

Image Processing

1. If the histogram of an image is clustered towards origin on X-axis of a histogram plot then it indicates that the image is

- (A) Dark (B) Good contrast
(C) Bright (D) Very low contrast

Answer: A

2. Which of the following is not used in standard JPEG image compression?

- (A) Huffman coding (B) Runlength encoding
(C) Zig-zag scan (D) K-L Transform

Answer: D

3. Which of the following is used for the boundary representation of an image object?

- (A) Quad Tree (B) Projections
(C) Run length coding (D) Chain codes

Answer: D

4. Which of the following is not a lossy compression technique ?

- (A) JPEG (B) MPEG
(C) FFT (D) Arithmetic coding

Answer: D

5. Blind image deconvolution is

- (A) Combination of blur identification and image restoration
(B) Combination of segmentation and classification
(C) Combination of blur and non-blur image
(D) None of the above

Answer: A

6. The redundancy in images stems from:

- (A) pixel decorrelation (B) pixel correlation
(C) pixel quantization (D) image size

Answer: B

7. Given two spatial masks

$$S_1 = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 0 \\ 0 & 1 & 0 \end{bmatrix} \text{ and } S_2 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

The Laplacian of an image at all points (x, y) can be implemented by convolving the image with spatial mask.

Which of the following can be used as the spatial mask ?

- (A) only S1 (B) only S2
(C) Both S1 and S2 (D) None of these

Answer: B

8. Given an image of size 1024×1024 pixels in which intensity of each pixel is an 8-bit quality. It requires of storage space if the image is not compressed.

- (A) one Terabyte
(B) one Megabyte
(C) 8 Megabytes
(D) 8 Terabytes

Answer: B

9. Consider the formula in image processing

$$R_D = 1 - (1/C_R) \text{ Where } C_R = n_1/n_2$$

C_R is called as compression ratio n_1 and n_2 denotes the number of information carrying units in two datasets that represent the same information. In this situation R_D is called as relative of the first data set.

- (A) Data Compression
- (B) Data Redundancy
- (C) Data Relation
- (D) Data Representation

Answer: B

10. MPEG involves both spatial compression and temporal compression. The spatial compression is similar to JPEG and temporal compression removes frames.

- (A) Temporal
- (B) Voice
- (C) Spatial
- (D) Redundant

Answer: D

11. The aspect ratio of an image is defined as

- (A) The ratio of width to its height measured in unit length.
- (B) The ratio of height to width measured in number of pixels.
- (C) The ratio of depth to width measured in unit length.
- (D) The ratio of width to depth measured in number of pixels.

Answer: A

12. The Mandelbrot set used for the construction of beautiful images is based on the following transformation :

$$x_{n+1} = x_n^2 + z$$

Here,

- (A) Both x & z are real numbers.
- (B) Both x & z are complex numbers.
- (C) x is real & z is complex.
- (D) x is complex & z is real.

Answer: B

13. You are given four images represented as

$$I_1 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}, I_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix},$$

$$I_3 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, I_4 = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$$

The value of entropy is maximum for image

- (A) I_1
- (B) I_2
- (C) I_3
- (D) I_4

Answer: C

Explanation:

Entropy of image represent the randomness pixels.

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In I1 all pixel are same. Entropy is zero. In I3 two are same therefore, entropy is maximum whereas in I2 and I4 three3 are same.

14. The number of distinct binary images which can be generated from a given binary image of right $M \times N$ are
- (A) $M + N$
 - (B) $M \times N$
 - (C) 2^{M+N}
 - (D) 2^{MN}

Answer: D

15. If $f(x, y)$ is a digital image, then x, y and amplitude values of f are
- (A) Finite
 - (B) Infinite
 - (C) Neither finite nor infinite
 - (D) None of the above

Answer: A

19. An image is 1024×800 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 10-Mbps Ethernet?
- (A) 196.6 seconds
 - (B) 19.66 seconds
 - (C) 1.966 seconds
 - (D) 0.1966 seconds

Answer: C

Explanation:

Time taken to transmit = $(1024 \times 800 \times 3 \times 8) / (10 \times 1000 \times 1000) = 1.966$ seconds

