Image Sampling and Quantization

1. A continuous image is digitised at_____points.
a) random
b) vertex
c) contour
d) sampling
View Answer

Answer: d
Explanation: The sampling points are ordered in the plane and their relation is called a Grid.

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

Answer: a
Explanation: The transition between continuous values of the image function and its digital equivalent is called Quantisation.

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

Answer: c
Explanation: This effect arises when the number brightness levels is lower that which the human eye can distinguish.

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

Answer: a
Explanation: Number of bits used to quantise intensity of an image is called intensity resolution.

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
View Answer

Answer: b
Explanation: Interpolation is the basic tool used for zooming, shrinking, rotating, etc.

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
View Answer

Answer: d
Explanation: Its called as Nearest Neighbour Interpolation since for each new location the intensity of the next neighbouring pixel is assigned.

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
View Answer

Answer: b
Explanation: Bilinear interpolation is where the FOUR neighbouring pixels is used to estimate intensity for a new location.

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

Answer: a
Explanation: Saturation is taken as the Numerator.

9. For Dynamic range ratio the lower limit is determined by
a) Saturation

b) Brightness
c) Noise
d) Contrast
View Answer

Answer: c
Explanation: Noise is taken as the Denominator.

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
View Answer

Answer: d
Explanation: All the options can be used to represent spatial resolution.

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

Answer: b
Explanation: Photodiode is the most commonly used single sensor made up of silicon materials.

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

Answer: b
Explanation: Sensor strips are very common next to single sensor and use in-line arrangement.

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

Answer: d
Explanation: Industrial Computerised Axial Tomography is based on image acquisition using sensor strips.

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
View Answer

Answer: a
Explanation: The section of the real plane spanned by the coordinates of an image is called the Spacial Domain, with the x and y coordinates referred to as Spacial coordinates.

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
View Answer

Answer: c
Explanation: Contrast is the measure of the difference is intensity between the highest and the lowest intensity levels in an image.

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
View Answer

Answer: c
Explanation: It is called so because the ridges resemble the contours of a map.

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
View Answer

Answer: b
Explanation: Interpolation is the process used to estimate unknown locations. It is applied in all image resampling methods.

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

Answer: c
Explanation: Because Pixelation deals with enlargement of pixels.

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
View Answer

Answer: d
Explanation: It is expressed as a transformation function T, of the form s=T(z) , where z is the intensity.

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
View Answer

Answer: a
Explanation: Tie points, also called Control points are points whose locations are known precisely in input and reference images.

21. Of the following,_____has the maximum frequency.
a) UV Rays
b) Gamma Rays
c) Microwaves
d) Radio Waves
View Answer

Answer: b
Explanation: Gamma Rays come first in the electromagnetic spectrum sorted in the decreasing order of frequency.

22. In the Visible spectrum the_____colour has the maximum wavelength.
a) Violet
b) Blue
c) Red
d) Yellow
View Answer

Answer: c
Explanation: Red is towards the right in the electromagnetic spectrum sorted in the increasing order of wavelength.

23. Wavelength and frequency are related as : (c = speed of light)
a) c = wavelength / frequency
b) frequency = wavelength / c
c) wavelength = c * frequency
d) c = wavelength * frequency
View Answer

Answer: d
Explanation: It is usually written as wavelength = c / frequency.

24. Electromagnetic waves can be visualised as a
a) sine wave
b) cosine wave
c) tangential wave
d) None of the mentioned
View Answer

Answer: a
Explanation: Electromagnetic waves are visualised as sinusoidal wave.

25. How is radiance measured?
a) lumens
b) watts
c) armstrong
d) hertz
View Answer

Answer: b
Explanation: Radiance is the total amount of energy that flows from the light source and is measured in Watts.

26. Which of the following is used for chest and dental scans?
a) Hard X-Rays
b) Soft X-Rays
c) Radio waves
d) Infrared Rays
View Answer

Answer: b
Explanation: Soft X-Rays (low energy) are used for dental and chest scans.

27. Which of the following is impractical to measure?
a) Frequency
b) Radiance
c) Luminance
d) Brightness
View Answer

Answer: d
Explanation: Brightness is subjective descriptor of light perception that is impossible to measure.

28. Massless particle containing a certain amount of energy is called
a) Photon
b) Shell
c) Electron
d) None of the mentioned
View Answer

Answer: a
Explanation: Each bundle of massless energy is called a Photon.

29. What do you mean by achromatic light?
a) Chromatic light
b) Monochromatic light
c) Infrared light
d) Invisible light
View Answer

Answer: b
Explanation: Achromatic light is also called monochromatic light.(Light void of color)

30. Which of the following embodies the achromatic notion of intensity?
a) Luminance
b) Brightness
c) Frequency
d) Radiance
View Answer

Answer: b
Explanation: Brightness embodies the achromatic notion of intensity and is a key factor in describing color sensation.

31. How is array operation carried out involving one or more images?
a) array by array
b) pixel by pixel
c) column by column
d) row by row
View Answer

Answer: b
Explanation: Any array operation is carried out on a pixel by pixel basis.

32. The property indicating that the output of a linear operation due to the sum of two inputs is same as performing the operation on the inputs individually and then summing the results is called _____
a) additivity
b) heterogeneity
c) homogeneity
d) None of the Mentioned
View Answer

Answer: a
Explanation: This property is called additivity .

33. The property indicating that the output of a linear operation to a constant times as input is the same as the output of operation due to original input multiplied by that constant is called _____
a) additivity
b) heterogeneity
c) homogeneity
d) None of the Mentioned
View Answer

Answer: c
Explanation: This property is called homogeneity .

34. Enhancement of differences between images is based on the principle of _____
a) Additivity
b) Homogeneity
c) Subtraction
d) None of the Mentioned
View Answer

Answer: c
Explanation: A frequent application of image subtraction is in the enhancement of differences between images .

35. A commercial use of Image Subtraction is _____
a) Mask mode radiography
b) MRI scan
c) CT scan
d) None of the Mentioned
View Answer

Answer: a
Explanation: Mask mode radiography is an important medical imaging area based on Image Subtraction.

36. Region of Interest (ROI) operations is commonly called as _____
a) Shading correction
b) Masking
c) Dilation
d) None of the Mentioned
View Answer

Answer: b
Explanation: A common use of image multiplication is Masking, also called ROI operation.

37. If every element of a set A is also an element of a set B, then A is said to be a_____of set B.
a) Disjoint set
b) Union
c) Subset
d) Complement set
View Answer

Answer: c
Explanation: A is called the subset of B.

38. Consider two regions A and B composed of foreground pixels. The_____of these two sets is the set of elements belonging to set A or set B or both.
a) OR
b) AND
c) NOT
d) XOR
View Answer

Answer: a
Explanation: This is called an OR operation.

39. Imaging systems having physical artefacts embedded in the imaging sensors produce a set of points called _____
a) Tie Points
b) Control Points
c) Reseau Marks
d) None of the Mentioned
View Answer

Answer: c
Explanation: These points are called “known” points or “Reseau marks”.

40. Image processing approaches operating directly on pixels of input image work directly in _____
a) Transform domain
b) Spatial domain
c) Inverse transformation
d) None of the Mentioned
View Answer

Answer: b
Explanation: Operations directly on pixels of input image work directly in Spatial Domain.

41. Noise reduction is obtained by blurring the image using smoothing filter.
a) True
b) False
View Answer

Answer: a
Explanation: Noise reduction is obtained by blurring the image using smoothing filter. Blurring is used in pre-processing steps, such as removal of small details from an image prior to object extraction and, bridging of small gaps in lines or curves.

42. What is the output of a smoothing, linear spatial filter?
a) Median of pixels
b) Maximum of pixels
c) Minimum of pixels
d) Average of pixels
View Answer

Answer: d
Explanation: The output or response of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighbourhood of the filter mask.

43. Smoothing linear filter is also known as median filter.
a) True

b) False
View Answer

Answer: b
Explanation: Since the smoothing spatial filter performs the average of the pixels, it is also called as averaging filter.

44. Which of the following in an image can be removed by using smoothing filter?
a) Smooth transitions of gray levels
b) Smooth transitions of brightness levels
c) Sharp transitions of gray levels
d) Sharp transitions of brightness levels
View Answer

Answer: c
Explanation: Smoothing filter replaces the value of every pixel in an image by the average value of the gray levels. So, this helps in removing the sharp transitions in the gray levels between the pixels. This is done because, random noise typically consists of sharp transitions in gray levels.

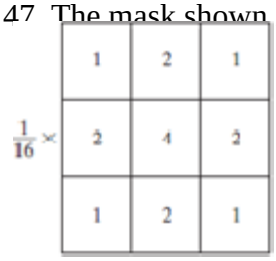
45. Which of the following is the disadvantage of using smoothing filter?
a) Blur edges
b) Blur inner pixels
c) Remove sharp transitions
d) Sharp edges
View Answer

Answer: a
Explanation: Edges, which almost always are desirable features of an image, also are characterized by sharp transitions in gray level. So, averaging filters have an undesirable side effect that they blur these edges.

46. Smoothing spatial filters doesn‟ t smooth the false contours.
a) True
b) False
View Answer

Answer: b
Explanation: One of the application of smoothing spatial filters is that, they help in smoothing the false contours that result from using an insufficient number of gray levels.

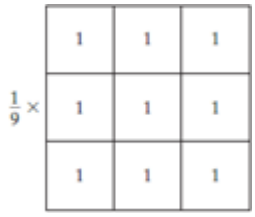
47. The mask shown in the figure below belongs to which type of filter?



a) Sharpening spatial filter
b) Median filter
c) Sharpening frequency filter
d) Smoothing spatial filter
View Answer

Answer: d
Explanation: This is a smoothing spatial filter. This mask yields a so called weighted average, which means that different pixels are multiplied with different coefficient values. This helps in giving much importance to the some pixels at the expense of others.

48. The mask shown in the figure below belongs to which type of filter?



a) Sharpening spatial filter
b) Median filter
c) Smoothing spatial filter
d) Sharpening frequency filter
View Answer

Answer: c
Explanation: The mask shown in the figure represents a 3×3 smoothing filter. Use of this filter yields the standard average of the pixels under the mask.

49. Box filter is a type of smoothing filter.
a) True
b) False
View Answer

Answer: a
Explanation: A spatial averaging filter or spatial smoothening filter in which all the coefficients are equal is also called as box filter.

50. If the size of the averaging filter used to smooth the original image to first image is 9, then what would be the size of the averaging filter used in smoothing the same original picture to

a) 3
b) 5
c) 9
d) 15
View Answer

Answer: d
Explanation: We know that, as the size of the filter used in smoothening the original image that is averaging filter increases then the blurring of the image. Since the second image is more blurred than the first image, the window size should be more than 9.

51. Which of the following comes under the application of image blurring?
a) Object detection
b) Gross representation
c) Object motion
d) Image segmentation
View Answer

Answer: b
Explanation: An important application of spatial averaging is to blur an image for the purpose of getting a gross representation of interested objects, such that the intensity of the small objects blends with the background and large objects become easy to detect.c

52. Which of the following filters response is based on ranking of pixels?
a) Nonlinear smoothing filters
b) Linear smoothing filters
c) Sharpening filters
d) Geometric mean filter
View Answer

Answer: a
Explanation: Order static filters are nonlinear smoothing spatial filters whose response is based on the ordering or ranking the pixels contained in the image area encompassed by the filter, and then replacing the value of the central pixel with the value determined by the ranking result.

53. Median filter belongs to which category of filters?
a) Linear spatial filter
b) Frequency domain filter
c) Order static filter
d) Sharpening filter
View Answer

Answer: c
Explanation: The median filter belongs to order static filters, which, as the name implies, replaces the value of the pixel by the median of the gray levels that are present in the neighbourhood of the pixels.

54. Median filters are effective in the presence of impulse noise.
a) True
b) False
View Answer

Answer: a
Explanation: Median filters are used to remove impulse noises, also called as salt-and-pepper noise because of its appearance as white and black dots in the image.

55. What is the maximum area of the cluster that can be eliminated by using an n×n median filter?
a) n^2
b) $n^2/2$
c) $2*n^2$
d) n
View Answer

Answer: b
Explanation: Isolated clusters of pixels that are light or dark with respect to their neighbours, and whose area is less than n2/2, i.e., half the area of the filter, can be eliminated by using an n×n median filter.

56. Which of the following expression is used to denote spatial domain process?
a) g(x,y)=T[f(x,y)]
b) f(x+y)=T[g(x+y)]
c) g(xy)=T[f(xy)]
d) g(x-y)=T[f(x-y)]
View Answer

Answer: a
Explanation: Spatial domain processes will be denoted by the expression g(x,y)=T[f(x,y)], where f(x,y) is the input image, g(x,y) is the processed image, and T is an operator on f, defined over

some neighborhood of (x, y). In addition, T can operate on a set of input images, such as performing the pixel-by-pixel sum of K images for noise reduction.

57. Which of the following shows three basic types of functions used frequently for image enhancement?
a) Linear, logarithmic and inverse law
b) Power law, logarithmic and inverse law
c) Linear, logarithmic and power law
d) Linear, exponential and inverse law
View Answer

Answer: b
Explanation: In introduction to gray-level transformations, which shows three basic types of functions used frequently for image enhancement: linear (negative and identity transformations), logarithmic (log and inverse-log transformations), and power-law (nth power and nth root transformations).The identity function is the trivial case in which output intensities are identical to input intensities. It is included in the graph only for completeness.

58. Which expression is obtained by performing the negative transformation on the negative of an image with gray levels in the range[0,L-1] ?
a) s=L+1-r
b) s=L+1+r
c) s=L-1-r
d) s=L-1+r
View Answer

Answer: c
Explanation: The negative of an image with gray levels in the range[0,L-1] is obtained by using the negative transformation, which is given by the expression: s=L-1-r.

59. What is the general form of representation of log transformation?
a) $s=c\log_{10}(1/r)$
b) $s=c\log_{10}(1+r)$
c) $s=c\log_{10}(1*r)$
d) $s=c\log_{10}(1-r)$
View Answer

Answer: b
Explanation: The general form of the log transformation: $s=c\log_{10}(1+r)$, where c is a constant, and it is assumed that $r \geq 0$.

60. What is the general form of representation of power transformation?
a) $s=cr^{\gamma}$
b) $c=sr^{\gamma}$
c) s=rc

d) $s=rc^{\gamma}$
View Answer

Answer: a
Explanation: Power-law transformations have the basic form: $s=cr^{\gamma}$ where c and g are positive constants. Sometimes $s=cr^{\gamma}$ is written as $s=c.(r+\varepsilon)^{\gamma}$ to account for an offset (that is, a measurable output when the input is zero).

61. What is the name of process used to correct the power-law response phenomena?
a) Beta correction
b) Alpha correction
c) Gamma correction
d) Pie correction
View Answer

Answer: c
Explanation: A variety of devices used for image capture, printing, and display respond according to a power law. By convention, the exponent in the power-law equation is referred to as gamma .The process used to correct these power-law response phenomena is called gamma correction.

62. Which of the following transformation function requires much information to be specified at the time of input?
a) Log transformation
b) Power transformation
c) Piece-wise transformation
d) Linear transformation
View Answer

Answer: c
Explanation: The practical implementation of some important transformations can be formulated only as piecewise functions. The principal disadvantage of piecewise functions is that their specification requires considerably more user input.

63. In contrast stretching, if $r_1=s_1$ and $r_2=s_2$ then which of the following is true?
a) The transformation is not a linear function that produces no changes in gray levels
b) The transformation is a linear function that produces no changes in gray levels
c) The transformation is a linear function that produces changes in gray levels
d) The transformation is not a linear function that produces changes in gray levels
View Answer

Answer: b
Explanation: The locations of points (r_1,s_1) and (r_2,s_2) control the shape of the transformation function. If $r_1=s_1$ and $r_2=s_2$ then the transformation is a linear function that produces no changes in gray levels.

64. In contrast stretching, if $r_1=r_2$, $s_1=0$ and $s_2=L-1$ then which of the following is true?
a) The transformation becomes a thresholding function that creates an octal image
b) The transformation becomes a override function that creates an octal image
c) The transformation becomes a thresholding function that creates a binary image
d) The transformation becomes a thresholding function that do not create an octal image
View Answer

Answer: c
Explanation: If $r_1=r_2$, $s_1=0$ and $s_2=L-1$,the transformation becomes a thresholding function that creates a binary image.

65. In contrast stretching, if $r_1 \leq r_2$ and $s_1 \leq s_2$ then which of the following is true?
a) The transformation function is double valued and exponentially increasing
b) The transformation function is double valued and monotonically increasing
c) The transformation function is single valued and exponentially increasing
d) The transformation function is single valued and monotonically increasing
View Answer

Answer: d
Explanation: The locations of points (r_1,s_1) and (r_2,s_2) control the shape of the transformation function. If $r_1 \leq r_2$ and $s_1 \leq s_2$ then the function is single valued and monotonically increasing.

66. In which type of slicing, highlighting a specific range of gray levels in an image often is desired?
a) Gray-level slicing
b) Bit-plane slicing
c) Contrast stretching
d) Byte-level slicing
View Answer

Answer: a
Explanation: Highlighting a specific range of gray levels in an image often is desired in gray-level slicing. Applications include enhancing features such as masses of water in satellite imagery and enhancing flaws in X-ray images.

67. Which of the following depicts the main functionality of the Bit-plane slicing?
a) Highlighting a specific range of gray levels in an image
b) Highlighting the contribution made to total image appearance by specific bits
c) Highlighting the contribution made to total image appearance by specific byte
d) Highlighting the contribution made to total image appearance by specific pixels
View Answer

Answer: b
Explanation: Instead of highlighting gray-level ranges, highlighting the contribution made to total image appearance by specific bits might be desired. Suppose , each pixel in an image is represented by 8 bits. Imagine that the image is composed of eight 1-bit planes, ranging from bit-

plane 0 for the least significant bit to bit-plane 7 for the most significant bit. In terms of 8-bit bytes, plane 0 contains all the lowest order bits in the bytes comprising the pixels in the image and plane 7 contains all the high-order bits.

68. 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
View Answer

Answer: b
Explanation: The sharpening of image helps in highlighting the fine details that are present in the image or to enhance the details that are blurred due to some reason like adding noise.

69. Image sharpening process is used in electronic printing.
a) True
b) False
View Answer

Answer: a
Explanation: The applications of image sharpening is present in various fields like electronic printing, autonomous guidance in military systems, medical imaging and industrial inspection.

70. 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
View Answer

Answer: d
Explanation: We know that, in blurring the image, we perform the average of pixels which can be considered as integration. As sharpening is the opposite process of blurring, logically we can tell that we perform differentiation on the pixels to sharpen the image.

71. Image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.
a) True
b) False
View Answer

Answer: a
Explanation: Fundamentally, the strength of the response of the derivative operative is

proportional to the degree of discontinuity in the image. So, we can state that image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.

72. In which of the following cases, we wouldn‟ t worry about the behaviour of sharpening filter?
a) Flat segments
b) Step discontinuities
c) Ramp discontinuities
d) Slow varying gray values
View Answer

Answer: d
Explanation: We are interested in the behaviour of derivatives used in sharpening in the constant gray level areas i.e., flat segments, and at the onset and end of discontinuities, i.e., step and ramp discontinuities.

73. 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
View Answer

Answer: c
Explanation: The derivations of digital functions are defined in terms of differences. The definition we use for first derivative should be zero in flat segments, nonzero at the onset of a gray level step or ramp and nonzero along the ramps.

74. Which of the following is not a valid response when we apply a second derivative?
a) Zero response at onset of gray level step
b) Nonzero response at onset of gray level step
c) Zero response at flat segments
d) Nonzero response along the ramps
View Answer

Answer: b
Explanation: The derivations of digital functions are defined in terms of differences. The definition we use for second derivative should be zero in flat segments, zero at the onset of a gray level step or ramp and nonzero along the ramps.

75. If f(x,y) is an image function of two variables, then the first order derivative of a one dimensional function, f(x) is:
a) f(x+1)-f(x)
b) f(x)-f(x+1)
c) f(x-1)-f(x+1)

d) f(x)+f(x-1)
View Answer

Answer: a
Explanation: The first order derivative of a single dimensional function f(x) is the difference between f(x) and f(x+1).
That is, $\partial f/\partial x = f(x+1)-f(x)$.

