Z
μ->mean of the graylevel value Z

18. Give the relation for rayleigh noise?
Rayleigh noise:
The PDF is
P(Z)= 2(z-a)e-(z—a)2/b/b for Z>=a
0 for Z=0
0 for Z<0 mean μ=b/a standard deviation _2=b/a2

20. Give the relation for Exponential noise?
Exponential noise The PDF is P(Z)= ae-az Z>=0
0 Z<0 mean μ=1/a standard deviation _2=1/a2

21. Give the relation for Uniform noise?
Uniform noise: The PDF is P(Z)=1/(b-a) if a<=Z<=b 0 otherwise mean μ=a+b/2 standard deviation _2=(b-a)2/12

22. Give the relation for Impulse noise? Impulse noise: The PDF is P(Z) =Pa for z=a Pb for z=b 0 Otherwise

23. What is inverse filtering?
The simplest approach to restoration is direct inverse filtering, an estimate F^(u,v) of the transform of the original image simply by dividing the transform of the degraded image G^(u,v) by the degradation function. F^ (u,v) = G^(u,v)/H(u,v)

24. What is pseudo inverse filter?
It is the stabilized version of the inverse filter.For a linear shift invariant system with frequency response H(u,v) the pseudo inverse filter is defined as H-(u,v)=1/(H(u,v) H=/0 0 H=0

25. 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.

26. Give the equation for singular value decomposition of an image?

U= m=1_r___m _m T This equation is called as singular value decomposition of an image.

27. Write the properties of Singular value Decomposition(SVD)?
The SVD transform is useful in the design of filters finding least square,minimum solution of linear equation and finding rank of large matrices.∝ The SVD transform gives best energy packing efficiency for any given image. ∝ The SVD transform varies drastically from image to image. ∝

28. What is meant by blind image restoration?

An information about the degradation must be extracted from the observed image either explicitly or implicitly.This task is called as blind image restoration.

29. What are the two approaches for blind image restoration?
Direct measurement _ Indirect estimation∝

30. What is meant by Direct measurement?
In direct measurement the blur impulse response and noise levels are first estimated from an observed image where this parameter are utilized in the restoration.

31. What is blur impulse response and noise levels?
Blur impulse response: This parameter is measured by isolating an image of a suspected object within a picture. Noise levels: The noise of an observed image can be estimated by measuring the image covariance over a region of constant background luminence.

32. What is meant by indirect estimation?
Indirect estimation method employ temporal or spatial averaging to either obtain a restoration or to obtain key elements of an image restoration algorithm.

33. 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 technique.

UNIT-III

Image Restoration and Segmentation

1. What is the use of Wiener filter in Image restoration? Explain
   : Least mean Square (LMS) filtering.

2. What is meant by Inverse filtering?
   : Inverse "Band width diagram
   : Inverse filtering Transfer function
   : Advantages

3. Explain the Geometric Transformation
   : Spatial Transformation
   : Gray-level Team Interpolation

4. Edge detection?
   : Edge models
   : use of the Gradient Operators
   : use of the Laplacian
   : Edge link via Hough Transform.

5. Segmentation By morphological watersheds.

: Basic concepts

: methods of segmentation

: Dam construction

: watershed segmentation Algorithm

: Applications of watershed segmentation

: markers

6. Region Representation Tech

: Region Based segmentation

: Region Growing

: Region Splitting and merging.

7. Image segmentation process.

: Introduction - image segmentation

: Detection of Discontinuities

: point detection.

: line detection.