31. Images tend to be very large collection of data. The size of memory required for a 1024 by 1024 image in which the colour of each pixel is represented by a n -bit number, (in an 8 bit machines) is
- (A) $n \times 8$ MB
 - (B) $n / 8$ MB
 - (C) $(1024 \times 1024) / 8$ MB
 - (D) 1024 MB

Answer: B

28. The refresh rate above which a picture stops flickering and fuses into a steady image is called
- (A) Crucial fusion frequency
 - (B) Current frequency fusion
 - (C) Critical fusion frequency
 - (D) Critically diffused frequency

Answer: C

56. The number of distinct binary images which can be generated from a given binary image of right $M \times N$ are
- (A) $M + N$
 - (B) $M \times N$
 - (C) 2^{M+N}
 - (D) 2^{MN}

Answer: D

57. If $f(x, y)$ is a digital image, then x, y and amplitude values of f are
- (A) Finite
 - (B) Infinite
 - (C) Neither finite nor infinite
 - (D) None of the above

Answer: A

60. The transform which possesses the “multi-resolution” property is
- (A) Fourier transform

- (B) Short-time-Fourier transform
- (C) Wavelet transform
- (D) Karhunen-Loere transform

Answer: C

64. If the Fourier transform of the function $f(x, y)$ is $F(m, n)$, then the Fourier transform of the function $f(2x, 2y)$ is :

(A) $\frac{1}{4} F\left(\frac{m}{2}, \frac{n}{2}\right)$

(B) $\frac{1}{4} F(2m, 2n)$

(C) $\frac{1}{4} F(m, n)$

(D) $\frac{1}{4} F\left(\frac{m}{4}, \frac{n}{4}\right)$

Answer: A

66. A Butterworth lowpass filter of order n , with a cutoff frequency at distance D_0 from the origin, has the transfer function $H(u, v)$ given by

(A) $\frac{1}{1 + \left[\frac{D(u, v)}{D_0}\right]^{2n}}$

(B) $\frac{1}{1 + \left[\frac{D(u, v)}{D_0}\right]^n}$

(C) $\frac{1}{1 + \left[\frac{D_0}{D(u, v)}\right]^{2n}}$

(D) $\frac{1}{1 + \left[\frac{D_0}{D(u, v)}\right]^n}$

Answer: A

10. In an image compression system 16384 bits are used to represent 256×256 image with 256 gray levels. What is the compression ratio for this system?

- (A) 1
- (B) 2
- (C) 4
- (D) 8

Answer: Wrong question

14. If the pixels of an image are shuffled then the parameter that may change is

- (A) Histogram
- (B) Mean
- (C) Entropy
- (D) Covariance

Answer: D

19. The quantiser in an image-compression system is a

- (A) lossy element which exploits the psychovisual redundancy
- (B) lossless element which exploits the psychovisual redundancy
- (C) lossy element which exploits the statistical redundancy
- (D) lossless element which exploits the statistical redundancy

Answer: A

22. The transform which possesses the highest 'energy compaction' property is

- (A) Slant transform
- (B) Cosine transform
- (C) Fourier transform
- (D) Karhunen-Loeve transform

Answer: D

22. The transform which possesses the highest 'energy compaction' property is

- (A) Slant transform
- (B) Cosine transform
- (C) Fourier transform
- (D) Karhunen-Loeve transform

Answer: D

49. Consider the conditional entropy and mutual information for the binary symmetric channel. The input source has alphabet $X=\{0,1\}$ and associated probabilities $\{1/2,1/2\}$. The channel matrix is

$$\begin{pmatrix} 1-p & p \\ p & 1-p \end{pmatrix}$$

where p is the transition probability. Then the conditional entropy is given by :

- (A) 1
- (B) $-\log(p)-(1-p)\log(1-p)$
- (C) $1+p\log(p)+(1-p)\log(1-p)$
- (D) 0

Answer: B

67. From the given data below:

a b b a a b b a a b

which one of the following is not a word in the dictionary created by LZ-coding (the initial words are a, b)?

- (1) a b
- (2) b b
- (3) b a
- (4) b a a b

Answer: 4