76. Isolated point is also called as noise point.
a) True
b) False
View Answer

Answer: a
Explanation: The point which has very high or very low gray level value compared to its neighbours, then that point is called as isolated point or noise point. The noise point of is of one pixel size.

77. What is the thickness of the edges produced by first order derivatives when compared to that of second order derivatives?
a) Finer
b) Equal
c) Thicker
d) Independent
View Answer

Answer: c
Explanation: We know that, the first order derivative is nonzero along the entire ramp while the second order is zero along the ramp. So, we can conclude that the first order derivatives produce thicker edges and the second order derivatives produce much finer edges.

78. First order derivative can enhance the fine detail in the image compared to that of second order derivative.
a) True
b) False
View Answer

Answer: b
Explanation: The response at and around the noise point is much stronger for the second order derivative than for the first order derivative. So, we can state that the second order derivative is better to enhance the fine details in the image including noise when compared to that of first order derivative.

79. Which of the following derivatives produce a double response at step changes in gray level?
a) First order derivative
b) Third order derivative

c) Second order derivative
d) First and second order derivatives
View Answer

Answer: c
Explanation: Second order derivatives produce a double line response for the step changes in the gray level. We also note of second-order derivatives that, for similar changes in gray-level values in an image, their response is stronger to a line than to a step, and to a point than to a line.

80. The objective of sharpening spatial filters is/are to _____
a) Highlight fine detail in an image
b) Enhance detail that has been blurred because of some error
c) Enhance detail that has been blurred because of some natural effect of some method of image acquisition
d) All of the mentioned
View Answer

Answer: d
Explanation: Highlighting the fine detail in an image or Enhancing detail that has been blurred because of some error or some natural effect of some method of image acquisition, is the principal objective of sharpening spatial filters.

81. Sharpening is analogous to which of the following operations?
a) To spatial integration
b) To spatial differentiation
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Smoothing is analogous to integration and so, sharpening to spatial differentiation.

82. Which of the following fact(s) is/are true about sharpening spatial filters using digital differentiation?
a) Sharpening spatial filter response is proportional to the discontinuity of the image at the point where the derivative operation is applied
b) Sharpening spatial filters enhances edges and discontinuities like noise
c) Sharpening spatial filters deemphasizes areas that have slowly varying gray-level values
d) All of the mentioned
View Answer

Answer: d
Explanation: Derivative operator‟ s response is proportional to the discontinuity of the image at the point where the derivative operation is applied.
Image differentiation enhances edges and discontinuities like noise and deemphasizes areas that

have slowly varying gray-level values.
Since a sharpening spatial filters are analogous to differentiation, so, all the above mentioned facts are true for sharpening spatial filters.

83. Which of the facts(s) is/are true for the first order derivative of a digital function?
a) Must be nonzero in the areas of constant grey values
b) Must be zero at the onset of a gray-level step or ramp discontinuities
c) Must be nonzero along the gray-level ramps
d) None of the mentioned
View Answer

Answer: c
Explanation: The first order derivative of a digital function is defined as:
Must be zero in the areas of constant grey values.
Must be nonzero at the onset of a gray-level step or ramp discontinuities.
Must be nonzero along the gray-level ramps.

84. Which of the facts(s) is/are true for the second order derivative of a digital function?
a) Must be zero in the flat areas
b) Must be nonzero at the onset and end of a gray-level step or ramp discontinuities
c) Must be zero along the ramps of constant slope
d) All of the mentioned
View Answer

Answer: c
Explanation: The second order derivative of a digital function is defined as:
Must be zero in the flat areas i.e. areas of constant grey values.
Must be nonzero at the onset of a gray-level step or ramp discontinuities.
Must be zero along the gray-level ramps of constant slope.

85. The derivative of digital function is defined in terms of difference. Then, which of the following defines the first order derivative $\partial f/\partial x=$_____of a one-dimensional function f(x)?
a) f(x+1)-f(x)
b) f(x+1)+ f(x-1)-2f(x)
c) All of the mentioned depending upon the time when partial derivative will be dealt along two spatial axes
d) None of the mentioned
View Answer

Answer: a
Explanation: The definition of a first order derivative of a one dimensional image f(x) is:
$\partial f/\partial x=$ f(x+1)-f(x), where the partial derivative is used to keep notation same even for f(x, y) when partial derivative will be dealt along two spatial axes.

86. The derivative of digital function is defined in terms of difference. Then, which of the following defines the second order derivative $\partial^2 f/\partial x^2 =$_____of a one-dimensional function f(x)?
a) f(x+1)-f(x)
b) f(x+1)+ f(x-1)-2f(x)
c) All of the mentioned depending upon the time when partial derivative will be dealt along two spatial axes
d) None of the mentioned
View Answer

Answer: b
Explanation: The definition of a second order derivative of a one dimensional image f(x) is: $(\partial^2 f)/\partial x^2$ =f(x+1)+ f(x-1)-2f(x), where the partial derivative is used to keep notation same even for f(x, y) when partial derivative will be dealt along two spatial axes.

87. What kind of relation can be obtained between first order derivative and second order derivative of an image having a on the basis of edge productions that shows a transition like a ramp of constant slope?
a) First order derivative produces thick edge while second order produces a very fine edge
b) Second order derivative produces thick edge while first order produces a very fine edge
c) Both first and second order produces thick edge
d) Both first and second order produces a very fine edge
View Answer

Answer: a
Explanation: the first order derivative remains nonzero along the entire ramp of constant slope, while the second order derivative remain nonzero only at onset and end of such ramps.
If an edge in an image shows transition like the ramp of constant slope, the first order and second order derivative values shows the production of thick and finer edge respectively.

88. What kind of relation can be obtained between first order derivative and second order derivative of an image on the response obtained by encountering an isolated noise point in the image?
a) First order derivative has a stronger response than a second order
b) Second order derivative has a stronger response than a first order
c) Both enhances the same and so the response is same for both first and second order derivative
d) None of the mentioned
View Answer

Answer: b
Explanation: This is because a second order derivative is more aggressive toward enhancing sharp changes than a first order.

89. What kind of relation can be obtained between the response of first order derivative and second order derivative of an image having a transition into gray-level step from zero?
a) First order derivative has a stronger response than a second order

b) Second order derivative has a stronger response than a first order
c) Both first and second order derivative has the same response
d) None of the mentioned
View Answer

Answer: c
Explanation: This is because a first order derivative has stronger response to a gray-level step than a second order, but, the response becomes same if transition into gray-level step is from zero.

90. If in an image there exist similar change in gray-level values in the image, which of the following shows a stronger response using second order derivative operator for sharpening?
a) A line
b) A step
c) A point
d) None of the mentioned
View Answer

Answer: c
Explanation: second order derivative shows a stronger response to a line than a step and to a point than a line, if there is similar changes in gray-level values in an image.

91. To convert a continuous sensed data into Digital form, which of the following is required?
a) Sampling
b) Quantization
c) Both Sampling and Quantization
d) Neither Sampling nor Quantization
View Answer

Answer: c
Explanation: The output of the most sensor is a continuous waveform and the amplitude and spatial behavior of such waveform are related to the physical phenomenon being sensed.

92. To convert a continuous image f(x, y) to digital form, we have to sample the function in _____
a) Coordinates
b) Amplitude`
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: An image may be continuous in the x- and y-coordinates or in amplitude, or in both.

93. For a continuous image f(x, y), how could be Sampling defined?
a) Digitizing the coordinate values
b) Digitizing the amplitude values
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: Sampling is the method of digitizing the coordinate values of the image.

94. For a continuous image f(x, y), Quantization is defined as
a) Digitizing the coordinate values
b) Digitizing the amplitude values
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Sampling is the method of digitizing the amplitude values of the image.

95. Validate the statement:
"For a given image in one-dimension given by function f(x, y), to sample the function we take equally spaced samples, superimposed on the function, along a horizontal line. However, the sample values still span (vertically) a continuous range of gray-level values. So, to convert the given function into a digital function, the gray-level values must be divided into various discrete levels."
a) True
b) False
View Answer

Answer: a
Explanation: Digital function requires both sampling and quantization of the one-dimensional image function.

96. How is sampling been done when an image is generated by a single sensing element combined with mechanical motion?
a) The number of sensors in the strip defines the sampling limitations in one direction and Mechanical motion in the other direction.
b) The number of sensors in the sensing array establishes the limits of sampling in both directions.
c) The number of mechanical increments when the sensor is activated to collect data.
d) None of the mentioned.
View Answer

Answer: c
Explanation: When an image is generated by a single sensing element along with mechanical

motion, the output data is quantized by dividing the gray-level scale into many discrete levels. However, sampling is done by selecting the number of individual mechanical increments recorded at which we activate the sensor to collect data.

97. How does sampling gets accomplished with a sensing strip being used for image acquisition?
a) The number of sensors in the strip establishes the sampling limitations in one image direction and Mechanical motion in the other direction
b) The number of sensors in the sensing array establishes the limits of sampling in both directions
c) The number of mechanical increments when the sensor is activated to collect data
d) None of the mentioned
View Answer

Answer: a
Explanation: When a sensing strip is used the number of sensors in the strip defines the sampling limitations in one direction and mechanical motion in the other direction.

98. How is sampling accomplished when a sensing array is used for image acquisition?
a) The number of sensors in the strip establishes the sampling limitations in one image direction and Mechanical motion in the other direction
b) The number of sensors in the sensing array defines the limits of sampling in both directions
c) The number of mechanical increments at which we activate the sensor to collect data
d) None of the mentioned
View Answer

Answer: b
Explanation: When we use sensing array for image acquisition, there is no motion and so, only the number of sensors in the array defines the limits of sampling in both directions and the output of the sensor is quantized by dividing the gray-level scale into many discrete levels.

99. The quality of a digital image is well determined by _____
a) The number of samples
b) The discrete gray levels
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: The quality of a digital image is determined mostly by the number of samples and discrete gray levels used in sampling and quantization.

100. Assume that an image f(x, y) is sampled so that the result has M rows and N columns. If the values of the coordinates at the origin are (x, y) = (0, 0), then the notation (0, 1) is used to signify :
a) Second sample along first row

b) First sample along second row
c) First sample along first row
d) Second sample along second row
View Answer

Answer: a
Explanation: The values of the coordinates at the origin are (x, y) = (0, 0). Then, the next coordinate values (second sample) along the first row of the image are represented as (x, y) = (0, 1).

101. The resulting image of sampling and quantization is considered a matrix of real numbers. By what name(s) the element of this matrix array is called _____
a) Image element or Picture element
b) Pixel or Pel
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: Sampling and Quantization of an image f(x, y) forms a matrix of real numbers and each element of this matrix array is commonly known as Image element or Picture element or Pixel or Pel.

102. Let Z be the set of real integers and R the set of real numbers. The sampling process may be viewed as partitioning the x-y plane into a grid, with the central coordinates of each grid being from the Cartesian product Z2, that is a set of all ordered pairs (zi, zj), with zi and zj being integers from Z. Then, f(x, y) is said a digital image if:
a) (x, y) are integers from Z2 and f is a function that assigns a gray-level value (from Z) to each distinct pair of coordinates (x, y)
b) (x, y) are integers from R2 and f is a function that assigns a gray-level value (from R) to each distinct pair of coordinates (x, y)
c) (x, y) are integers from R2 and f is a function that assigns a gray-level value (from Z) to each distinct pair of coordinates (x, y)
d) (x, y) are integers from Z2 and f is a function that assigns a gray-level value (from R) to each distinct pair of coordinates (x, y)
View Answer

Answer: d
Explanation: In the given condition, f(x, y) is a digital image if (x, y) are integers from Z2 and f a function that assigns a gray-level value (that is, a real number from the set R) to each distinct coordinate pair (x, y).

103. Let Z be the set of real integers and R the set of real numbers. The sampling process may be viewed as partitioning the x-y plane into a grid, with the central coordinates of each grid being from the Cartesian product Z2, that is a set of all ordered pairs (zi, zj), with zi and zj being integers from Z. Then, f(x, y) is a digital image if (x, y) are integers from Z2 and f is a function

that assigns a gray-level value (that is, a real number from the set R) to each distinct coordinate pair (x, y). What happens to the digital image if the gray levels also are integers?
a) The Digital image then becomes a 2-D function whose coordinates and amplitude values are integers
b) The Digital image then becomes a 1-D function whose coordinates and amplitude values are integers
c) The gray level can never be integer
d) None of the mentioned
View Answer

Answer: a
Explanation: In Quantization Process if the gray levels also are integers the Digital image then becomes a 2-D function whose coordinates and amplitude values are integers.

104. The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of gray levels allowed for each pixel. The value M and N have to be:
a) M and N have to be positive integer
b) M and N have to be negative integer
c) M have to be negative and N have to be positive integer
d) M have to be positive and N have to be negative integer
View Answer

Answer: a
Explanation: The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of max gray level. There are no requirements on M and N, other than that M and N have to be positive integer.

105. The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of max gray levels. There are no requirements on M and N, other than that M and N have to be positive integer. However, the number of gray levels typically is
a) An integer power of 2 i.e. L = 2k
b) A Real power of 2 i.e. L = 2k
c) Two times the integer value i.e. L = 2k
d) None of the mentioned
View Answer

Answer: a
Explanation: Due to processing, storage, and considering the sampling hardware, the number of gray levels typically is an integer power of 2 i.e. L = 2k.

106. The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of max gray levels is an integer power of 2 i.e. L = 2k, allowed for each pixel. If we assume that the discrete levels are equally spaced and that they are integers then they are in the interval_____and Sometimes the range of values spanned

by the gray scale is called the_____of an image.
a) [0, L – 1] and static range respectively
b) [0, L / 2] and dynamic range respectively
c) [0, L / 2] and static range respectively
d) [0, L – 1] and dynamic range respectively
View Answer

Answer: d
Explanation: In digitization process M rows and N columns have to be positive and for the number, L, of discrete gray levels typically an integer power of 2 for each pixel. If we assume that the discrete levels are equally spaced and that they are integers then they lie in the interval [0, L-1] and Sometimes the range of values spanned by the gray scale is called the dynamic range of an image.

107. After digitization process a digital image with M rows and N columns have to be positive and for the number, L, max gray levels i.e. an integer power of 2 for each pixel. Then, the number b, of bits required to store a digitized image is:
a) b=M*N*k
b) b=M*N*L
c) b=M*L*k
d) b=L*N*k
View Answer

Answer: a
Explanation: In digital image of M rows and N columns and L max gray levels an integer power of 2 for each pixel. The number, b, of bits required to store a digitized image is: b=M*N*k.

108. An image whose gray-levels span a significant portion of gray scale have _____ dynamic range while an image with dull, washed out gray look have_____dynamic range.
a) Low and High respectively
b) High and Low respectively
c) Both have High dynamic range, irrespective of gray levels span significance on gray scale
d) Both have Low dynamic range, irrespective of gray levels span significance on gray scale
View Answer

Answer: b
Explanation: An image whose gray-levels signifies a large portion of gray scale have High dynamic range, while that with dull, washed out gray look have Low dynamic range.

109. Validate the statement “When in an Image an appreciable number of pixels exhibit high dynamic range, the image will have high contrast.”
a) True
b) False
View Answer

Answer: a
Explanation: In an Image if an appreciable number of pixels exhibit high dynamic range property, the image will have high contrast.

110. In digital image of M rows and N columns and L discrete gray levels, calculate the bits required to store a digitized image for M=N=32 and L=16.
a) 16384
b) 4096
c) 8192
d) 512
View Answer

Answer: b
Explanation: In digital image of M rows and N columns and L max gray levels i.e. an integer power of 2 for each pixel. The number, b, of bits required to store a digitized image is:
b=M*N*k.
For L=16, k=4.
i.e. b=4096.

Light and the Electromagnetic Spectrum

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Light and the Electromagnetic Spectrum".

111. Of the following,_____has the maximum frequency.
a) UV Rays
b) Gamma Rays
c) Microwaves
d) Radio Waves
View Answer

Answer: b
Explanation: Gamma Rays come first in the electromagnetic spectrum sorted in the decreasing order of frequency.

112. In the Visible spectrum the_____colour has the maximum wavelength.
a) Violet
b) Blue
c) Red
d) Yellow
View Answer

Answer: c
Explanation: Red is towards the right in the electromagnetic spectrum sorted in the increasing order of wavelength.

113. Wavelength and frequency are related as : (c = speed of light)
a) c = wavelength / frequency
b) frequency = wavelength / c
c) wavelength = c * frequency
d) c = wavelength * frequency
View Answer

Answer: d
Explanation: It is usually written as wavelength = c / frequency.

114. Electromagnetic waves can be visualised as a
a) sine wave
b) cosine wave
c) tangential wave
d) None of the mentioned
View Answer

Answer: a
Explanation: Electromagnetic waves are visualised as sinusoidal wave.

115. How is radiance measured?
a) lumens
b) watts
c) armstrong
d) hertz
View Answer

Answer: b
Explanation: Radiance is the total amount of energy that flows from the light source and is measured in Watts.

116. Which of the following is used for chest and dental scans?
a) Hard X-Rays
b) Soft X-Rays
c) Radio waves
d) Infrared Rays
View Answer

Answer: b
Explanation: Soft X-Rays (low energy) are used for dental and chest scans.

117. Which of the following is impractical to measure?
a) Frequency
b) Radiance
c) Luminance
d) Brightness
View Answer

Answer: d
Explanation: Brightness is subjective descriptor of light perception that is impossible to measure.

118. Massless particle containing a certain amount of energy is called
a) Photon
b) Shell
c) Electron
d) None of the mentioned
View Answer

Answer: a
Explanation: Each bundle of massless energy is called a Photon.

119. What do you mean by achromatic light?
a) Chromatic light
b) Monochromatic light
c) Infrared light
d) Invisible light
View Answer

Answer: b
Explanation: Achromatic light is also called monochromatic light.(Light void of color)

120. Which of the following embodies the achromatic notion of intensity?
a) Luminance
b) Brightness
c) Frequency
d) Radiance
View Answer

Answer: b
Explanation: Brightness embodies the achromatic notion of intensity and is a key factor in describing color sensation.

Mathematical Tools in Digital Image Processing

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on ” Mathematical Tools in Digital Image Processing”.

121. How is array operation carried out involving one or more images?
a) array by array
b) pixel by pixel
c) column by column
d) row by row
View Answer

Answer: b
Explanation: Any array operation is carried out on a pixel by pixel basis.

122. The property indicating that the output of a linear operation due to the sum of two inputs is same as performing the operation on the inputs individually and then summing the results is called _____
a) additivity
b) heterogeneity
c) homogeneity
d) None of the Mentioned
View Answer

Answer: a
Explanation: This property is called additivity .

123. The property indicating that the output of a linear operation to a constant times as input is the same as the output of operation due to original input multiplied by that constant is called _____
a) additivity
b) heterogeneity
c) homogeneity
d) None of the Mentioned
View Answer

Answer: c
Explanation: This property is called homogeneity .

124. Enhancement of differences between images is based on the principle of _____
a) Additivity

b) Homogeneity
c) Subtraction
d) None of the Mentioned
View Answer

Answer: c
Explanation: A frequent application of image subtraction is in the enhancement of differences between images .

125. A commercial use of Image Subtraction is _____
a) Mask mode radiography
b) MRI scan
c) CT scan
d) None of the Mentioned
View Answer

Answer: a
Explanation: Mask mode radiography is an important medical imaging area based on Image Subtraction.

126. Region of Interest (ROI) operations is commonly called as _____
a) Shading correction
b) Masking
c) Dilation
d) None of the Mentioned
View Answer

Answer: b
Explanation: A common use of image multiplication is Masking, also called ROI operation.

127. If every element of a set A is also an element of a set B, then A is said to be a_____of set B.
a) Disjoint set
b) Union
c) Subset
d) Complement set
View Answer

Answer: c
Explanation: A is called the subset of B.

128. Consider two regions A and B composed of foreground pixels. The_____of these two sets is the set of elements belonging to set A or set B or both.
a) OR
b) AND
c) NOT

d) XOR
View Answer

Answer: a
Explanation: This is called an OR operation.

