

UNIT IV IMAGE SEGMENTATION

1. What is image compression?

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

2. What is Data Compression?

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

3. What are two main types of Data compression?

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

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

4. What is the need for Compression?

In terms of storage, the capacity of a storage device can be effectively increased with methods that compress a body of data on its way to a storage device and decompresses it when it is retrieved.

In terms of communications, the bandwidth of a digital communication link can be effectively increased by compressing data at the sending end and decompressing data at the receiving end.

At any given time, the ability of the Internet to transfer data is fixed. Thus, if data can

effectively be compressed wherever possible, significant improvements of data throughput can be achieved. Many files can be combined into one compressed document making sending easier.

5. What are different Compression Methods?

Run Length Encoding (RLE)

Arithmetic coding

Huffman coding and

Transform coding

6. Define coding redundancy?

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

7. Define interpixel redundancy?

The value of any given pixel can be predicted from the values of its neighbors.

The information carried by is small. Therefore the visual contribution of a single pixel to an image is redundant. Otherwise called as spatial redundant geometric redundant or

8. What is run length coding?

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

9. Define compression ratio.

Compression Ratio = original size / compressed size: 1

10. Define psycho visual redundancy?

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

11. Define encoder

Source encoder is responsible for removing the coding and interpixel redundancy and psycho visual redundancy.

There are two components

- A) Source Encoder
- B) Channel Encoder

12. Define source encoder

Source encoder performs three operations

- 1) Mapper -this transforms the input data into non-visual format. It reduces the interpixel redundancy.
- 2) Quantizer - It reduces the psycho visual redundancy of the input images .This step is omitted if the system is error free.
- 3) Symbol encoder- This reduces the coding redundancy .This is the final stage of encoding process.

13. Define channel encoder

The channel encoder reduces the impact of the channel noise by inserting

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redundant bits into the source encoded data.

Eg: Hamming code

14. What are the types of decoder?

Source decoder- has two components

a) Symbol decoder- This performs inverse operation of symbol encoder.

b) Inverse mapping- This performs inverse operation of mapper.

Channel decoder- this is omitted if the system is error free.

15. What are the operations performed by error free compression?

1) Devising an alternative representation of the image in which its interpixel redundant are reduced.

2) Coding the representation to eliminate coding redundancy

16. What is Variable Length Coding?

Variable Length Coding is the simplest approach to error free compression. It reduces only the coding redundancy. It assigns the shortest possible codeword to the most probable gray levels.

17. Define Huffman coding

Huffman coding is a popular technique for removing coding redundancy. ∞

When coding the symbols of an information source the Huffman code ∞ yields the smallest possible number of code words, code symbols per source symbol.

18. Define Block code

Each source symbol is mapped into fixed sequence of code symbols or code words. So it is called as block code.

19. Define instantaneous code

A code word that is not a prefix of any other code word is called instantaneous or prefix codeword.

20. Define uniquely decodable code

A code word that is not a combination of any other codeword is said to be uniquely decodable code.

21. Define B2 code

Each code word is made up of continuation bit c and information bit which are binary numbers. This is called B2 code or B code. This is called B2 code because two information bits are used for continuation bits

22. Define the procedure for Huffman shift

List all the source symbols along with its probabilities in descending order. Divide the total number of symbols into block of equal size. Sum the probabilities of all the source symbols outside the reference block. Now apply the procedure for reference block, including the prefix source symbol. The code words for the remaining symbols can be constructed by means of one or more prefix code followed by the reference block as in the case of binary shift code.

23. Define arithmetic coding

In arithmetic coding one to one corresponds between source symbols and code word doesn't exist where as the single arithmetic code word assigned for a sequence of source symbols. A code word defines an interval of number between 0 and 1.

24. What is bit plane Decomposition?

An effective technique for reducing an image's interpixel redundancies is to process the image's bit plane individually. This technique is based on the concept of decomposing multilevel images into a series of binary images and compressing each binary image via one of several well-known binary compression methods.

25. What are three categories of constant area coding?

The three categories of constant area coding are

All white ∞

All black ∞

Mixed intensity. ∞

The most probable or frequency occurring is assigned a 1 bit code '0', other two categories are assigned as 2 bit code '10' and '11'

27. How effectiveness of quantization can be improved?

Introducing an enlarged quantization interval around zero, called a dead ∞ zero.

Adapting ∞ the size of the quantization intervals from scale to scale. In either case, the selected quantization intervals must be transmitted to the decoder with the encoded image bit stream.

28. What are the coding systems in JPEG?

1. A lossy baseline coding system, which is based on the DCT and is adequate for most compression applications.
2. An extended coding system for greater compression, higher precision or progressive reconstruction applications.
3. a lossless independent coding system for reversible compression.

29. What is JPEG?

The acronym is expanded as "Joint Photographic Expert Group". It is an international standard in 1992. It perfectly works with color and grayscale images, Many applications e.g., satellite, medical,...

30. What are the basic steps in JPEG?

The Major Steps in JPEG Coding involve:

- _ DCT (Discrete Cosine Transformation)
- _ Quantization
- _ Zigzag Scan

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- _ DPCM on DC component

_ RLE on AC Components

_ Entropy Coding

31. What is MPEG?

The acronym is expanded as "Moving Picture Expert Group". It is an international standard in 1992. It perfectly works with video and also used in teleconferencing

Input image Wavelet transform Quantizer Symbol

encoder

Symbol

decoder

Inverse wavelet

transform

Compressed

image

Compressed image

Decompressed

Image

32. Draw the JPEG Encoder.

33. Draw the JPEG Decoder.

34. What is zig zag sequence?

The purpose of the Zig-zag Scan:

_ To group low frequency coefficients in top of vector.

_ Maps 8 x 8 to a 1 x 64 vector

35. Define I-frame

I-frame is Intraframe or Independent frame. An I-frame is compressed independently of all frames. It resembles a JPEG encoded image. It is the reference point for the motion estimation needed to generate subsequent P and P-frame.

36. Define P-frame

P-frame is called predictive frame. A P-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame

37. Define B-frame

B-frame is the bidirectional frame. A B-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame or next P-frame. Accordingly the decoder must have access to both past and future reference frames.

Unit - IV wavelets and Image Compression

1. Explain the image compression standards.
 - Binary Image Compression Standards
 - Continuous Tone Still Image Compression Standards - JPEG
 - Video Compression Standard - MPEG
2. Explain the Bit-plane coding & Run-length coding.
 - Bit-plane Decomposition
 - Compression of Bit planes
3. Explain various coding techniques in image compression.
 - Variable-length coding
 - Huffman coding
 - Near optimal variable length codes
 - Arithmetic coding
 - LZW coding