129. Imaging systems having physical artefacts embedded in the imaging sensors produce a set of points called _____
a) Tie Points
b) Control Points
c) Reseau Marks
d) None of the Mentioned
View Answer

Answer: c
Explanation: These points are called “known” points or “Reseau marks”.

130. Image processing approaches operating directly on pixels of input image work directly in _____
a) Transform domain
b) Spatial domain
c) Inverse transformation
d) None of the Mentioned
View Answer

Answer: b
Explanation: Operations directly on pixels of input image work directly in Spatial Domain.

Digital Image Processing Questions And Answers – Smoothing Spatial Filters

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on “Smoothing Spatial Filters”.

131. Noise reduction is obtained by blurring the image using smoothing filter.
a) True
b) False
View Answer

Answer: a
Explanation: Noise reduction is obtained by blurring the image using smoothing filter. Blurring

is used in pre-processing steps, such as removal of small details from an image prior to object extraction and, bridging of small gaps in lines or curves.

132. What is the output of a smoothing, linear spatial filter?
a) Median of pixels
b) Maximum of pixels
c) Minimum of pixels
d) Average of pixels
View Answer

Answer: d
Explanation: The output or response of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighbourhood of the filter mask.

133. Smoothing linear filter is also known as median filter.
a) True
b) False
View Answer

Answer: b
Explanation: Since the smoothing spatial filter performs the average of the pixels, it is also called as averaging filter.

134. Which of the following in an image can be removed by using smoothing filter?
a) Smooth transitions of gray levels
b) Smooth transitions of brightness levels
c) Sharp transitions of gray levels
d) Sharp transitions of brightness levels
View Answer

Answer: c
Explanation: Smoothing filter replaces the value of every pixel in an image by the average value of the gray levels. So, this helps in removing the sharp transitions in the gray levels between the pixels. This is done because, random noise typically consists of sharp transitions in gray levels.

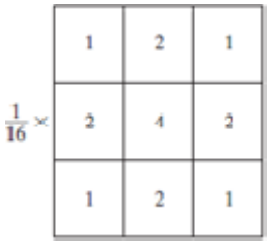
135. Which of the following is the disadvantage of using smoothing filter?
a) Blur edges
b) Blur inner pixels
c) Remove sharp transitions
d) Sharp edges
View Answer

Answer: a
Explanation: Edges, which almost always are desirable features of an image, also are characterized by sharp transitions in gray level. So, averaging filters have an undesirable side effect that they blur these edges.

136. Smoothing spatial filters doesn‟ t smooth the false contours.
a) True
b) False
View Answer

Answer: b
Explanation: One of the application of smoothing spatial filters is that, they help in smoothing the false contours that result from using an insufficient number of gray levels.

137. The mask shown in the figure below belongs to which type of filter?



a) Sharpening spatial filter
b) Median filter
c) Sharpening frequency filter
d) Smoothing spatial filter
View Answer

Answer: d
Explanation: This is a smoothing spatial filter. This mask yields a so called weighted average, which means that different pixels are multiplied with different coefficient values. This helps in giving much importance to the some pixels at the expense of others.

138. The mask shown in the figure below belongs to which type of filter?

a) Sharpening spatial filter
b) Median filter
c) Smoothing spatial filter
d) Sharpening frequency filter
View Answer

Answer: c
Explanation: The mask shown in the figure represents a 3×3 smoothing filter. Use of this filter yields the standard average of the pixels under the mask.

139. Box filter is a type of smoothing filter.
a) True
b) False
View Answer

Answer: a
Explanation: A spatial averaging filter or spatial smoothening filter in which all the coefficients are equal is also called as box filter.

140. If the size of the averaging filter used to smooth the original image to first image is 9, then what would be the size of the averaging filter used in smoothing the same original picture to second in second image?

a) 3
b) 5
c) 9
d) 15
View Answer

Answer: d
Explanation: We know that, as the size of the filter used in smoothening the original image that is averaging filter increases then the blurring of the image. Since the second image is more blurred than the first image, the window size should be more than 9.

141. Which of the following comes under the application of image blurring?
a) Object detection
b) Gross representation
c) Object motion
d) Image segmentation
View Answer

Answer: b
Explanation: An important application of spatial averaging is to blur an image for the purpose of getting a gross representation of interested objects, such that the intensity of the small objects blends with the background and large objects become easy to detect.c

142. Which of the following filters response is based on ranking of pixels?
a) Nonlinear smoothing filters
b) Linear smoothing filters

c) Sharpening filters
d) Geometric mean filter
View Answer

Answer: a
Explanation: Order static filters are nonlinear smoothing spatial filters whose response is based on the ordering or ranking the pixels contained in the image area encompassed by the filter, and then replacing the value of the central pixel with the value determined by the ranking result.

143. Median filter belongs to which category of filters?
a) Linear spatial filter
b) Frequency domain filter
c) Order static filter
d) Sharpening filter
View Answer

Answer: c
Explanation: The median filter belongs to order static filters, which, as the name implies, replaces the value of the pixel by the median of the gray levels that are present in the neighbourhood of the pixels.

144. Median filters are effective in the presence of impulse noise.
a) True
b) False
View Answer

Answer: a
Explanation: Median filters are used to remove impulse noises, also called as salt-and-pepper noise because of its appearance as white and black dots in the image.

145. What is the maximum area of the cluster that can be eliminated by using an n×n median filter?
a) n^2
b) $n^2/2$
c) $2*n^2$
d) n
View Answer

Answer: b
Explanation: Isolated clusters of pixels that are light or dark with respect to their neighbours, and whose area is less than n2/2, i.e., half the area of the filter, can be eliminated by using an n×n median filter.

Digital Image Processing Questions And Answers – Basic Intensity Transformation Functions

This set of Digital Image Processing Interview Questions and Answers focuses on “Basic Intensity Transformation Functions”.

146. Which of the following expression is used to denote spatial domain process?
a) g(x,y)=T[f(x,y)]
b) f(x+y)=T[g(x+y)]
c) g(xy)=T[f(xy)]
d) g(x-y)=T[f(x-y)]
View Answer

Answer: a
Explanation: Spatial domain processes will be denoted by the expression g(x,y)=T[f(x,y)], where f(x,y) is the input image, g(x,y) is the processed image, and T is an operator on f, defined over some neighborhood of (x, y). In addition, T can operate on a set of input images, such as performing the pixel-by-pixel sum of K images for noise reduction.

147. Which of the following shows three basic types of functions used frequently for image enhancement?
a) Linear, logarithmic and inverse law
b) Power law, logarithmic and inverse law
c) Linear, logarithmic and power law
d) Linear, exponential and inverse law
View Answer

Answer: b
Explanation: In introduction to gray-level transformations, which shows three basic types of functions used frequently for image enhancement: linear (negative and identity transformations), logarithmic (log and inverse-log transformations), and power-law (nth power and nth root transformations).The identity function is the trivial case in which output intensities are identical to input intensities. It is included in the graph only for completeness.

148. Which expression is obtained by performing the negative transformation on the negative of an image with gray levels in the range[0,L-1] ?
a) s=L+1-r
b) s=L+1+r

c) s=L-1-r
d) s=L-1+r
View Answer

Answer: c
Explanation: The negative of an image with gray levels in the range[0,L-1] is obtained by using the negative transformation, which is given by the expression: s=L-1-r.

149. What is the general form of representation of log transformation?
a) $s=c\log_{10}(1/r)$
b) $s=c\log_{10}(1+r)$
c) $s=c\log_{10}(1*r)$
d) $s=c\log_{10}(1-r)$
View Answer

Answer: b
Explanation: The general form of the log transformation: $s=c\log_{10}(1+r)$, where c is a constant, and it is assumed that $r \geq 0$.

150. What is the general form of representation of power transformation?
a) $s=cr^{\gamma}$
b) $c=sr^{\gamma}$
c) s=rc
d) $s=rc^{\gamma}$
View Answer

Answer: a
Explanation: Power-law transformations have the basic form: $s=cr^{\gamma}$ where c and g are positive constants. Sometimes $s=cr^{\gamma}$ is written as $s=c.(r+\varepsilon)^{\gamma}$ to account for an offset (that is, a measurable output when the input is zero).

151. What is the name of process used to correct the power-law response phenomena?
a) Beta correction
b) Alpha correction
c) Gamma correction
d) Pie correction
View Answer

Answer: c
Explanation: A variety of devices used for image capture, printing, and display respond according to a power law. By convention, the exponent in the power-law equation is referred to as gamma .The process used to correct these power-law response phenomena is called gamma correction.

152. Which of the following transformation function requires much information to be specified at the time of input?

a) Log transformation
b) Power transformation
c) Piece-wise transformation
d) Linear transformation
View Answer

Answer: c
Explanation: The practical implementation of some important transformations can be formulated only as piecewise functions. The principal disadvantage of piecewise functions is that their specification requires considerably more user input.

153. In contrast stretching, if $r_1=s_1$ and $r_2=s_2$ then which of the following is true?
a) The transformation is not a linear function that produces no changes in gray levels
b) The transformation is a linear function that produces no changes in gray levels
c) The transformation is a linear function that produces changes in gray levels
d) The transformation is not a linear function that produces changes in gray levels
View Answer

Answer: b
Explanation: The locations of points (r_1,s_1) and (r_2,s_2) control the shape of the transformation function. If $r_1=s_1$ and $r_2=s_2$ then the transformation is a linear function that produces no changes in gray levels.

154. In contrast stretching, if $r_1=r_2$, $s_1=0$ and $s_2=L-1$ then which of the following is true?
a) The transformation becomes a thresholding function that creates an octal image
b) The transformation becomes a override function that creates an octal image
c) The transformation becomes a thresholding function that creates a binary image
d) The transformation becomes a thresholding function that do not create an octal image
View Answer

Answer: c
Explanation: If $r_1=r_2$, $s_1=0$ and $s_2=L-1$,the transformation becomes a thresholding function that creates a binary image.

155. In contrast stretching, if $r_1 \leq r_2$ and $s_1 \leq s_2$ then which of the following is true?
a) The transformation function is double valued and exponentially increasing
b) The transformation function is double valued and monotonically increasing
c) The transformation function is single valued and exponentially increasing
d) The transformation function is single valued and monotonically increasing
View Answer

Answer: d
Explanation: The locations of points (r_1,s_1) and (r_2,s_2) control the shape of the transformation function. If $r_1 \leq r_2$ and $s_1 \leq s_2$ then the function is single valued and monotonically increasing.

156. In which type of slicing, highlighting a specific range of gray levels in an image often is desired?
a) Gray-level slicing
b) Bit-plane slicing
c) Contrast stretching
d) Byte-level slicing
View Answer

Answer: a
Explanation: Highlighting a specific range of gray levels in an image often is desired in gray-level slicing. Applications include enhancing features such as masses of water in satellite imagery and enhancing flaws in X-ray images.

157. Which of the following depicts the main functionality of the Bit-plane slicing?
a) Highlighting a specific range of gray levels in an image
b) Highlighting the contribution made to total image appearance by specific bits
c) Highlighting the contribution made to total image appearance by specific byte
d) Highlighting the contribution made to total image appearance by specific pixels
View Answer

Answer: b
Explanation: Instead of highlighting gray-level ranges, highlighting the contribution made to total image appearance by specific bits might be desired. Suppose , each pixel in an image is represented by 8 bits. Imagine that the image is composed of eight 1-bit planes, ranging from bit-plane 0 for the least significant bit to bit-plane 7 for the most significant bit. In terms of 8-bit bytes, plane 0 contains all the lowest order bits in the bytes comprising the pixels in the image and plane 7 contains all the high-order bits.

Digital Image Processing Questions And Answers – Sharpening Spatial Filters

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on “Sharpening Spatial Filters”.

158. 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
View Answer

Answer: b
Explanation: The sharpening of image helps in highlighting the fine details that are present in the image or to enhance the details that are blurred due to some reason like adding noise.

159. Image sharpening process is used in electronic printing.
a) True
b) False
View Answer

Answer: a
Explanation: The applications of image sharpening is present in various fields like electronic printing, autonomous guidance in military systems, medical imaging and industrial inspection.

160. 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
View Answer

Answer: d
Explanation: We know that, in blurring the image, we perform the average of pixels which can be considered as integration. As sharpening is the opposite process of blurring, logically we can tell that we perform differentiation on the pixels to sharpen the image.

161. Image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.
a) True
b) False
View Answer

Answer: a
Explanation: Fundamentally, the strength of the response of the derivative operative is proportional to the degree of discontinuity in the image. So, we can state that image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.

162. In which of the following cases, we wouldn‟ t worry about the behaviour of sharpening filter?
a) Flat segments
b) Step discontinuities
c) Ramp discontinuities
d) Slow varying gray values
View Answer

Answer: d
Explanation: We are interested in the behaviour of derivatives used in sharpening in the constant gray level areas i.e., flat segments, and at the onset and end of discontinuities, i.e., step and ramp discontinuities.

163. 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
View Answer

Answer: c
Explanation: The derivations of digital functions are defined in terms of differences. The definition we use for first derivative should be zero in flat segments, nonzero at the onset of a gray level step or ramp and nonzero along the ramps.

164. Which of the following is not a valid response when we apply a second derivative?
a) Zero response at onset of gray level step
b) Nonzero response at onset of gray level step
c) Zero response at flat segments
d) Nonzero response along the ramps
View Answer

Answer: b
Explanation: The derivations of digital functions are defined in terms of differences. The definition we use for second derivative should be zero in flat segments, zero at the onset of a gray level step or ramp and nonzero along the ramps.

165. If f(x,y) is an image function of two variables, then the first order derivative of a one dimensional function, f(x) is:
a) f(x+1)-f(x)
b) f(x)-f(x+1)
c) f(x-1)-f(x+1)
d) f(x)+f(x-1)
View Answer

Answer: a
Explanation: The first order derivative of a single dimensional function f(x) is the difference between f(x) and f(x+1).
That is, $\partial f/\partial x = f(x+1)-f(x)$.

166. Isolated point is also called as noise point.
a) True
b) False
View Answer

Answer: a
Explanation: The point which has very high or very low gray level value compared to its neighbours, then that point is called as isolated point or noise point. The noise point of is of one pixel size.

167. What is the thickness of the edges produced by first order derivatives when compared to that of second order derivatives?
a) Finer
b) Equal
c) Thicker
d) Independent
View Answer

Answer: c
Explanation: We know that, the first order derivative is nonzero along the entire ramp while the second order is zero along the ramp. So, we can conclude that the first order derivatives produce thicker edges and the second order derivatives produce much finer edges.

168. First order derivative can enhance the fine detail in the image compared to that of second order derivative.
a) True
b) False
View Answer

Answer: b
Explanation: The response at and around the noise point is much stronger for the second order derivative than for the first order derivative. So, we can state that the second order derivative is better to enhance the fine details in the image including noise when compared to that of first order derivative.

169. Which of the following derivatives produce a double response at step changes in gray level?
a) First order derivative
b) Third order derivative
c) Second order derivative
d) First and second order derivatives
View Answer

Answer: c
Explanation: Second order derivatives produce a double line response for the step changes in the gray level. We also note of second-order derivatives that, for similar changes in gray-level values in an image, their response is stronger to a line than to a step, and to a point than to a line.

Digital Image Processing Questions and Answers – Sharpening Spatial Filters-2

This set of Digital Image Processing Questions and Answers for Freshers focuses on "Sharpening Spatial Filters-2".

168. The objective of sharpening spatial filters is/are to _____
a) Highlight fine detail in an image
b) Enhance detail that has been blurred because of some error
c) Enhance detail that has been blurred because of some natural effect of some method of image acquisition
d) All of the mentioned
View Answer

Answer: d
Explanation: Highlighting the fine detail in an image or Enhancing detail that has been blurred because of some error or some natural effect of some method of image acquisition, is the principal objective of sharpening spatial filters.

169. Sharpening is analogous to which of the following operations?
a) To spatial integration
b) To spatial differentiation
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Smoothing is analogous to integration and so, sharpening to spatial differentiation.

170. Which of the following fact(s) is/are true about sharpening spatial filters using digital differentiation?
a) Sharpening spatial filter response is proportional to the discontinuity of the image at the point where the derivative operation is applied
b) Sharpening spatial filters enhances edges and discontinuities like noise
c) Sharpening spatial filters deemphasizes areas that have slowly varying gray-level values
d) All of the mentioned
View Answer

Answer: d
Explanation: Derivative operator‟ s response is proportional to the discontinuity of the image at

the point where the derivative operation is applied.
Image differentiation enhances edges and discontinuities like noise and deemphasizes areas that have slowly varying gray-level values.
Since a sharpening spatial filters are analogous to differentiation, so, all the above mentioned facts are true for sharpening spatial filters.

171. Which of the facts(s) is/are true for the first order derivative of a digital function?
a) Must be nonzero in the areas of constant grey values
b) Must be zero at the onset of a gray-level step or ramp discontinuities
c) Must be nonzero along the gray-level ramps
d) None of the mentioned
View Answer

Answer: c
Explanation: The first order derivative of a digital function is defined as:
Must be zero in the areas of constant grey values.
Must be nonzero at the onset of a gray-level step or ramp discontinuities.
Must be nonzero along the gray-level ramps.

172. Which of the facts(s) is/are true for the second order derivative of a digital function?
a) Must be zero in the flat areas
b) Must be nonzero at the onset and end of a gray-level step or ramp discontinuities
c) Must be zero along the ramps of constant slope
d) All of the mentioned
View Answer

Answer: c
Explanation: The second order derivative of a digital function is defined as:
Must be zero in the flat areas i.e. areas of constant grey values.
Must be nonzero at the onset of a gray-level step or ramp discontinuities.
Must be zero along the gray-level ramps of constant slope.

173. The derivative of digital function is defined in terms of difference. Then, which of the following defines the first order derivative $\partial f/\partial x=$_____of a one-dimensional function f(x)?
a) f(x+1)-f(x)
b) f(x+1)+ f(x-1)-2f(x)
c) All of the mentioned depending upon the time when partial derivative will be dealt along two spatial axes
d) None of the mentioned
View Answer

Answer: a
Explanation: The definition of a first order derivative of a one dimensional image f(x) is:
$\partial f/\partial x=$ f(x+1)-f(x), where the partial derivative is used to keep notation same even for f(x, y) when partial derivative will be dealt along two spatial axes.

174. The derivative of digital function is defined in terms of difference. Then, which of the following defines the second order derivative $\partial^2 f/\partial x^2 =$_____of a one-dimensional function f(x)?
a) f(x+1)-f(x)
b) f(x+1)+ f(x-1)-2f(x)
c) All of the mentioned depending upon the time when partial derivative will be dealt along two spatial axes
d) None of the mentioned
View Answer

Answer: b
Explanation: The definition of a second order derivative of a one dimensional image f(x) is: $(\partial^2 f)/\partial x^2 =$f(x+1)+ f(x-1)-2f(x), where the partial derivative is used to keep notation same even for f(x, y) when partial derivative will be dealt along two spatial axes.

175. What kind of relation can be obtained between first order derivative and second order derivative of an image having a on the basis of edge productions that shows a transition like a ramp of constant slope?
a) First order derivative produces thick edge while second order produces a very fine edge
b) Second order derivative produces thick edge while first order produces a very fine edge
c) Both first and second order produces thick edge
d) Both first and second order produces a very fine edge
View Answer

Answer: a
Explanation: the first order derivative remains nonzero along the entire ramp of constant slope, while the second order derivative remain nonzero only at onset and end of such ramps.
If an edge in an image shows transition like the ramp of constant slope, the first order and second order derivative values shows the production of thick and finer edge respectively.

176. What kind of relation can be obtained between first order derivative and second order derivative of an image on the response obtained by encountering an isolated noise point in the image?
a) First order derivative has a stronger response than a second order
b) Second order derivative has a stronger response than a first order
c) Both enhances the same and so the response is same for both first and second order derivative
d) None of the mentioned
View Answer

Answer: b
Explanation: This is because a second order derivative is more aggressive toward enhancing sharp changes than a first order.

178. What kind of relation can be obtained between the response of first order derivative and second order derivative of an image having a transition into gray-level step from zero?
a) First order derivative has a stronger response than a second order

b) Second order derivative has a stronger response than a first order
c) Both first and second order derivative has the same response
d) None of the mentioned
View Answer

Answer: c
Explanation: This is because a first order derivative has stronger response to a gray-level step than a second order, but, the response becomes same if transition into gray-level step is from zero.

179. If in an image there exist similar change in gray-level values in the image, which of the following shows a stronger response using second order derivative operator for sharpening?
a) A line
b) A step
c) A point
d) None of the mentioned
View Answer

Answer: c
Explanation: second order derivative shows a stronger response to a line than a step and to a point than a line, if there is similar changes in gray-level values in an image.

Digital Image Processing Questions and Answers – Sharpening Spatial Filters – 3

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Sharpening Spatial Filters – 3".

180. The principle objective of Sharpening, to highlight transitions is _____
a) Pixel density
b) Composure
c) Intensity
d) Brightness
View Answer

Answer: c
Explanation: The principle objective of Sharpening, to highlight transitions is Intensity.

181. How can Sharpening be achieved?
a) Pixel averaging
b) Slicing
c) Correlation
d) None of the mentioned
View Answer

Answer: d
Explanation: Sharpening is achieved using Spatial Differentiation.

182. What does Image Differentiation enhance?
a) Edges
b) Pixel Density
c) Contours
d) None of the mentioned
View Answer

Answer: a
Explanation: Image Differentiation enhances Edges and other discontinuities.

183. What does Image Differentiation de-emphasize?
a) Pixel Density
b) Contours
c) Areas with slowly varying intensities
d) None of the mentioned
View Answer

Answer: c
Explanation: Image Differentiation de-emphasizes areas with slowly varying intensities.

184. The requirements of the First Derivative of a digital function:
a) Must be zero in areas of constant intensity
b) Must be non-zero at the onset of an intensity step
c) Must be non-zero along ramps
d) All of the Mentioned
View Answer

Answer: d
Explanation: All the three conditions must be satisfied.

185. What is the Second Derivative of Image Sharpening called?
a) Gaussian
b) Laplacian
c) Canny
d) None of the mentioned
View Answer

Answer: b
Explanation: It is also called Laplacian.

186. The ability that rotating the image and applying the filter gives the same result, as applying the filter to the image first, and then rotating it, is called _____
a) Isotropic filtering
b) Laplacian
c) Rotation Invariant
d) None of the mentioned
View Answer

Answer: c
Explanation: It is called Rotation Invariant, although the process used is Isotropic filtering.

187. For a function f(x,y), the gradient of „f‟ at coordinates (x,y) is defined as a _____
a) 3-D row vector
b) 3-D column vector
c) 2-D row vector
d) 2-D column vector
View Answer

Answer: d
Explanation: The gradient is a 2-D column vector.

188. Where do you find frequent use of Gradient?
a) Industrial inspection
b) MRI Imaging
c) PET Scan
d) None of the mentioned
View Answer

Answer: a
Explanation: Gradient is used in Industrial inspection, to aid humans, in detection of defects.

189. Which of the following occurs in Unsharp Masking?
a) Blurring original image
b) Adding a mask to original image
c) Subtracting blurred image from original
d) All of the mentioned
View Answer

Answer: d
Explanation: In Unsharp Masking, all of the above occurs in the order: Blurring, Subtracting the blurred image and then Adding the mask.

Digital Image Processing Questions and Answers – Combining Spatial Enhancements Methods

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Combining Spatial Enhancements Methods".

190. 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
View Answer

Answer: d
Explanation: All the mentioned options make it difficult to enhance an image.

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

Answer: b
Explanation: Laplacian is a second-order derivative operator.

192. Response of the gradient to noise and fine detail is_____the Laplacian‟s.
a) equal to
b) lower than
c) greater than
d) has no relation with
View Answer

Answer: b
Explanation: Response of the gradient to noise and fine detail is lower than the Laplacian‟s and can further be lowered by smoothing.

193. Dark characteristics in an image are better solved using _____
a) Laplacian Transform
b) Gaussian Transform

c) Histogram Specification
d) Power-law Transformation
View Answer

Answer: d
Explanation: It can be solved by Histogram Specification but it is better handled by Power-law Transformation.

194. What is the smallest possible value of a gradient image?
a) e
b) 1
c) 0
d) -e
View Answer

Answer: c
Explanation: The smallest possible value of a gradient image is 0.

195. Which of the following fails to work on dark intensity distributions?
a) Laplacian Transform
b) Gaussian Transform
c) Histogram Equalization
d) Power-law Transformation
View Answer

Answer: c
Explanation: Histogram Equalization fails to work on dark intensity distributions.

196. _____is used to detect diseases such as bone infection and tumors.
a) MRI Scan
b) PET Scan
c) Nuclear Whole Body Scan
d) X-Ray
View Answer

Answer: c
Explanation: Nuclear Whole Body Scan is used to detect diseases such as bone infection and tumors

197. How do you bring out more of the skeletal detail from a Nuclear Whole Body Bone Scan?
a) Sharpening
b) Enhancing
c) Transformation
d) None of the mentioned
View Answer

Answer: a
Explanation: Sharpening is used to bring out more of the skeletal detail.

198. An alternate approach to median filtering is _____
a) Use a mask
b) Gaussian filter
c) Sharpening
d) Laplacian filter
View Answer

Answer:a
Explanation: Using a mask, formed from the smoothed version of the gradient image, can be used for median filtering.

199. Final step of enhancement lies in_____of the sharpened image.
a) Increase range of contrast
b) Increase range of brightness
c) Increase dynamic range
d) None of the mentioned
View Answer

Answer: c
Explanation: Increasing the dynamic range of the sharpened image is the final step in enhancement.

Digital Image Processing Questions and Answers – Fundamentals of Spatial Filtering

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Fundamentals of Spatial Filtering".

200. What is accepting or rejecting certain frequency components called as?
a) Filtering
b) Eliminating
c) Slicing
d) None of the Mentioned
View Answer

Answer: a
Explanation: Filtering is the process of accepting or rejecting certain frequency components.

201. A filter that passes low frequencies is _____
a) Band pass filter
b) High pass filter
c) Low pass filter
d) None of the Mentioned
View Answer

Answer: c
Explanation: Low pass filter passes low frequencies.

202. What is the process of moving a filter mask over the image and computing the sum of products at each location called as?
a) Convolution
b) Correlation
c) Linear spatial filtering
d) Non linear spatial filtering
View Answer

Answer: b
Explanation: The process is called as Correlation.

203. The standard deviation controls_____of the bell (2-D Gaussian function of bell shape).
a) Size
b) Curve
c) Tightness
d) None of the Mentioned
View Answer

Answer: c
Explanation: The standard deviation controls "tightness" of the bell.

204. What is required to generate an M X N linear spatial filter?
a) MN mask coefficients
b) M+N coordinates
c) MN spatial coefficients
d) None of the Mentioned
View Answer

Answer: a
Explanation: To generate an M X N linear spatial filter MN mask coefficients must be specified.

205. What is the difference between Convolution and Correlation?
a) Image is pre-rotated by 180 degree for Correlation
b) Image is pre-rotated by 180 degree for Convolution
c) Image is pre-rotated by 90 degree for Correlation

d) Image is pre-rotated by 90 degree for Convolution
View Answer

Answer: b
Explanation: Convolution is the same as Correlation except that the image must be rotated by 180 degrees initially.

206. Convolution and Correlation are functions of _____
a) Distance
b) Time
c) Intensity
d) Displacement
View Answer

Answer: d
Explanation: Convolution and Correlation are functions of displacement.

207. The function that contains a single 1 with the rest being 0s is called _____
a) Identity function
b) Inverse function
c) Discrete unit impulse
d) None of the Mentioned
View Answer

Answer: c
Explanation: It is called Discrete unit impulse.

208. Which of the following involves Correlation?
a) Matching
b) Key-points
c) Blobs
d) None of the Mentioned.
View Answer

Answer: a
Explanation: Correlation is applied in finding matches.

209. An example of a continuous function of two variables is _____
b) Intensity function
c) Contrast stretching
d) Gaussian function
View Answer

Answer: d
Explanation: Gaussian function has two variables and is an exponential continuous function.

Digital Image Processing Questions And Answers – Histogram Processing – 2

This set of Digital Image Processing Interview Questions and Answers for freshers focuses on "Histogram Processing – 2".

210. 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) $h(r\_k)=n\_k/n$
View Answer

Answer: a
Explanation: The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function $h(r_k)=n_k$, where r_k is the kth gray level and $n_k$is the number of pixels in the image having gray level r_k.

211. 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) $p(r\_k)=n/n\_k$
View Answer

Answer: b
Explanation: It is common practice to normalize a histogram by dividing each of its values by the total number of pixels in the image, denoted by n. Thus, a normalized histogram is given by $p(r_k)=n_k/n$, for k=0,1,2…..L-1. Loosely speaking, $p(r_k)$ gives an estimate of the probability of occurrence of gray-level r_k. Note that the sum of all components of a normalized histogram is equal to 1.

212. Which of the following conditions does the T(r) must satisfy?
a) T(r) is double-valued and monotonically decreasing in the interval $0\leq r\leq 1$; and $0\leq T(r)\leq 1$ for $0\leq r\leq 1$
b) T(r) is double-valued and monotonically increasing in the interval $0\leq r\leq 1$; and $0\leq T(r)\leq 1$ for $0\leq r\leq 1$
c) T(r) is single-valued and monotonically decreasing in the interval $0\leq r\leq 1$; and $0\leq T(r)\leq 1$ for $0\leq r\leq 1$
d) T(r) is single-valued and monotonically increasing in the interval $0\leq r\leq 1$; and

$0 \leq T(r) \leq 1$ for $0 \leq r \leq 1$
View Answer

Answer: d
Explanation: For any r satisfying the aforementioned conditions, we focus attention on transformations of the form
$s=T(r)$ For $0 \leq r \leq 1$
That produces a level s for every pixel value r in the original image.
For reasons that will become obvious shortly, we assume that the transformation function T(r) satisfies the following conditions:
T(r) is single-valued and monotonically increasing in the interval $0 \leq r \leq 1$; and
$0 \leq T(r) \leq 1$ for $0 \leq r \leq 1$.

213. 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 $0 \geq s \geq 1$
View Answer

Answer: c
Explanation: The inverse transformation from s back to r is denoted by:
$r=T_{-1}(s)$ for $0 \leq s \leq 1$.

214. The probability density function p_s (s) of the transformed variable s can be obtained by using which of the following formula?
a) $p_{\_s}(s)=p_{\_r}(r)|dr/ds|$
b) $p_{\_s}(s)=p_{\_r}(r)|ds/dr|$
c) $p_{\_r}(r)=p_{\_s}(s)|dr/ds|$
d) $p_{\_s}(s)=p_{\_r}(r)|dr/dr|$
View Answer

Answer: a
Explanation: The probability density function $p_{\_s}(s)$ of the transformed variable s can be obtained using a basic formula: $p_{\_s}(s)=p\_r(r)|dr/ds|$
Thus, the probability density function of the transformed variable, s, is determined by the gray-level PDF of the input image and by the chosen transformation function.

215. A transformation function of particular importance in image processing is represented in which of the following form?
a) $s=T(r)=\int_0^{(2r)} p_r(\omega)d\omega$
b) $s=T(r)=\int_0^{(r-1)} p_r(\omega)d\omega$
c) $s=T(r)=\int_0^{(r/2)} p_r(\omega)d\omega$
d) $s=T(r)=\int_0 p_r(\omega)d\omega$
View Answer

Answer: d
Explanation: A transformation function of particular importance in image processing has the form: $s=T(r)=\int_0^r p_r(\omega)dw$, where ω is a dummy variable of integration. The right side of is recognized as the cumulative distribution function (CDF) of random variable r.

216. Histogram equalization or Histogram linearization is represented by of the following equation:
a) $s_k = \sum_{j=1}^{k} n_j/n$ k=0,1,2,……,L-1
b) $s_k = \sum_{j=0}^{k} n_j/n$ k=0,1,2,……,L-1
c) $s_k = \sum_{j=0}^{k} n/n_j$ k=0,1,2,……,L-1
d) $s_k = \sum_{j=n}^{k} n_j/n$ k=0,1,2,……,L-1
View Answer

Answer: b
Explanation: A plot of $p_{k\_}(r_k)$ versus r_k is called a histogram .The transformation (mapping) given in $s_k = \sum_{j=0)_k}^{k} n_j/n$ k=0,1,2,……,L-1 is called histogram equalization or histogram linearization.

217. 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
View Answer

Answer: c
Explanation: In particular, it is useful sometimes to be able to specify the shape of the histogram that we wish the processed image to have. The method used to generate a processed image that has a specified histogram is called histogram matching or histogram specification.

218. Histograms are the basis for numerous spatial domain processing techniques.
a) True
b) False
View Answer

Answer: a
Explanation: Histograms are the basis for numerous spatial domain processing techniques. Histogram manipulation can be used effectively for image enhancement.

219. 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
Explanation: We know that in the dark image, the components of histogram are concentrated mostly on the low i.e., dark side of the grey scale. Similarly, the components of histogram of the bright image are biased towards the high side of the grey scale.

Digital Image Processing Questions and Answers – Histogram Processing – 1

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Histogram Processing –
1".

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

Answer: c
Explanation: Histogram is the basis for numerous spatial domain processing techniques.

221. In_____image we notice that the components of histogram are concentrated on the low side on intensity scale.
a) bright
b) dark
c) colourful
d) All of the Mentioned
View Answer

Answer: b
Explanation: Only in dark images, we notice that the components of histogram are concentrated on the low side on intensity scale.

222. What is Histogram Equalisation also called as?
a) Histogram Matching
b) Image Enhancement
c) Histogram linearisation

d) None of the Mentioned
View Answer

Answer: c
Explanation: Histogram Linearisation is also known as Histogram Equalisation.

223. What is Histogram Matching also called as?
a) Histogram Equalisation
b) Histogram Specification
c) Histogram linearisation
d) None of the Mentioned
View Answer

Answer: b
Explanation: Histogram Specification is also known as Histogram Matching.

224. Histogram Equalisation is mainly used for _____
a) Image enhancement
b) Blurring
c) Contrast adjustment
d) None of the Mentioned
View Answer

Answer: a
Explanation: It is mainly used for Enhancement of usually dark images.

225. To reduce computation if one utilises non-overlapping regions, it usually produces _____ effect.
a) Dimming
b) Blurred
c) Blocky
d) None of the Mentioned
View Answer

Answer: c
Explanation: Utilising non-overlapping regions usually produces “Blocky” effect.

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

Answer: c
Explanation: SEM stands for Scanning Electron Microscope.

227. The type of Histogram Processing in which pixels are modified based on the intensity distribution of the image is called_____.
a) Intensive
b) Local
c) Global
d) Random
View Answer

Answer: c
Explanation: It is called Global Histogram Processing.

228. Which type of Histogram Processing is suited for minute detailed enhancements?
a) Intensive
b) Local
c) Global
d) Random
View Answer

Answer: b
Explanation: Local Histogram Processing is used.

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

Answer: d
Explanation: PDF stands for Probability Density Function.

Digital Image Processing Questions and Answers – Smoothing Spacial Filters

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Smoothing Spacial Filters".

230. The output of a smoothing, linear spatial filtering is a_____of the pixels contained in the neighbourhood of the filter mask.
a) Sum
b) Product

c) Average
d) Dot Product
View Answer

Answer: c
Explanation: Smoothing is simply the average of the pixels contained in the neighbourhood.

231. Averaging filters is also known as_____filter.
a) Low pass
b) High pass
c) Band pass
d) None of the Mentioned
View Answer

Answer: a
Explanation: Averaging filters is also known as Low pass filters.

232. What is the undesirable side effects of Averaging filters?
a) No side effects
b) Blurred image
c) Blurred edges
d) Loss of sharp transitions
View Answer

Answer: c
Explanation: Blue edges is the undesirable side effect of Averaging filters.

233. A spatial averaging filter in which all coefficients are equal is called _____.
a) Square filter
b) Neighbourhood
c) Box filter
d) Zero filter
View Answer

Answer: c
Explanation: It is called a Box filter.

234. Which term is used to indicate that pixels are multiplied by different coefficients?
a) Weighted average
b) Squared average
c) Spatial average
d) None of the Mentioned
View Answer

Answer: a
Explanation: It is called weighted average since more importance(weight) is given to some pixels.

235. The non linear spacial filters whose response is based on ordering of the pixels contained is called_____.
a) Box filter
b) Square filter
c) Gaussian filter
d) Order-statistic filter
View Answer

Answer: d
Explanation: It is called Order-statistic filter.

236. Impulse noise in Order-statistic filter is also called as _____
a) Median noise
b) Bilinear noise
c) Salt and pepper noise
d) None of the Mentioned
View Answer

Answer: c
Explanation: It is called salt-and-pepper noise because of its appearance as white and black dots superimposed on an image.

237. Best example for a Order-statistic filter is _____
a) Impulse filter
b) Averaging filter
c) Median filter
d) None of the Mentioned
View Answer

Answer: c
Explanation: Median filter is the best known Order-statistic filter.

238. What does “eliminated” refer to in median filter?
a) Force to average intensity of neighbours
b) Force to median intensity of neighbours
c) Eliminate median value of pixels
d) None of the Mentioned
View Answer

Answer: b
Explanation: It refers to forcing to median intensity of neighbours.

239. Which of the following is best suited for salt-and-pepper noise elimination?
a) Average filter
b) Box filter
c) Max filter
d) Median filter
View Answer

Answer: d
Explanation: Median filter is better suited than average filter for salt-and-pepper noise elimination.

Digital Image Processing Questions and Answers – Smoothing Linear Spatial Filters

This set of Digital Image Processing Questions and Answers for Aptitude test focuses on "Smoothing Linear Spatial Filters".

240. Smoothing filter is used for which of the following work(s)?
a) Blurring
b) Noise reduction
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: Smoothing filter is used for blurring and noise reduction.

241. The response of the smoothing linear spatial filter is/are _____
a) Sum of image pixel in the neighborhood filter mask
b) Difference of image in the neighborhood filter mask
c) Product of pixel in the neighborhood filter mask
d) Average of pixels in the neighborhood of filter mask
View Answer

Answer: d
Explanation: The average of pixels in the neighborhood of filter mask is simply the output of the smoothing linear spatial filter.

242. Which of the following filter(s) results in a value as average of pixels in the neighborhood of filter mask.
a) Smoothing linear spatial filter
b) Averaging filter
c) Lowpass filter

d) All of the mentioned
View Answer

Answer: d
Explanation: The output as an average of pixels in the neighborhood of filter mask is simply the output of the smoothing linear spatial filter also known as averaging filter and lowpass filter.

243. What is/are the resultant image of a smoothing filter?
a) Image with high sharp transitions in gray levels
b) Image with reduced sharp transitions in gray levels
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Random noise has sharp transitions in gray levels and smoothing filters does noise reduction.

244. At which of the following scenarios averaging filters is/are used?
a) In the reduction of irrelevant details in an image
b) For smoothing of false contours
c) For noise reductions
d) All of the mentioned
View Answer

Answer: d
Explanation: Averaging filter or smoothing linear spatial filter is used: for noise reduction by reducing the sharp transitions in gray level, for smoothing false contours that arises because of use of insufficient number of gray values and for reduction of irrelevant data i.e. the pixels regions that are small in comparison of filter mask.

245. A spatial averaging filter having all the coefficients equal is termed _____
a) A box filter
b) A weighted average filter
c) A standard average filter
d) A median filter
View Answer

Answer: a
Explanation: An averaging filter is termed as box filter if all the coefficients of spatial averaging filter are equal.

246. What does using a mask having central coefficient maximum and then the coefficients reducing as a function of increasing distance from origin results?
a) It results in increasing blurring in smoothing process
b) It results to reduce blurring in smoothing process

c) Nothing with blurring occurs as mask coefficient relation has no effect on smoothing process
d) None of the mentioned
View Answer

Answer: a
Explanation: Use of a mask having central coefficient maximum and then the coefficients reducing as a function of increasing distance from origin is a strategy to reduce blurring in smoothing process.

247. What is the relation between blurring effect with change in filter size?
a) Blurring increases with decrease of the size of filter size
b) Blurring decrease with decrease of the size of filter size
c) Blurring decrease with increase of the size of filter size
d) Blurring increases with increase of the size of filter size
View Answer

Answer: d
Explanation: Using a size 3 filter 3*3 and 5*5 size squares and other objects shows a significant blurring with respect to object of larger size.
The blurring gets more pronounced while using filter size 5, 9 and so on.

Digital Image Processing Questions and Answers – Smoothing Nonlinear Spatial Filter

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on “Smoonthing Nonlinear Spatial Filter”.

248. Which of the following filter(s) has the response in which the central pixel value is replaced by value defined by ranking the pixel in the image encompassed by filter?
a) Order-Statistic filters
b) Non-linear spatial filters
c) Median filter
d) All of the mentioned
View Answer

Answer: d
Explanation: An Order-Statistic filters also called non-linear spatial filters, response is based on ranking the pixel in the image encompassed by filter that replaces the central pixel value. A Median filter is an example of such filters.

249. Is it true or false that “the original pixel value is included while computing the median using gray-levels in the neighborhood of the original pixel in median filter case”?
a) True
b) False
View Answer

Answer: a
Explanation: A median filter the pixel value is replaced by median of the gray-level in the neighborhood of that pixel and also the original pixel value is included while computing the median.

250. Two filters of similar size are used for smoothing image having impulse noise. One is median filter while the other is a linear spatial filter. Which would the blurring effect of both?
a) Median filter effects in considerably less blurring than the linear spatial filters
b) Median filter effects in considerably more blurring than the linear spatial filters
c) Both have the same blurring effect
d) All of the mentioned
View Answer

Answer: a
Explanation: For impulse noise, median filter is much effective for noise reduction and causes considerably less blurring than the linear spatial filters.

251. An image contains noise having appearance as black and white dots superimposed on the image. Which of the following noise(s) has the same appearance?
a) Salt-and-pepper noise
b) Gaussian noise
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: An impulse noise has an appearance as black and white dots superimposed on the image. This is also known as Salt-and-pepper noise.

252. While performing the median filtering, suppose a 3*3 neighborhood has value (10, 20, 20, 20, 15, 20, 20, 25, 100), then what is the median value to be given to the pixel under filter?
a) 15
b) 20
c) 100
d) 25
View Answer

Answer: b
Explanation: The values are first sorted and so turns out to (10, 15, 20, 20, 20, 20, 20, 25, and 100). For a 3*3 neighborhood the 5th largest value is the median, and so is 20.

253. Which of the following are forced to the median intensity of the neighbors by n*n median filter?
a) Isolated cluster of pixels that are light or dark in comparison to their neighbors
b) Isolated cluster of pixels whose area is less than one-half the filter area
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: The isolated cluster pixel value doesn‟ t come as a median value and since are either are light or dark as compared to neighbors, so are forced with median intensity of neighbors that aren‟ t even close to their original value and so are sometimes termed “eliminated”.
If the area of such isolated pixels are < n2/2, that is again the pixel value won‟ t be a median value and so are eliminated.
Larger cluster pixels value are more pronounced to be a median value, so are considerably less forced to median intensity.

254. Which filter(s) used to find the brightest point in the image?
a) Median filter
b) Max filter
c) Mean filter
d) All of the mentioned
View Answer

Answer: b
Explanation: A max filter gives the brightest point in an image and so is used.

255. The median filter also represents which of the following ranked set of numbers?
a) 100th percentile
b) 0th percentile
c) 50th percentile
d) None of the mentioned
View Answer

Answer: c
Explanation: Since the median filter forces median intensity to the pixel which is almost the largest value in the middle of the list of values as per the ranking, so represents a 50th percentile ranked set of numbers.

256. Which of the following filter represents a 0th percentile set of numbers?
a) Max filter
b) Mean filter
c) Median filter
d) None of the mentioned
View Answer

Answer: d
Explanation: A min filter since provides the minimum value in the image, so represents a 0th percentile set of numbers.

Digital Image Processing Questions and Answers – Spatial Filtering

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Spatial Filtering".

257. In neighborhood operations working is being done with the value of image pixel in the neighborhood and the corresponding value of a subimage that has same dimension as neighborhood. The subimage is referred as _____
a) Filter
b) Mask
c) Template
d) All of the mentioned
View Answer

Answer: d
Explanation: Working in neighborhood operations is done with the value of a subimage having same dimension as neighborhood corresponding to the value in the image pixel. The subimage is called as filter, mask, template, kernel or window.

258. The response for linear spatial filtering is given by the relationship _____
a) Sum of filter coefficient‟ s product and corresponding image pixel under filter mask
b) Difference of filter coefficient‟ s product and corresponding image pixel under filter mask
c) Product of filter coefficient‟ s product and corresponding image pixel under filter mask
d) None of the mentioned
View Answer

Answer: a
Explanation: In spatial filtering the mask is moved from point to point and at each point the response is calculated using a predefined relationship. The relationship in linear spatial filtering is given by: the Sum of filter coefficient‟ s product and corresponding image pixel in area under filter mask.

259. In linear spatial filtering, what is the pixel of the image under mask corresponding to the mask coefficient w (1, -1), assuming a 3*3 mask?
a) f (x, -y)
b) f (x + 1, y)

c) f (x, y – 1)
d) f (x + 1, y – 1)
View Answer

Answer: d
Explanation: The pixel corresponding to mask coefficient (a 3*3 mask) w (0, 0) is f (x, y), and so for w (1, -1) is f (x + 1, y – 1).

260. Which of the following is/are a nonlinear operation?
a) Computation of variance
b) Computation of median
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: Computation of variance as well as median comes under nonlinear operation.

261. Which of the following is/are used as basic function in nonlinear filter for noise reduction?
a) Computation of variance
b) Computation of median
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Computation of median gray-level value in the neighborhood is the basic function of nonlinear filter for noise reduction.

262. In neighborhood operation for spatial filtering if a square mask of size n*n is used it is restricted that the center of mask must be at a distance ≥ (n – 1)/2 pixels from border of image, what happens to the resultant image?
a) The resultant image will be of same size as original image
b) The resultant image will be a little larger size than original image
c) The resultant image will be a little smaller size than original image
d) None of the mentioned
View Answer

Answer: c
Explanation: If the center of mask must be at a distance ≥ (n – 1)/2 pixels from border of image, the border pixels won‟ t get processed under mask and so the resultant image would be of smaller size.

263. Which of the following method is/are used for padding the image?
a) Adding rows and column of 0 or other constant gray level
b) Simply replicating the rows or columns

c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: In neighborhood operation for spatial filtering using square mask, padding of original image is done to obtain filtered image of same size as of original image done, by adding rows and column of 0 or other constant gray level or by replicating the rows or columns of the original image.

264. In neighborhood operation for spatial filtering using square mask of n*n, which of the following approach is/are used to obtain a perfectly filtered result irrespective of the size?
a) By padding the image
b) By filtering all the pixels only with the mask section that is fully contained in the image
c) By ensuring that center of mask must be at a distance ≥ (n – 1)/2 pixels from border of image
d) None of the mentioned
View Answer

Answer: c
Explanation: By ensuring that center of mask must be at a distance ≥ (n – 1)/2 pixels from border of image, the resultant image would be of smaller size but all the pixels would be the result of the filter processing and so is a fully filtered result.
In the other approach like padding affect the values near the edges that gets more prevalent with mask size increase, while the another approach results in the band of pixels near border that gets processed with partial filter mask. So, not a fully filtered case.

Digital Image Processing Questions and Answers – Filtering in Frequency Domain

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on “Filtering in Frequency Domain”.

265. Which of the following fact(s) is/are true for the relationship between low frequency component of Fourier transform and the rate of change of gray levels?
a) Moving away from the origin of transform the low frequency corresponds to smooth gray level variation
b) Moving away from the origin of transform the low frequencies corresponds to abrupt change in gray level
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: Moving away from the origin of transform the low frequency corresponds to the slowly varying components in an image. Moving further away from origin the higher frequencies corresponds to faster gray level changes.

266. Which of the following fact(s) is/are true for the relationship between high frequency component of Fourier transform and the rate of change of gray levels?
a) Moving away from the origin of transform the high frequency corresponds to smooth gray level variation
b) Moving away from the origin of transform the higher frequencies corresponds to abrupt change in gray level
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Moving away from the origin of transform the low frequency corresponds to the slowly varying components in an image. Moving further away from origin the higher frequencies corresponds to faster gray level changes.

267. What is the name of the filter that multiplies two functions F(u, v) and H(u, v), where F has complex components too since is Fourier transformed function of f(x, y), in an order that each component of H multiplies both real and complex part of corresponding component in F?
a) Unsharp mask filter
b) High-boost filter
c) Zero-phase-shift-filter
d) None of the mentioned
View Answer

Answer: c
Explanation: Zero-phase-shift-filter multiplies two functions F(u, v) and H(u, v), where F has complex components too since is Fourier transformed function of f(x, y), in an order that each component of H multiplies both real and complex part of corresponding component in F.

268. To set the average value of an image zero, which of the following term would be set 0 in the frequency domain and the inverse transformation is done, where F(u, v) is Fourier transformed function of f(x, y)?
a) F(0, 0)
b) F(0, 1)
c) F(1, 0)
d) None of the mentioned
View Answer

Answer: a
Explanation: For an image f(x, y), the Fourier transform at origin of an image, F(0, 0), is equal to the average value of the image.

269. What is the name of the filter that is used to turn the average value of a processed image zero?
a) Unsharp mask filter
b) Notch filter
c) Zero-phase-shift-filter
d) None of the mentioned
View Answer

Answer: b
Explanation: Notch filter sets F (0, 0), to zero, hence setting up the average value of image zero. The filter is named so, because it is a constant function with a notch at origin and so is able to set F (0, 0) to zero leaving out other values.

270. Which of the following filter(s) attenuates high frequency while passing low frequencies of an image?
a) Unsharp mask filter
b) Lowpass filter
c) Zero-phase-shift filter
d) All of the mentioned
View Answer

Answer: b
Explanation: A lowpass filter attenuates high frequency while passing low frequencies.

271. Which of the following filter(s) attenuates low frequency while passing high frequencies of an image?
a) Unsharp mask filter
b) Highpass filter
c) Zero-phase-shift filter
d) All of the mentioned
View Answer

Answer: b
Explanation: A highpass filter attenuates low frequency while passing high frequencies.

272. Which of the following filter have a less sharp detail than the original image because of attenuation of high frequencies?
a) Highpass filter
b) Lowpass filter
c) Zero-phase-shift filter
d) None of the mentioned
View Answer

Answer: b
Explanation: A lowpass filter attenuates high so the image has less sharp details.

273. The feature(s) of a highpass filtered image is/are _____
a) Have less gray-level variation in smooth areas
b) Emphasized transitional gray-level details
c) An overall sharper image
d) All of the mentioned
View Answer

Answer: d
Explanation: A highpass filter attenuates low frequency so have less gray-level variation in smooth areas, and allows high frequencies so have emphasized transitional gray-level details, resulting in a sharper image.

274. A spatial domain filter of the corresponding filter in frequency domain can be obtained by applying which of the following operation(s) on filter in frequency domain?
a) Fourier transform
b) Inverse Fourier transform
c) None of the mentioned
d) All of the mentioned
View Answer

Answer: b
Explanation: Filters in spatial domain and frequency domain has a Fourier transform pair relation. A spatial domain filter of the corresponding filter in frequency domain can be obtained by applying inverse Fourier transform on frequency domain filter.

275. A frequency domain filter of the corresponding filter in spatial domain can be obtained by applying which of the following operation(s) on filter in spatial domain?
a) Fourier transform
b) Inverse Fourier transform
c) None of the mentioned
d) All of the mentioned
View Answer

Answer: a
Explanation: Filters in spatial domain and frequency domain has a Fourier transform pair relation. A frequency domain filter of the corresponding filter in spatial domain can be obtained by applying inverse Fourier transform on spatial domain filter.

276. Which of the following filtering is done in frequency domain in correspondence to lowpass filtering in spatial domain?
a) Gaussian filtering
b) Unsharp mask filtering
c) High-boost filtering
d) None of the mentioned
View Answer

Answer: a
Explanation: A plot of Gaussian filter in frequency domain can be recognized similar to lowpass filter in spatial domain.

277. Using the feature of reciprocal relationship of filter in spatial domain and corresponding filter in frequency domain, which of the following fact is true?
a) The narrower the frequency domain filter results in increased blurring
b) The wider the frequency domain filter results in increased blurring
c) The narrower the frequency domain filter results in decreased blurring
d) None of the mentioned
View Answer

Answer: a
Explanation: The characteristics feature of reciprocal relationship says that the narrower the frequency domain filter becomes it attenuates more low frequency component and so increases blurring.

Digital Image Processing Questions and Answers – Smoothing Frequency-Domain Filters

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Smoothing Frequency-Domain Filters".

278. Smoothing in frequency domain is achieved by attenuating which of the following component in the transform of a given image?
a) Attenuating a range of high-frequency components
b) Attenuating a range of low-frequency components
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: Since, edges and sharp transitions contribute significantly to high-frequency contents in the gray level of an image. So, smoothing is done by attenuating a range of high-frequency components.

279. Which of the following is/are considered as type(s) of lowpass filters?
a) Ideal
b) Butterworth

c) Gaussian
d) All of the mentioned
View Answer

Answer: d
Explanation: Lowpass filters are considered of three types: Ideal, Butterworth, and Gaussian.

280. Which of the following lowpass filters is/are covers the range of very sharp filter function?
a) Ideal lowpass filters
b) Butterworth lowpass filter
c) Gaussian lowpass filter
d) All of the mentioned
View Answer

Answer: a
Explanation: Ideal lowpass filter covers the range of very sharp filter functioning of lowpass filters.

281. Which of the following lowpass filters is/are covers the range of very smooth filter function?
a) Ideal lowpass filters
b) Butterworth lowpass filter
c) Gaussian lowpass filter
d) All of the mentioned
View Answer

Answer: a
Explanation: Gaussian lowpass filter covers the range of very smooth filter functioning of lowpass filters.

282. Butterworth lowpass filter has a parameter, filter order, determining its functionality as very sharp or very smooth filter function or an intermediate filter function. If the parameter value is very high, the filter approaches to which of the following filter(s)?
a) Ideal lowpass filter
b) Gaussian lowpass filter
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: For high value of filter order Butterworth lowpass filter behaves as Ideal lowpass filter, while for lower order value it has a smoother form behaving like Gaussian lowpass filter.

283. Butterworth lowpass filter has a parameter, filter order, determining its functionality as very sharp or very smooth filter function or an intermediate filter function. If the parameter value is of lower order, the filter approaches to which of the following filter(s)?

a) Ideal lowpass filter
b) Gaussian lowpass filter
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: For high value of filter order Butterworth lowpass filter behaves as Ideal lowpass filter, while for lower order value it has a smoother form behaving like Gaussian lowpass filter.

284. In a filter, all the frequencies inside a circle of radius D0 are not attenuated while all frequencies outside circle are completely attenuated. The D0 is the specified nonnegative distance from origin of the Fourier transform. Which of the following filter(s) characterizes the same?
a) Ideal filter
b) Butterworth filter
c) Gaussian filter
d) All of the mentioned
View Answer

Answer: a
Explanation: In ideal filter all the frequencies inside a circle of radius D0 are not attenuated while all frequencies outside the circle are completely attenuated.

285. In an ideal lowpass filter case, what is the relation between the filter radius and the blurring effect caused because of the filter?
a) Filter size is directly proportional to blurring caused because of filter
b) Filter size is inversely proportional to blurring caused because of filter
c) There is no relation between filter size and blurring caused because of it
d) None of the mentioned
View Answer

Answer: b
Explanation: Increase in filter size, removes less power from the image and so less severe blurring occurs.

286. The characteristics of the lowpass filter h(x, y) is/are_____
a) Has a dominant component at origin
b) Has a concentric, circular components about the center component
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: the lowpass filter has two different characteristics: one is a dominant component at origin and other one is a concentric, circular components about the center component.

287. What is the relation for the components of ideal lowpass filter and the image enhancement?
a) The concentric component is primarily responsible for blurring
b) The center component is primarily for the ringing characteristic of ideal filter
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: d
Explanation: The center component of ideal lowpass filter is primarily responsible for blurring while, concentric component is primarily for the ringing characteristic of ideal filter.

288. Using the feature of reciprocal relationship of filter in spatial domain and corresponding filter in frequency domain along with convolution, which of the following fact is true?
a) The narrower the frequency domain filter more severe is the ringing
b) The wider the frequency domain filter more severe is the ringing
c) The narrower the frequency domain filter less severe is the ringing
d) None of the mentioned
View Answer

Answer: a
Explanation: The characteristics feature of reciprocal relationship says that the narrower the frequency domain filter becomes it attenuates more low frequency component and so increases blurring and more severe becomes the ringing.

289. Which of the following defines the expression for BLPF H(u, v) of order n, where D(u, v) is the distance from point (u, v), D0 is the distance defining cutoff frequency?
a) $H(u,v) = \frac{1}{1+[\frac{D(u,v)}{D_0}]^{2n}}$
b) $H(u,v) = \begin{cases} 1, \text{if } D(u,v) \leq D_0 \\ 0, \text{if } D(u,v) > D_0 \end{cases}$
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: BLPF is the Butterworth lowpass filter and is defined as:
$H(u,v) = \frac{1}{1+[\frac{D(u,v)}{D_0}]^{2n}}$.

289. Which of the following defines the expression for ILPF H(u, v) of order n, where D(u, v) is the distance from point (u, v), D0 is the distance defining cutoff frequency?
a) $H(u,v) = \frac{1}{1+[\frac{D(u,v)}{D_0}]^{2n}}$

b) $H(u,v)=\begin{cases}1, \text{if } D(u,v) \le D_0 \\ 0, \text{if } D(u,v) > D_0\end{cases}$
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: ILPF is the Ideal lowpass filter and is defined as:

$$H(u,v)=\begin{cases}1, \text{if } D(u,v) \le D_0 \\ 0, \text{if } D(u,v) > D_0\end{cases}$$

.

290. State the statement true or false: "BLPF has sharp discontinuity and ILPF doesn‟ t, and so ILPF establishes a clear cutoff b/w passed and filtered frequencies".
a) True
b) False
View Answer

Answer: b
Explanation: ILPF has sharp discontinuity and BLPF doesn‟ t, so BLPF establishes a clear cutoff b/w passed and filtered frequencies.

291. A Butterworth filter of what order has no ringing?
a) 1
b) 2
c) 3
d) 4
View Answer

Answer: a
Explanation: A Butterworth filter of order 1 has no ringing and ringing exist for order 2 although is imperceptible. A Butterworth filter of higher order shows significant factor of ringing.

Digital Image Processing Questions and Answers – Unsharp Masking, High-boost filtering and Emphasis Filtering

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Unsharp Masking, High-boost filtering and Emphasis Filtering".

292. In frequency domain terminology, which of the following is defined as "obtaining a highpass filtered image by subtracting from the given image a lowpass filtered version of itself"?
a) Emphasis filtering
b) Unsharp masking
c) Butterworth filtering
d) None of the mentioned
View Answer

Answer: b
Explanation: In frequency domain terminology unsharp masking is defined as "obtaining a highpass filtered image by subtracting from the given image a lowpass filtered version of itself".

293. Which of the following is/ are a generalized form of unsharp masking?
a) Lowpass filtering
b) High-boost filtering
c) Emphasis filtering
d) All of the mentioned
View Answer

Answer: b
Explanation: Unsharp masking is defined as "obtaining a highpass filtered image by subtracting from the given image a lowpass filtered version of itself" while high-boost filtering generalizes it by multiplying the input image by a constant, say $A \geq 1$.

294. High boost filtered image is expressed as: $f_{hb} = A\, f(x, y) – f_{lp}(x, y)$, where f(x, y) the input image, A is a constant and $f_{lp}(x, y)$ is the lowpass filtered version of f(x, y). Which of the following fact validates if A=1?
a) High-boost filtering reduces to regular Highpass filtering
b) High-boost filtering reduces to regular Lowpass filtering
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: High boost filtered image is modified as: $f_{hb} = (A-1)\, f(x, y) + f(x, y) – f_{lp}(x, y)$
i.e. $f_{hb} = (A-1)\, f(x, y) + f_{hp}(x, y)$. So, when A=1, High-boost filtering reduces to regular Highpass filtering.

295. High boost filtered image is expressed as: $f_{hb} = A\, f(x, y) – f_{lp}(x, y)$, where f(x, y) the input image, A is a constant and $f_{lp}(x, y)$ is the lowpass filtered version of f(x, y). Which of the following fact(s) validates if A increases past 1?
a) The contribution of the image itself becomes more dominant
b) The contribution of the highpass filtered version of image becomes less dominant
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: High boost filtered image is modified as: f_{hb} = (A-1) f(x, y) +f(x, y) – f_{lp}(x, y) i.e. f_{hb} = (A-1) f(x, y) + f_{hp}(x, y). So, when A>1, the contribution of the image itself becomes more dominant over the highpass filtered version of image.

296. If, $F_{hp}(u, v)=F(u, v) – F_{lp}(u, v)$ and $F_{lp}(u, v) = H_{lp}(u, v)F(u, v)$, where F(u, v) is the image in frequency domain with F_{hp}(u, v) its highpass filtered version, F_{lp}(u, v) its lowpass filtered component and H_{lp}(u, v) the transfer function of a lowpass filter. Then, unsharp masking can be implemented directly in frequency domain by using a filter. Which of the following is the required filter?
a) $H_{hp}(u, v) = H_{lp}(u, v)$
b) $H_{hp}(u, v) = 1 + H_{lp}(u, v)$
c) $H_{hp}(u, v) = – H_{lp}(u, v)$
d) $H_{hp}(u, v) = 1 – H_{lp}(u, v)$
View Answer

Answer: d
Explanation: Unsharp masking can be implemented directly in frequency domain by using a composite filter: $H_{hp}(u, v) = 1 – H_{lp}(u, v)$.

297. Unsharp masking can be implemented directly in frequency domain by using a filter: $H_{hp}(u, v) = 1 – H_{lp}(u, v)$, where H_{lp}(u, v) the transfer function of a lowpass filter. What kind of filter is H_{hp}(u, v)?
a) Composite filter
b) M-derived filter
c) Constant k filter
d) None of the mentioned
View Answer

Answer: a
Explanation: Unsharp masking can be implemented directly in frequency domain by using a composite filter: $H_{hp}(u, v) = 1 – H_{lp}(u, v)$.

298. If unsharp masking can be implemented directly in frequency domain by using a composite filter: $H_{hp}(u, v) = 1 – H_{lp}(u, v)$, where H_{lp}(u, v) the transfer function of a lowpass filter. Then, the composite filter for High-boost filtering is _____
a) $H_{hb}(u, v) = 1 – H_{hp}(u, v)$
b) $H_{hb}(u, v) = 1 + H_{hp}(u, v)$
c) $H_{hb}(u, v) = (A-1) – H_{hp}(u, v)$, A is a constant
d) $H_{hb}(u, v) = (A-1) + H_{hp}(u, v)$, A is a constant
View Answer

Answer: d
Explanation: For given composite filter of unsharp masking $H_{hp}(u, v) = 1 – H_{lp}(u, v)$, the composite filter for High-boost filtering is $H_{hb}(u, v) = (A-1) + H_{hp}(u, v)$.

299. The frequency domain Laplacian is closer to which of the following mask?
a) Mask that excludes the diagonal neighbors
b) Mask that excludes neighbors in 4-adjacancy
c) Mask that excludes neighbors in 8-adjacancy
d) None of the mentioned
View Answer

Answer: a
Explanation: The frequency domain Laplacian is closer to mask that excludes the diagonal neighbors.

300. To accentuate the contribution to enhancement made by high-frequency components, which of the following method(s) should be more appropriate to apply?
a) Multiply the highpass filter by a constant
b) Add an offset to the highpass filter to prevent eliminating zero frequency term by filter
c) All of the mentioned combined and applied
d) None of the mentioned
View Answer

Answer: c
Explanation: To accentuate the contribution to enhancement made by high-frequency components, we have to multiply the highpass filter by a constant and add an offset to the highpass filter to prevent eliminating zero frequency term by filter.

301. A process that accentuate the contribution to enhancement made by high-frequency components, by multiplying the highpass filter by a constant and adding an offset to the highpass filter to prevent eliminating zero frequency term by filter is known as _____
a) Unsharp masking
b) High-boost filtering
c) High frequency emphasis
d) None of the mentioned
View Answer

Answer: c
Explanation: High frequency emphasis is the method that accentuate the contribution to enhancement made by high-frequency component. In this we multiply the highpass filter by a constant and add an offset to the highpass filter to prevent eliminating zero frequency term by filter.

302. Which of the following a transfer function of High frequency emphasis $\{H_{hfe}(u, v)\}$ for $H_{hp}(u, v)$ being the highpass filtered version of image?
a) $H_{hfe}(u, v) = 1 – H_{hp}(u, v)$
b) $H_{hfe}(u, v) = a – H_{hp}(u, v)$, $a \geq 0$
c) $H_{hfe}(u, v) = 1 – b\ H_{hp}(u, v)$, $a \geq 0$ and $b > a$
d) $H_{hfe}(u, v) = a + b\ H_{hp}(u, v)$, $a \geq 0$ and $b > a$
View Answer

Answer: d
Explanation: The transfer function of High frequency emphasis is given as:$H_{hfe}(u, v) = a + b H_{hp}(u, v)$, a≥0 and b>a.

303. The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$, for $H_{hp}(u, v)$ being the highpass filtered version of image,a≥0 and b>a. for certain values of a and b it reduces to High-boost filtering. Which of the following is the required value?
a) a = (A-1) and b = 0,A is some constant
b) a = 0 and b = (A-1),A is some constant
c) a = 1 and b = 1
d) a = (A-1) and b =1,A is some constant
View Answer

Answer: d
Explanation: The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$ and the transfer function for High-boost filtering is $H_{hb}(u, v) = (A-1) + H_{hp}(u, v)$, A being some constant. So, for a = (A-1) and b =1, $H_{hfe}(u, v) = H_{hb}(u, v)$.

304. The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$, for $H_{hp}(u, v)$ being the highpass filtered version of image,a≥0 and b>a. What happens when b increases past 1?
a) The high frequency are emphasized
b) The low frequency are emphasized
c) All frequency are emphasized
d) None of the mentioned
View Answer

Answer: a
Explanation: The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$, for $H_{hp}(u, v)$ being the highpass filtered version of image,a≥0 and b>a. When b increases past 1, the high frequency are emphasized.

305. The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$, for $H_{hp}(u, v)$ being the highpass filtered version of image,a≥0 and b>a. When b increases past 1 the filtering process is specifically termed as_____
a) Unsharp masking
b) High-boost filtering
c) Emphasized filtering
d) None of the mentioned
View Answer

Answer: c
Explanation: The transfer function of High frequency emphasis is given as: $H_{hfe}(u, v) = a + b H_{hp}(u, v)$, for $H_{hp}(u, v)$ being the highpass filtered version of image,a≥0 and b>a. When b increases past 1, the high frequency are emphasized and so the filtering process is better known as Emphasized filtering.

306. Validate the statement “Because of High frequency emphasis the gray-level tonality due to low frequency components is not lost”.
a) True
b) False
View Answer

Answer: a
Explanation: Because of High frequency emphasis the gray-level tonality due to low frequency components is not lost.

Digital Image Processing Questions and Answers – Homomorphic filtering

This set of Digital Image Processing Questions and Answers for Campus interviews focuses on “Homomorphic filtering-2”.

307. Which of the following fact is true for a image?
a) An image is the addition of illumination and reflectance component
b) An image is the subtraction of illumination component from reflectance component
c) An image is the subtraction of reflectance component from illumination component
d) An image is the multiplication of illumination and reflectance component
View Answer

Answer: d
Explanation: An image is expressed as the multiplication of illumination and reflectance component.

308. If an image is expressed as the multiplication of illumination and reflectance component i.e. f(x, y)= i(x, y) * r(x, y), then Validate the statement “We can directly use the equation f(x, y)= i(x, y) * r(x, y) to operate separately on the frequency component of illumination and reflectance” .
a) True
b) False
View Answer

Answer: b
Explanation: For an image is expressed as the multiplication of illumination and reflectance component i.e. f(x, y)= i(x, y) * r(x, y), the equation can‟ t be used directly to operate separately on the frequency component of illumination and reflectance because the Fourier transform of the product of two function is not separable.

309. In Homomorphic filtering which of the following operations is used to convert input image to discrete Fourier transformed function?
a) Logarithmic operation
b) Exponential operation
c) Negative transformation
d) None of the mentioned
View Answer

Answer: a
Explanation: For an image is expressed as the multiplication of illumination and reflectance component i.e. f(x, y) = i(x, y) * r(x, y), the equation can‟ t be used directly to operate separately on the frequency component of illumination and reflectance because the Fourier transform of the product of two function is not separable. So, the logarithmic operation is used.I{z(x,y)}=I{ln(f(x,y)) }=I{ln(i(x,y)) }+I{ln(r(x,y))}.

310. A class of system that achieves the separation of illumination and reflectance component of an image is termed as _____
a) Base class system
b) Homomorphic system
c) Base separation system
d) All of the mentioned
View Answer

Answer: b
Explanation: Homomorphic system is a class of system that achieves the separation of illumination and reflectance component of an image.

311. Which of the following image component is characterized by a slow spatial variation?
a) Illumination component
b) Reflectance component
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: The illumination component of an image is characterized by a slow spatial variation.

312. Which of the following image component varies abruptly particularly at the junction of dissimilar objects?
a) Illumination component
b) Reflectance component
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: The reflectance component of an image varies abruptly particularly at the junction of dissimilar objects.

313. The reflectance component of an image varies abruptly particularly at the junction of dissimilar objects. The characteristic lead to associate illumination with _____
a) The low frequency of Fourier transform of logarithm of the image
b) The high frequency of Fourier transform of logarithm of the image
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: The reflectance component of an image varies abruptly, so, is associated with the high frequency of Fourier transform of logarithm of the image.

314. The illumination component of an image is characterized by a slow spatial variation. The characteristic lead to associate illumination with _____
a) The low frequency of Fourier transform of logarithm of the image
b) The high frequency of Fourier transform of logarithm of the image
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: The illumination component of an image is characterized by a slow spatial variation, so, is associated with the low frequency of Fourier transform of logarithm of the image.

315. If the contribution made by illumination component of image is decreased and the contribution of reflectance component is amplified, what will be the net result?
a) Dynamic range compression
b) Contrast enhancement
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: The illumination component of an image is characterized by a slow spatial variation and the reflectance component of an image varies abruptly particularly at the junction of dissimilar objects, so, if the contribution made by illumination component of image is decreased and the contribution of reflectance component is amplified then there is simultaneous dynamic range compression and contrast stretching.

Digital Image Processing Questions and Answers – Intensity Transformation Functions

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Intensity Transformation Functions".

316. How is negative of an image obtained with intensity levels [0,L-1] with "r" and "s" being pixel values?
a) s = L – 1 + r
b) s = L – 1 – r
c) s = L + 1 + r
d) s = L + 1 + r
View Answer

Answer: b
Explanation: The negative is obtained using s = L – 1 + r.

317. The general form of log transformations is _____
a) s = c.log(1 + r)
b) s = c+log(1 + r)
c) s = c.log(1 – r)
d) s = c-log(1 – r)
View Answer

Answer: a
Explanation: s = c.log(1 + r) is the log transformation.

318. Power-law transformations has the basic form of_____where c and Δ are constants.
a) $s = c + r^{\Delta}$
b) $s = c – r^{\Delta}$
c) $s = c * r^{\Delta}$
d) s = c / r.Δ
View Answer

Answer: c
Explanation: $s = c * r^{\Delta}$ is called the Power-law transformation.

319. For what value of the output must the Power-law transformation account for offset?
a) No offset needed

b) All values
c) One
d) Zero
View Answer

Answer: d
Explanation: When the output is Zero, an offset is necessary.

320. What is Gamma Correction?
a) A Power-law response phenomenon
b) Inverted Intensity curve
c) Light brightness variation
d) None of the Mentioned
View Answer

Answer: a
Explanation: The exponent in Power-law is called gamma and the process used to correct the response of Power-law transformation is called Gamma Correction.

321. 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
Explanation: Contrast sketching is the process used to expand intensity levels in an image.

322. 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
View Answer

Answer: c
Explanation: Highlighting a specific range of intensities of an image is called Intensity Slicing.

323. 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
View Answer

Answer: c
Explanation: It is called Bit-plane slicing.

324. Which of the following involves reversing the intensity levels of an image?
a) Log Transformations
b) Piecewise Linear Transformations
c) Image Negatives
d) None of the Mentioned
View Answer

Answer: c
Explanation: Image negatives use reversing intensity levels.

325. Piecewise Linear Transformation function involves which of the following?
a) Bit-plane slicing
b) Intensity level slicing
c) Contrast stretching
d) All of the Mentioned
View Answer

Answer: d
Explanation: Piecewise Linear Transformation function involves all the mentioned functions.

Digital Image Processing Questions and Answers – Fuzzy Techniques – Transformations and Filtering

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Fuzzy Techniques – Transformations and Filtering".

326. What is the set generated using infinite-value membership functions, called?
a) Crisp set
b) Boolean set
c) Fuzzy set
d) All of the mentioned
View Answer

Answer: c
Explanation: It is called fuzzy set.

327. Which is the set, whose membership only can be true or false, in bi-values Boolean logic?
a) Boolean set
b) Crisp set
c) Null set
d) None of the mentioned
View Answer

Answer: b
Explanation: The so called Crisp set is the one in which membership only can be true or false, in bi-values Boolean logic.

328. If Z is a set of elements with a generic element z, i.e. Z = {z}, then this set is called _____
a) Universe set
b) Universe of discourse
c) Derived set
d) None of the mentioned
View Answer

Answer: b
Explanation: It is called the universe of discourse.

329. A fuzzyset „A" in Z is characterized by a_____that associates with element of Z, a real number in the interval [0, 1].
a) Grade of membership
b) Generic element
c) Membership function
d) None of the mentioned
View Answer

Answer: c
Explanation: A fuzzy set is characterized by a membership function.

330. A fuzzy set is_____if and only if membership function is identically zero in Z.
a) Empty
b) Subset
c) Complement
d) None of the mentioned
View Answer

Answer: a
Explanation: It is called an Empty set.

331. Which of the following is a type of Membership function?
a) Triangular
b) Trapezoidal
c) Sigma
d) All of the mentioned
View Answer

Answer: d
Explanation: All of them are types of Membership functions.

332. Which of the following is not a type of Membership function?
a) S-shape
b) Bell shape
c) Truncated Gaussian
d) None of the mentioned
View Answer

Answer: d
Explanation: All of the mentioned above are types of Membership functions.

333. Using IF-THEN rule to create the output of fuzzy system is called_____.
a) Inference
b) Implication
c) Both the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: It is called Inference or Implication.

334. What is the independent variable of fuzzy output?
a) Maturity
b) Membership
c) Generic Element
d) None of the mentioned
View Answer

Answer: a
Explanation: Maturity is the independent variable of fuzzy output.

335. Which of the following is not a principle step in fuzzy technique?
a) Fuzzify input
b) Apply implication method
c) Defuzzify final output
d) None of the mentioned
View Answer

Answer: d
Explanation: All of the mentioned above are key steps in fuzzy technique.

Digital Image Processing Questions and Answers – Piecewise-Linear Transformation Functions

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Piecewise-Linear Transformation Functions".

336. Which gray-level transformation increase the dynamic range of gray-level in the image?
a) Power-law transformations
b) Negative transformations
c) Contrast stretching
d) None of the mentioned
View Answer

Answer: c
Explanation: Increasing the dynamic range of gray-levels in the image is the basic idea behind contrast stretching.

337. When is the contrast stretching transformation a linear function, for r and s as gray-value of image before and after processing respectively?
a) $r_1 = s_1$ and $r_2 = s_2$
b) $r_1 = r_2$, $s_1 = 0$ and $s_2 = L – 1$, L is the max gray value allowed
c) $r_1 = 1$ and $r_2 = 0$
d) None of the mentioned
View Answer

Answer: a
Explanation: If $r_1 = s_1$ and $r_2 = s_2$ the contrast stretching transformation is a linear function.

338. When is the contrast stretching transformation a thresholding function, for r and s as gray-value of image before and after processing respectively?
a) $r_1 = s_1$ and $r_2 = s_2$
b) $r_1 = r_2$, $s_1 = 0$ and $s_2 = L – 1$, L is the max gray value allowed
c) $r_1 = 1$ and $r_2 = 0$
d) None of the mentioned
View Answer

Answer: b
Explanation: If $r_1 = r_2$, $s_1 = 0$ and $s_2 = L - 1$, the contrast stretching transformation is a thresholding function.

339. What condition prevents the intensity artifacts to be created while processing with contrast stretching, if r and s are gray-values of image before and after processing respectively?
a) $r_1 = s_1$ and $r_2 = s_2$
b) $r_1 = r_2$, $s_1 = 0$ and $s_2 = L - 1$, L is the max gray value allowed
c) $r_1 = 1$ and $r_2 = 0$
d) $r_1 \leq r_2$ and $s_1 \leq s_2$
View Answer

Answer: d
Explanation: While processing through contrast stretching, if $r_1 \leq r_2$ and $s_1 \leq s_2$ is maintained, the function remains single valued and so monotonically increasing. This helps in the prevention of creation of intensity artifacts.

340. A contrast stretching result been obtained by setting $(r_1, s_1) = (r_{min}, 0)$ and $(r_2, s_2) = (r_{max}, L - 1)$, where, r and s are gray-values of image before and after processing respectively, L is the max gray value allowed and r_{max} and r_{min} are maximum and minimum gray-values in image respectively. What should we term the transformation function if $r_1 = r_2 = m$, some mean gray-value.
a) Linear function
b) Thresholding function
c) Intermediate function
d) None of the mentioned
View Answer

Answer: b
Explanation: From $(r_1, s_1) = (r_{min}, 0)$ and $(r_2, s_2) = (r_{max}, L - 1)$, we have $s_1 = 0$ and $s_2 = L - 1$ and if $r_1 = r_2 = m$ is set then the result becomes $r_1 = r_2$, $s_1 = 0$ and $s_2 = L - 1$, i.e. a thresholding function.

341. A specific range of gray-levels highlighting is the basic idea of _____
a) Contrast stretching
b) Bit –plane slicing
c) Thresholding
d) Gray-level slicing
View Answer

Answer: d
Explanation: gray-level slicing is being done by two approach: One approach is to give all gray level of a specific range high value and a low value to all other gray levels.
Second approach is to brighten the pixels gray-value of interest and preserve the background.
I.e. in both highlighting of a specific range of gray-level is been done.

342. What is/are the approach(s) of the gray-level slicing?
a) To give all gray level of a specific range high value and a low value to all other gray levels
b) To brighten the pixels gray-value of interest and preserve the background
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: There are basically two approach of gray-level slicing:
One approach is to give all gray level of a specific range high value and a low value to all other gray levels.
Second approach is to brighten the pixels gray-value of interest and preserve the background.

343. Which of the following transform produces a binary image after processing?
a) Contrast stretching
b) Gray-level slicing
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: The approach of gray-level slicing "to give all gray level of a specific range high value and a low value to all other gray levels" produces a binary image.
One of the transformation in Contrast stretching darkens the value of r (input image gray-level) below m (some predefined gray-value) and brightens the value of r above m, giving a binary image as result.

344. Specific bit contribution in the image highlighting is the basic idea of _____
a) Contrast stretching
b) Bit –plane slicing
c) Thresholding
d) Gray-level slicing
View Answer

Answer: b
Explanation: Bit-plane slicing highlights the contribution of specific bits made to total image, instead of highlighting a specific gray-level range.

345. In bit-plane slicing if an image is represented by 8 bits and is composed of eight 1-bit plane, with plane 0 showing least significant bit and plane 7 showing most significant bit. Then, which plane(s) contain the majority of visually significant data.
a) Plane 4, 5, 6, 7
b) Plane 0, 1, 2, 3
c) Plane 0
d) Plane 2, 3, 4, 5
View Answer

Answer: a
Explanation: In bit-plane slicing, for the given data, the higher-ordered bits (mostly top four) contains most of the data visually signified.

Digital Image Processing Questions and Answers – Gaussain Lowpass and Sharpening Frequency Domain Filters

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Gaussain Lowpass and Sharpening Frequency Domain Filters".

346. If the Gaussian filter is expressed as $H(u, v) = e^{(-D2\ (u,v)/2D_0^2)}$,where D(u, v) is the distance from point(u, v), D_0 is the distance defining cutoff frequency, then for what value of D(u, v) the filter is down to 0.607 of its maximum value?
a) $D(u, v) = D_0$
b) $D(u, v) = D_0^2$
c) $D(u, v) = D_0^3$
d) D(u, v) = 0
View Answer

Answer: a
Explanation: For the given Gaussian filter of 2-D image, the value $D(u, v) = D_0$ gives the filter a down to 0.607 of its maximum value.

347. State the statement as true or false. "The GLPF did produce as much smoothing as the BLPF of order 2 for the same value of cutoff frequency".
a) True
b) False
View Answer

Answer: b
Explanation: For the same value of cutoff frequency, the GLPF did not produce as much smoothing as the BLPF of order 2, because the profile of GLPF is not as tight as BLPF of order 2.

348. In general, which of the following assures of no ringing in the output?
a) Gaussian Lowpass Filter
b) Ideal Lowpass Filter
c) Butterworth Lowpass Filter
d) All of the mentioned
View Answer

Answer: a
Explanation: Using Gaussian Lowpass Filter no ringing is assured, but Ideal Lowpass Filter and Butterworth Lowpass Filter of order 2and more produces significant ringing.

349. The lowpass filtering process can be applied in which of the following area(s)?
a) The field of machine perception, with application of character recognition
b) In field of printing and publishing industry
c) In field of processing satellite and aerial images
d) All of the mentioned
View Answer

Answer: d
Explanation: In case of broken characters recognition system, LPF is used. LPF is used as preprocessing system in printing and publishing industry, and in case of remote sensed images LPF is used to blur out as much detail as possible leaving the large feature recognizable.

350. The edges and other abrupt changes in gray-level of an image are associated with_____
a) High frequency components
b) Low frequency components
c) Edges with high frequency and other abrupt changes in gray-level with low frequency components
d) Edges with low frequency and other abrupt changes in gray-level with high frequency components
View Answer

Answer: a
Explanation: High frequency components are related with the edges and other abrupt changes in gray-level of an image.

351. A type of Image is called as VHRR image. What is the definition of VHRR image?
a) Very High Range Resolution image
b) Very High Resolution Range image
c) Very High Resolution Radiometer image
d) Very High Range Radiometer Image
View Answer

Answer: c
Explanation: A VHRR image is a Very High Resolution Radiometer Image.

352. The Image sharpening in frequency domain can be achieved by which of the following method(s)?
a) Attenuating the high frequency components
b) Attenuating the low-frequency components
c) All of the mentioned

d) None of the mentioned
View Answer

Answer: b
Explanation: The Image sharpening in frequency domain is achieved by attenuating the low-frequency components without disturbing the high-frequency components.

353. The function of filters in Image sharpening in frequency domain is to perform reverse operation of which of the following Lowpass filter?
a) Gaussian Lowpass filter
b) Butterworth Lowpass filter
c) Ideal Lowpass filter
d) None of the Mentioned
View Answer

Answer: c
Explanation: The function of filters in Image sharpening in frequency domain is to perform precisely reverse operation of Ideal Lowpass filter.
The transfer function of Highpass filter is obtained by relation: $H_{hp}(u, v) = 1 – H_{lp}(u, v)$, where $H_{lp}(u, v)$ is transfer function of corresponding lowpass filter.

354. If D_0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v). Then what value does an Ideal Highpass filter will give if $D(u, v) \leq D0$ andif$D(u, v) > D0$?
a) 0 and 1 respectively
b) 1 and 0 respectively
c) 1 in both case
d) 0 in both case
View Answer

Answer: a
Explanation: Unlike Ideal lowpass filter, an Ideal highpass filter attenuates the low-frequency components and so gives 0 for $D(u, v) \leq D_0$ and 1 for $D(u, v) > D_0$.

355. What is the relation of the frequencies to a circle of radius D_0, where D_0 is the cutoff distance measured from origin of frequency rectangle, for an Ideal Highpass filter?
a) IHPF sets all frequencies inside circle to zero
b) IHPF allows all frequencies, without attenuating, outside the circle
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: c
Explanation: An Ideal high pass filter gives 0 for $D(u, v) \leq D_0$ and 1 for $D(u, v) > D_0$.

356. Which of the following is the transfer function of the Butterworth Highpass Filter, of order n, D_0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the dis$H(u,v) = \frac{1}{1+[D_0/D(u,v)]^{2n}}$

a) $H(u,v) = \begin{cases} 0 & if\ D(u,v) \le D_0 \\ 1 & if\ D(u,v) > D_0 \end{cases}$

b) $H(u,v) = 1 - e^{-D^2(u,v)/2D_0^2}$

c)
d) none of the mentioned
View Answer

Answer: a
Explanation: The transfer function of Butterworth highpass filter of order n, D_0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v) is given by: $H(u,v) = \frac{1}{1+[D_0/D(u,v)]^{2n}}$.

357. Which of the following is the transfer function of the Ideal Highpass Filter? Given D_0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v).

a) $H(u,v) = \frac{1}{1+[D_0/D(u,v)]^{2n}}$

b) $H(u,v) = \begin{cases} 0 & if\ D(u,v) \le D_0 \\ 1 & if\ D(u,v) > D_0 \end{cases}$

c) $H(u,v) = 1 - e^{-D^2(u,v)/2D_0^2}$
d) none of the mentioned
View Answer

Answer: b
Explanation: The transfer function of Ideal highpass filter, whereD0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v) is given by: $H(u,v) = \begin{cases} 0 & if\ D(u,v) \le D_0 \\ 1 & if\ D(u,v) > D_0 \end{cases}$.

358. Which of the following is the transfer function of the Gaussian Highpass Filter? Given D_0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v).

a) $H(u,v) = \frac{1}{1+[D_0/D(u,v)]^{2n}}$

b) $H(u,v) = \begin{cases} 0 & if\ D(u,v) \le D_0 \\ 1 & if\ D(u,v) > D_0 \end{cases}$

c) $H(u, v) = 1 - e^{-D^2(u,v)/2D_0^2}$
d) none of the mentioned
View Answer

Answer: c
Explanation: The transfer function of Gaussian highpass filter, where D0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v) is given by: $H(u, v) = 1 - e^{-D^2(u,v)/2D_0^2}$.

359. For a given image having smaller objects, which of the following filter(s), having D_0 as the cutoff distance measured from origin of frequency rectangle, would you prefer for a comparably smoother result?
a) IHLF with D_0 15
b) BHPF with D_0 15 and order 2
c) GHPF with D_0 15 and order 2
d) All of the mentioned
View Answer

Answer: c
Explanation: For the same format as for BHPF, GHPF gives a result comparably smoother than BHPF. However, BHPF performance for filtering smaller object is comparable with IHPF.

360. Which of the following statement(s) is true for the given fact that "Applying Highpass filters has an effect on the background of the output image"?
a) The average background intensity increases to near white
b) The average background intensity reduces to near black
c) The average background intensity changes to a value average of black and white
d) All of the mentioned
View Answer

Answer: b
Explanation: The Highpass filter eliminates the zero frequency components of the Fourier transformed image HPFs are applied on. So, the average background intensity reduces to near black.

Digital Image Processing Questions and Answers – Elements of Visual Perception

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Elements of Visual Perception".

361. Which of the following is a receptor in the retina of human eye?
a) Rods
b) Cones
c) Rods and Cones
d) Neither Rods nor Cones
View Answer

Answer: c
Explanation: Rods are long slender receptors while cones are shorter and thicker receptors.

362. How is image formation in the eye different from that in a photographic camera
a) No difference
b) Variable focal length
c) Varying distance between lens and imaging plane
d) Fixed focal length
View Answer

Answer: b
Explanation: Fibers in ciliary body vary shape of the lens thereby varying its focal length.

363. Range of light intensity levels to which the human eye can adapt (in Log of Intensity-mL)
a) 10^{-6} to 10^{-4}
b) 10^{4} to 10^{6}
c) 10^{-6} to 10^{4}
d) 10^{-5} to 10^{5}
View Answer

Answer: c
Explanation: Range of light intensity to which human eye can adapt is enormous and about the order 10^{10} from 10^{-6} to 10^{4}.

364. What is subjective brightness?
a) Related to intensity
b) Related to brightness
c) Related to image perception
d) Related to image formation
View Answer

Answer: a
Explanation: It is the intensity as perceived by the human eye.

365. What is brightness adaptation?
a) Changing the eye‟ s overall sensitivity

b) Changing the eye‟ s imaging ability
c) Adjusting the focal length
d) Transition from scotopic to photopic vision
View Answer

Answer: a
Explanation: The human eye a wide dynamic range by changing the eye‟ s overall sensitivity and this is called brightness adaptation.

366. The inner most membrane of the human eye is
a) Blind Spot
b) Sclera
c) Choroid
d) Retina
View Answer

Answer: d
Explanation: Retina is the innermost membrane of the human eye.

367. What is the function of Iris?
a) Source of nutrition
b) Detect color
c) Varies focal length
d) Control amount of light
View Answer

Answer: d
Explanation: Iris is responsible for controlling the amount of light that enters the human eye.

368. _____serve to a general, overall picture of the field of view.
a) Cones
b) Rods
c) Retina
d) All of the Mentioned
View Answer

Answer: b
Explanation: Rods produce an overall picture of the field of view.

369. Ratio of number of rods to the number of cones is _____
a) 1:20
b) 1:2
c) 1:1
d) 1:5
View Answer

Answer: a
Explanation: No of rods: 6 to 7 million, No of rods: 75 to 150.

370. The absence of receptors is in the retinal area called _____
a) Lens
b) Ciliary body
c) Blind spot
d) Fovea
View Answer

Answer: c
Explanation: Except the blind spot, receptors are radially distributed.

Digital Image Processing Questions and Answers – Relationships between Pixels

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Relationships between Pixels".

371. In 4-neighbours of a pixel p, how far are each of the neighbours located from p?
a) one pixel apart
b) four pixels apart
c) alternating pixels
d) none of the Mentioned
View Answer

Answer: a
Explanation: Each pixel is a unit distance apart from the pixel p.

372. If S is a subset of pixels, pixels p and q are said to be_____if there exists a path between them consisting of pixels entirely in S.
a) continuous
b) ambiguous
c) connected
d) none of the Mentioned
View Answer

Answer: c
Explanation: Pixels p and q are said to be connected if there exists a path between them consisting of pixels entirely in S.

373. If R is a subset of pixels, we call R a_____of the image if R is a connected set.
a) Disjoint
b) Region
c) Closed
d) Adjacent
View Answer

Answer: b
Explanation: R is called a Region of the image.

374. Two regions are said to be_____if their union forms a connected set.
a) Adjacent
b) Disjoint
c) Closed
d) None of the Mentioned
View Answer

Answer: a
Explanation: The regions are said to be Adjacent to each other.

375. If an image contains K disjoint regions, what does the union of all the regions represent?
a) Background
b) Foreground
c) Outer Border
d) Inner Border
View Answer

Answer: b
Explanation: The union of all regions is called Foreground and its complement is called the Background.

376. For a region R, the set of points that are adjacent to the complement of R is called as _____
a) Boundary
b) Border
c) Contour
d) All of the Mentioned
View Answer

Answer: d
Explanation: The words boundary, border and contour mean the same set.

377. The distance between pixels p and q, the pixels have a distance less than or equal to some value of radius r centred at (x,y) is called :
a) Euclidean distance
b) City-Block distance

c) Chessboard distance
d) None of the Mentioned
View Answer

Answer: a
Explanation: Euclidean distance is measured using a radius from a defined centre.

378. The distance between pixels p and q, the pixels have a distance less than or equal to some value of radius r, form a diamond centred at (x,y) is called :
a) Euclidean distance
b) Chessboard distance
c) City-Block distance
d) None of the Mentioned
View Answer

Answer: c
Explanation: Formation of a diamond is measured as City-Block distance.

379. The distance between pixels p and q, the pixels have a distance less than or equal to some value of radius r, form a square centred at (x,y) is called :
a) Euclidean distance
b) Chessboard distance
c) City-Block distance
d) None of the Mentioned
View Answer

Answer: b
Explanation: Distance measured by forming a square around the centre is called Chessboard distance.

380. Which of the following is NOT is not a type of Adjacency?
a) 4-Adjacency
b) 8-Adjacency
c) m-Adjacency
d) None of the Mentioned
View Answer

Answer: d
Explanation: All the mentioned adjacency types are valid.

Digital Image Processing Questions And Answers – Color Fundamentals

This set of Digital Image Processing test focuses on “Color Fundamentals”.

381. How many categories does the color image processing is basically divided into?
a) 4
b) 2
c) 3
d) 5
View Answer

Answer: b
Explanation: Color image processing is divided into two major areas: full-color and pseudo-color processing.

382. What are the names of categories of color image processing?
a) Full-color and pseudo-color processing
b) Half-color and full-color processing
c) Half-color and pseudo-color processing
d) Pseudo-color and Multi-color processing
View Answer

Answer: a
Explanation: Color image processing is divided into two major areas: full-color and pseudo-color processing. In the first category, the images are acquired with a full-color sensor like color TV or color scanner. In the second category, there is a problem of assigning a color to a particular monochrome intensity or range of intensities.

383. What are the basic quantities that are used to describe the quality of a chromatic light source?
a) Radiance, brightness and wavelength
b) Brightness and luminence
c) Radiance, brightness and luminence
d) Luminence and radiance
View Answer

Answer: c
Explanation: Three quantities are used to describe the quality of a chromatic light source: radiance, luminance and brightness.

384. What is the quantity that is used to measure the total amount of energy flowing from the light source?
a) Brightness
b) Intensity
c) Luminence
d) Radiance
View Answer

Answer: d
Explanation: Three quantities are used to describe the quality of a chromatic light source: radiance, luminance and brightness. Radiance is used to measure the total amount of energy flows from the light source and is generally measured in watts (W).

385. What are the characteristics that are used to distinguish one color from the other?
a) Brightness, Hue and Saturation
b) Hue, Brightness and Intensity
c) Saturation, Hue
d) Brightness, Saturation and Intensity
View Answer

Answer: a
Explanation: The characteristics generally used to distinguish one color from another are brightness, hue and saturation. Brightness embodies the chromatic notion of intensity. Hue is an attribute associated with dominant wavelength in a mixture of light waves. Saturation refers to the relative purity or the amount of white light mixed with a hue.

386. What are the characteristics that are taken together in chromaticity?
a) Saturation and Brightness
b) Hue and Saturation
c) Hue and Brightness
d) Saturation, Hue and Brightness
View Answer

Answer: b
Explanation: Hue and saturation are taken together are called chromaticity and therefore, a color may be characterized by its brightness and chromaticity.

387. Which of the following represent the correct equations for trichromatic coefficients?
a) x=X/(X+Y+Z), y=Y/(X+Y+Z), z=Z/(X+Y+Z)
b) x=(Y+Z)/(X+Y+Z), y=(X+Z)/(X+Y+Z), z=(X+Y)/(X+Y+Z)
c) x=X/(X-Y+Z), y=Y/(X-Y+Z), z=Z/(X-Y+Z)
d) x=(-X)/(X+Y+Z), y=(-Y)/(X+Y+Z), z=(-Z)/(X+Y+Z)
View Answer

Answer: a
Explanation: Tri-stimulus values are the amounts of red, green and blue needed to form any particular color and they are denoted as X,Y and Z respectively. A colors the specified by its trichromatic coefficients x, y & z: =X/(X+Y+Z), y=Y/(X+Y+Z), z=Z/(X+Y+Z).

388. What do you mean by tri-stimulus values?
a) It is the amount of red, green and yellow needed to form any particular color
b) It is the amount of red, green and indigo needed to form any particular color
c) It is the amount of red, yellow and blue needed to form any particular color

d) It is the amount of red, green and blue needed to form any particular color
View Answer

Answer: d
Explanation: The amounts of red, green and blue needed to form any particular color are called the tri-stimulus values and are denoted by X, Y and Z respectively. A color is then specified by its trichromatic coefficients, whose equations are formed from tri-stimulus values.

389. What is the value obtained by the sum of the three trichromatic coefficients?
a) 0
b)-1
c) 1
d) Null
View Answer

Answer: c
Explanation: From the equations: x=X/(X+Y+Z), y=Y/(X+Y+Z), z=Z/(X+Y+Z) it is the noted that sum of the coefficients is x+y+z≅1.

390. What is the name of area of the triangle in C.I E chromatic diagram that shows a typical range of colors produced by RGB monitors?
a) Color gamut
b) Tricolor
c) Color game
d) Chromatic colors
View Answer

Answer: a
Explanation: The triangle in C.I.E chromatic diagram shows a typical range of colors called the color gamut produced by RGB monitors. The irregular region inside the triangle is representative of the color gamut of today‟ s high-quality color printing devices.

Digital Image Processing Questions And Answers – Color Models

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on “Color Models”.

391. Color model is also named as (another name):
a) Color space
b) Color gap

c) Color space & color system
d) Color system
View Answer

Answer: c
Explanation: A color model is also called as color space or color system .Its purpose is to facilitate the specification of colors in some standard, generally accepted way.

392. What do you mean by the term pixel depth?
a) It is the number of bits used to represent each pixel in RGB space
b) It is the number of bytes used to represent each pixel in RGB space
c) It is the number of units used to represent each pixel in RGB space
d) It is the number of mm used to represent each pixel in RGB space
View Answer

Answer: a
Explanation: Images are represented in the RGB color model consist of three component images one for each primary color. When fed into RGB monitor, these three images combine on the phosphor screen to produce a composite color image. The number of bits used to represent each pixel in RGB space is called the pixel depth.

393. How many bit RGB color image is represented by full-color image?
a) 32-bit RGB color image
b) 24-bit RGB color image
c) 16-bit RGB color image
d) 8-bit RGB color image
View Answer

Answer: b
Explanation: The term full-color image is used often to denote a 24-bit RGB color image. The total number of colors in a 24-bit RGB color image is $(2^8)^3$=16777216.

394. What is the equation used to obtain S component of each RGB pixel in RGB color format?
a) S=1+3/(R+G+B) [min(R,G,B)].
b) S=1+3/(R+G+B) [max(R,G,B)].
c) S=1-3/(R+G+B) [max(R,G,B)].
d) S=1-3/(R+G+B) [min(R,G,B)].
View Answer

Answer: d
Explanation: If an image is given in RGB format then the saturation component is obtained by the equation.

395. What is the equation used to obtain I(Intensity) component of each RGB pixel in RGB color format?
a) I=1/2(R+G+B)

b) I=1/3(R+G+B)
c) I=1/3(R-G-B)
d) I=1/3(R-G+B)
View Answer

Answer: b
Explanation: If an image is given in RGB format then the intensity (I) component is obtained by the equation, I=1/3 (R+G+B).

396. What is the equation used for obtaining R value in terms of HSI components?
a) R=I[1-(S cos⁡H)/cos⁡(60°-H)].
b) R=I[1+(S cos⁡H)/cos(120°-H)].
c) R=I[1+(S cos⁡H)/cos⁡(60°-H)].
d) R=I[1+(S cos⁡H)/cos(30°-H)].
View Answer

Answer: c
Explanation: Given values of HSI in the interval [0, 1], the R value in the RGB components is given by the equation:

397. What is the equation used for calculating B value in terms of HSI components?
a) B=I(1+S)
b) B=S(1-I)
c) B=S(1+I)
d) B=I(1-S)
View Answer

Answer: d
Explanation: Given values of HSI in the interval [0, 1], the B value in the RGB components is given by the equation: B=I(1-S).

398. What is the equation used for calculating G value in terms of HSI components?
a) G=3I-(R+B)
b) G=3I+(R+B)
c) G=3I-(R-B)
d) G=2I-(R+B)
View Answer

Answer: a
Explanation: Given values of HSI in the interval [0, 1], the B value in the RGB components is given by the equation: G=3I-(R+B).

399. Which of the following color models are used for color printing?
a) RGB
b) CMY

c) CMYK
d) CMY and CMYK
View Answer

Answer: d
Explanation: The hardware oriented models which are prominently used in the color printing process are CMY (cyan, magenta and yellow) and CMYK (cyan, magenta, yellow and black).

Digital Image Processing Questions And Answers – Regional Descriptors

This set of Digital Image Processing MCQs focuses on “Regional Descriptors”.

400. What does the total number of pixels in the region defines?
a) Perimeter
b) Area
c) Intensity
d) Brightness
View Answer

Answer: b
Explanation: The area of a region is defined by the total number of pixels in the region. The perimeter is given the number of pixels along the length of the boundary of the region.

401. What is the unit of compactness of a region?
a) Meter
b) Meter2
c) No units
d) Meter-1
View Answer

Answer: c
Explanation: The compactness of a region is defined as (perimeter)2/area. Thus, the compactness of a region is a dimensionless quantity.

402. For which of the following regions, compactness is minimal?
a) Rectangle
b) Square
c) Irregular
d) Disk
View Answer

Answer: d
Explanation: We know that, compactness of a region is defined as (perimeter)2/area. Thus, disk shaped region has a minimal value of this ratio and hence the minimal compactness.

403. Compactness is insensitive to orientation.
a) True
b) False
View Answer

Answer: a
Explanation: With the exception of errors introduced by the rotation of the digital image, we can state that compactness of a region is insensitive to the orientation of the image.

404. Which of the following measures are not used to describe a region?
a) Mean and median of grey values
b) Minimum and maximum of grey values
c) Number of pixels alone
d) Number of pixels above and below mean
View Answer

Answer: c
Explanation: Some of the measures which are used to describe a region are mean and median of grey values, minimum and maximum of grey values and number of pixels above and below mean. The area of the region, i.e., the total number of pixels in the region cannot alone describe the region.

405. We cannot use normalized area as one of the region descriptor.
a) True
b) False
View Answer

Answer: b
Explanation: One of the regional descriptor is normalized area. It can be quite useful to extract information from the image. In satellite images of earth, the data can be refined by normalized it with respect to land mass per region.

406. What is the study of properties of a figure that are unaffected by any deformation?
a) Topology
b) Geography
c) Statistics
d) Deformation
View Answer

Answer: a
Explanation: We can define topology as the study of properties of a figure that are unaffected by

any deformation, as long as there is no joining or tearing of the figure. We use topological properties in the region description.

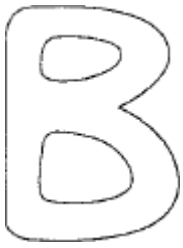
407. On which of the following operation of an image, the topology of the region changes?
a) Stretching
b) Rotation
c) Folding
d) Change in distance measure
View Answer

Answer: c
Explanation: If a topological descriptor is defined by the number of holes in an image, then the number of holes will not vary if the image is stretched or rotated. The number of holes in the region will change only if the image is torn or folded.

408. Topological properties don‟ t depend on the distance measures.
a) True
b) False
View Answer

Answer: a
Explanation: We know that, as stretching affects distance, topological properties do not depend on the notion of distance or any properties implicitly based on the concept of distance measures.

409. What is the Euler number of the image shown below?



a) 0
b) 1
c) 2
d) -1
View Answer

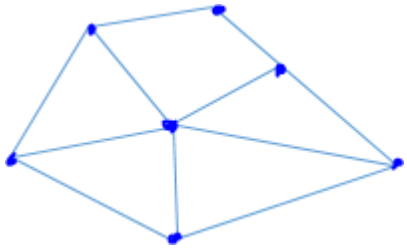
Answer: d
Explanation: The image shown in the question has two holes and one connected components. So, the Euler number E is given as 1-2=-1.

410. What is the Euler number of a region with polygonal network containing V,Q and F as the number of vertices, edges and faces respectively?
a) V+Q+F
b) V-Q+F

c) V+Q-F
d) V-Q-F
View Answer

Answer: b
Explanation: It is very important to classify the polygonal network. Let V,Q and F denote the number of vertices, edges and faces respectively. Then,
V-Q+F=C-H
Where C,H represents the number of connected components and number of holes in the region respectively. So, the Euler number E is given by V-Q+F.

411. What is the Euler number of the region shown in the figure below?



a) 1
b) -2
c) -1
d) 2
View Answer

Answer: b
Explanation: The polygonal network given in the figure has 7 vertices, 11 edges and 2 faces. Thus the Euler number is given by the formula,
E=V-Q+F=7-11+2=-2.

412. The texture of the region provides measure of which of the following properties?
a) Smoothness alone
b) Coarseness alone
c) Regularity alone
d) Smoothness, coarseness and regularity
View Answer

Answer: d
Explanation: One of the important approach to region description is texture content. This helps to provide the measure of some of the important properties of an image like smoothness, coarseness and regularity of the region.

413. Structural techniques deal with the arrangement of image primitives.
a) True

b) False
View Answer

Answer: a
Explanation: Structural techniques deal with the arrangement of image primitives, such as the description of the texture based on the regularly spaced parallel lines.

414. Which of the following techniques is based on the Fourier transform?
a) Structural
b) Spectral
c) Statistical
d) Topological
View Answer

Answer: b
Explanation: Spectral techniques are based on properties of the Fourier spectrum and are used primarily to detect global periodicity in an image by identifying high energy, narrow peaks in the image.

Digital Image Processing Questions And Answers – Boundary Descriptors

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Boundary Descriptors".

415. The length of a boundary is one of the boundary descriptors.
a) True
b) False
View Answer

Answer: a
Explanation: The length of a boundary is one of the simple boundary descriptor. The length of the boundary is approximately given by the number of pixels along that boundary.

416. Which of the following of a boundary is defined as the line perpendicular to the major axis?
a) Equilateral axis
b) Equidistant axis
c) Minor axis
d) Median axis
View Answer

Answer: c
Explanation: The minor axis of a boundary is defined as the line perpendicular to the major axis

and of such length that a box passing through the outer four points of intersection of the boundary with the two axes completely encloses the boundary.

417. Which of the following is the useful descriptor of a boundary, whose value is given by the ratio of length of the major axis to the minor axis?
a) Radius
b) Perimeter
c) Area
d) Eccentricity
View Answer

Answer: d
Explanation: Eccentricity, which is the ratio of major axis to the minor axis which is one of the important parameter that is used to describe a boundary.

418. The term, Curvature is defined as:
a) Rate of change of area
b) Rate of change of slope
c) Slope
d) Rate of change of diameter
View Answer

Answer: b
Explanation: Curvature of a boundary is defined as the rate of change of slope. In general, as the boundaries tend to be locally ragged, it is difficult to obtain reliable measures of curvature at a point on a digital boundary.

419. If the boundary is traversed in the clockwise direction, a vertex point „p" is said to be a part of the convex segment if the rate of change of slope at „p" is:
a) Negative
b) Zero
c) Non negative
d) Cannot be determined
View Answer

Answer: c
Explanation: If the boundary is traversed in the clockwise direction and the rate of change of slope at the vertex point is non negative, then that point is said to be in the convex segment.

420. A point „p" is said to be corner point, if the change of slope is less than 10^0.
a) True
b) False
View Answer

Answer: b
Explanation: In general, a point „p‟ is said to be on the straight line segment if the change of slope is less than 100 and said to be at the corner point if the change exceeds 90^0.

421. Based on the 4-directional code, the first difference of smallest magnitude is called as:
a) Shape number
b) Chain number
c) Difference
d) Difference number
View Answer

Answer: a
Explanation: We know that, the first difference of a chain coded boundary depends on the starting point. Based on such 4 directional boundary, the first difference of smallest magnitude is called as the shape number of the boundary.

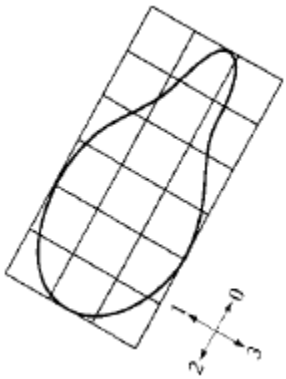
422. The order of shape number for a closed boundary is:
a) Odd
b) Even
c) 1
d) Any positive value
View Answer

Answer: b
Explanation: The order of shape number gives the number of digits in its representation. The value of this order is even for closed boundary and limits the number of possible different shapes.

423. What is the order of the shape number of a rectangular boundary with the dimensions of 3×3?
a) 3
b) 6
c) 9
d) 12
View Answer

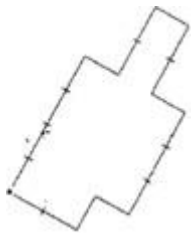
Answer: d
Explanation: The order of shape number is also defined as the perimeter of the boundary. Since, given is a rectangle of dimensions 3×3, the perimeter of the rectangle is given as 2(3+3) = 12.

the following shape is given as:



a) 000030032232221211
b) 003010203310321032
c) 022332103210201330
d) 012302301023100321
View Answer

Answer: a
Explanation: The effective boundary for the given figure is given as



So, the chain code is given as 000030032232221211.

425. What is the shape number for the boundary given in the previous figure?
a) 003231023101230123
b) 012301220331023010
c) 133021030012330120
d) 000310330130031303
View Answer

Answer: d
Explanation: The chain code for the boundary is given as 000030032232221211.
We know that, shape number is the first difference of a chain coded boundary. Thus the shape number of the above given boundary will be 000310330130031303.

426. Statistical moments are used to describe the shape of boundary segments quantitatively.
a) True
b) False
View Answer

Answer: a
Explanation: Statistical moments like mean, variance and higher order moments can quantitatively describe the shape of boundary segments.

427. Which of the following techniques of boundary descriptions have the physical interpretation of boundary shape?
a) Fourier transform
b) Statistical moments
c) Laplace transform
d) Curvature
View Answer

Answer: b
Explanation: The statistical moments have an advantage over the other techniques that it helps in the physical interpretation of the shape of the boundary.

428. Statistical moments is sensitive to rotation.
a) True
b) False
View Answer

Answer: b
Explanation: The statistical moment technique of describing the shape of boundary is insensitive of the rotation of the shape. If desired, size normalization can be achieved by scaling the range of values of „g‟ and „r‟ .

Digital Image Processing Questions and Answers – Spatial and Gray-Level Resolution and Aliasing

This set of Digital Image Processing online test focuses on “Spatial and Gray-Level Resolution and Aliasing”.

429. The principal factor to determine the spatial resolution of an image is _____
a) Quantization
b) Sampling
c) Contrast
d) Dynamic range
View Answer

Answer: b
Explanation: The spatial resolution of an image principally determine by Sampling.

430. What causes the effect, imperceptible set of very fine ridge like structures in areas of smooth gray levels?
a) Caused by the use of an insufficient number of gray levels in smooth areas of a digital image
b) Caused by the use of huge number of gray levels in smooth areas of a digital image
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: The set of very fine ridge like structures in area of smooth gray levels generally is quite visible in images displayed using 16 or less uniformly spaced gray levels.

431. What is the name of the effect caused by the use of an insufficient number of gray levels in smooth areas of a digital image?
a) Dynamic range
b) Ridging
c) Graininess
d) False contouring
View Answer

Answer: d
Explanation: The effect, caused due to insufficient number of gray levels in smooth areas of a digital image, is called false contouring, so called because the ridges resemble topographic contours in a map.

432. Using rough rule of thumb, and assuming powers of 2 for convenience, what image size are about the smallest images that can be expected to be reasonably free of objectionable sampling checkerboards and false contouring?
a) 512*512pixels and 16 gray levels
b) 256*256pixels and 64 gray levels
c) 64*64pixels and 16 gray levels
d) 32*32pixels and 32 gray levels
View Answer

Answer: b
Explanation: An image of 128*128pixels shows a pronounced checkerboard pattern, while for 256*256pixels image a minimum gray level of 64 is required to remove false contouring.
Also the effect is quite visible in images displayed using 16 or less uniformly spaced gray levels.

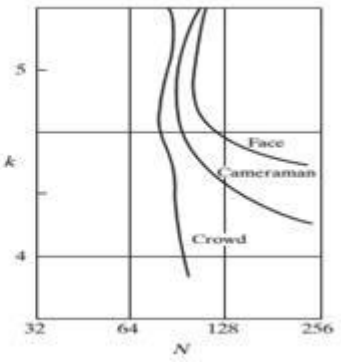
433. What does a shift up and right in the curves of isopreference curve simply means? Verify in terms of N (number of pixels) and k (L=2k, L is the gray level) values.
a) Smaller values for N and k, implies a better picture quality
b) Larger values for N and k, implies low picture quality

c) Larger values for N and k, implies better picture quality
d) Smaller values for N and k, implies low picture quality
View Answer

Answer: c
Explanation: Points lying on an isopreference curve correspond to images of equal subjective quality. It was found that the isopreference curves tended to shift right and upward with the details of the image. So, a shift up and right in the curves simply means larger values for N and k, implying better picture quality.

434. How does the curves behave to the detail in the image in isopreference curve?
a) Curves tend to become more vertical as the detail in the image decreases
b) Curves tend to become less vertical as the detail in the image increases
c) Curves tend to become less vertical as the detail in the image decreases
d) Curves tend to become more vertical as the detail in the image increases
View Answer

Answer: d
Explanation: The curves in isopreference curve tend to become more vertical as the detail in the image increases.
The right side graph shows the same, curve for crowd is nearly vertical.



435. For an image with a large amount of detail, if the value of N (number of pixels) is fixed then what is the gray level dependency in the perceived quality of this type of image?
a) Totally independent of the number of gray levels used
b) Nearly independent of the number of gray levels used
c) Highly dependent of the number of gray levels used
d) None of the mentioned
View Answer

Answer: b
Explanation: For image with high details of the image only a few gray levels may be needed.

436. What is a band-limited function?
a) A function of limited duration whose highest frequency is finite
b) A function of limited duration whose highest frequency is infinite

c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: Functions whose area under the curve is finite can be represented in terms of sines and cosines of various frequencies. The highest frequency is determined by the sine/cosine component is the highest "frequency content" of the function. If this highest frequency is finite and that the function is of unlimited duration, then, these functions are called band-limited functions.

437. For a band-limited function, which Theorem says that "if the function is sampled at a rate equal to or greater than twice its highest frequency, the original function can be recovered from its samples"?
a) Band-limitation theorem
b) Aliasing frequency theorem
c) Shannon sampling theorem
d) None of the mentioned
View Answer

Answer: c
Explanation: For a band-limited function, Shannon sampling theorem says that "if the function is sampled at a rate equal to or greater than twice its highest frequency, the original function can be recovered from its samples".

438. What is the name of the phenomenon that corrupts the sampled image, and how does it happen?
a) Shannon sampling, if the band-limited functions are undersampled
b) Shannon sampling, if the band-limited functions are oversampled
c) Aliasing, if the band-limited functions are undersampled
d) Aliasing, if the band-limited functions are oversampled
View Answer

Answer: c
Explanation: If the band-limited functions is undersampled, then a phenomenon called aliasing corrupts the sampled image.

439. How aliasing does corrupts the sampled image?
a) By introducing additional frequency components to the sampled function
b) By removing some frequency components from the sampled function
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: a
Explanation: Aliasing corrupts the sampled image by introducing additional frequency components into the sampled function. These added components are called aliased frequencies.

440. How can one reduce the aliasing effect on an image?
a) By reducing the high-frequency components of image by blurring the image
b) By increasing the high-frequency components of image by blurring the image
c) By reducing the high-frequency components of image by clarifying the image
d) By increasing the high-frequency components of image by clarifying the image
View Answer

Answer: a
Explanation: Aliasing corrupts the sampled image by introducing additional frequency components to the sampled function. So, the principal approach for reducing the aliasing effects on an image is to reduce its high-frequency components by blurring the image prior to sampling.

Digital Image Processing Questions and Answers – Zooming and Shrinking Digital Images

This set of Digital Image Processing Multiple Choice Questions & Answers (MCQs) focuses on "Zooming and Shrinking Digital Images".

441. In terms of Sampling and Quantization, Zooming and Shrinking may be viewed as _____
a) Oversampling for both
b) Oversampling and Undersampling respectively
c) Undersampling and Oversampling respectively
d) Undersampling for both
View Answer

Answer: b
Explanation: Oversampling increases the number of sample in the image, i.e. like Zooming. Undersampling decreases the number of samples in the image, i.e. like Shrinking.

442. The two steps: one is the creation of new pixel locations, and other is the assignment of gray levels to those new locations are involved in _____
a) Shrinking
b) Zooming
c) All of the mentioned
d) None of the mentioned
View Answer

Answer: b
Explanation: Suppose that we have an image of size500*500pixels and we want to enlarge it 1.5 times to 750*750pixels.
Creation of new Pixels: One of the easiest ways to visualize zooming is laying an imaginary 750*750 grid over the original image and so there would be less spacing by one pixel in the grid because we are fitting it over a smaller image.
Assignment of gray levels to new locations: In order to perform gray-level assignment for any point in the overlay, we assign its gray level to the new pixel in the grid its closest pixel in the original image.
When the above steps are done with all points in the overlay grid, we expand it to the original specified size to obtain the zoomed image.

443. While Zooming, In order to perform gray-level assignment for any point in the overlay, we assign its graylevel to the new pixel in the grid its closest pixel in the original image. What‟ s this method of gray-level assignment called?
a) Neighbor Duplication
b) Duplication
c) Nearest neighbor Interpolation
d) None of the mentioned
View Answer

Answer: c
Explanation: Because we look for the closest pixel in the original image and assign its gray level to the new pixel in the grid.

444. A special case of nearest neighbor Interpolation that just duplicates the pixels the number of times to achieve the desired size, is known as _____
a) Bilinear Interpolation
b) Contouring
c) Ridging
d) Pixel Replication
View Answer

Answer: d
Explanation: A special case of nearest neighbor interpolation is Pixel replication and is applicable when we want to increase the size of an image an integer number of times.
For example, doubling the size of an image is achieved duplicating each column and hence image size gets doubled in the horizontal direction. Then, we duplicate each row of the enlarged image to double the size in the vertical direction. Similarly, enlarging the image by any integer number of times (triple, quadruple, and so on) is possible.

445. Nearest neighbor Interpolation has an undesirable feature, that is _____
a) Aliasing effect
b) False contouring effect
c) Ridging effect

d) Checkerboard effect
View Answer

Answer: d
Explanation: At greater magnification nearest neighbor Interpolation has the undesirable feature that it produces a checkerboard effect.

446. What does the bilinear Interpolation do for gray-level assignment?
a) Assign gray level to the new pixel using its right neighbor
b) Assign gray level to the new pixel using its left neighbor
c) Assign gray level to the new pixel using its four nearest neighbors
d) Assign gray level to the new pixel using its eight nearest neighbors
View Answer

Answer: c
Explanation: Bilinear interpolation uses the four nearest neighbors of the new pixel. Let ($x^{"}$, $y^{"}$) is the coordinates of a point in the zoomed image and the gray level assigned to the point is v(x, $y^{"}$).
For bilinear interpolation, the assigned gray level is given by
$v(x^{"}, y^{"}) = ax^{"} + by^{"} + cx^{"} y^{"} + d$
Here, a, b, c and d are determined from the four equations in four unknowns that can be written using the four nearest neighbors of point ($x^{"}$, $y^{"}$).

447. Row-column deletion method of Image Shrinking is an equivalent process to which method of Zooming?
a) Bilinear Interpolation
b) Contouring
c) Pixel Replication
d) There is no such equivalent process
View Answer

Answer: c
Explanation: Row-column deletion method is used to shrink an image by one-half, one-fourth and so on.
In case of one-half we delete every other row and column.

448. Image Shrinking has an undesirable feature, that is _____
a) Aliasing effect
b) False contouring effect
c) Ridging effect
d) Checkerboard effect
View Answer

Answer: a
Explanation: Although Image Shrinking uses the grid analogy of nearest neighbor interpolation, but that we now expand the grid to fit over the original image, do gray-level nearest neighbor or

bilinear interpolation, causing the possible aliasing effect, and then shrink the grid back to its original specified size.

449. State for the validation of the statement:
“In general-purpose for a digital image of zooming and shrinking, where Bilinear Interpolation generally is the method of choice over nearest neighbor Interpolation”.
a) True
b) False
View Answer

Answer: a
Explanation: For case 32*32 to 1024*1024, the data is rather lost in nearest neighbor Interpolation, but the result of Bilinear Interpolation remains reasonably good for the same.