Ioannis Pitas

Digital Image Processing Fundamentals

Chapter 4

Digital Image Compression

Answers to the Chapter Questions

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Digital image compression

4.2 Huffman coding

Questions/Answers

1. Is Huffman coding lossy or not ?
Huffman coding is not lossy because every pixels exact value can be decoded.

2. What happens at Huffman decoding if an error occurs in the compressed bit sequence ?
If an error occurs inthe bit sequence when it is decoded, then a false codeword would be detected. This error is also possible to affect the limits of the following codewords, which would be incorrectly detected.

4.3 Run-length coding

Questions/Answers

1. Is the Run-Length code suitable for natural images ?
The Run-Length code is not suitable for natural images because in such images changes in luminance happen quite often.

2. Is the Run-Length code suitable for graphical images and why ?
The Run-Length code is suitable for graphical images in some cases, when there are regions in the images with constant luminance.

3. What happens in the case of an error in the Run-Length decoding ?
The decoded line is destroyed from the error point until the end of the line.

4.4 Modified READ coding

Questions/Answers

1. What happens if an error occurs in the READ decoding ?
An error in the reference line can be diffused to the following lines until the next reference line. Besides, errors in the coded lines can lead to erroneous coding mode detection.

4.5 LZW compression

Questions/Answers

1. What happens if an error occurs in the LZW decoding ?
The detected codewords can be wrong or invalid (they do not belong in the codebook).

2. What happens if we compress by LZW an image which already has been compressed by LZW ?
LZW compressed data can not be compressed using LZW compression because the more frequent bit sequences of the compressed image correspond to the codewords of the original image. So, the codebook will not change.

4.6 Predictive coding

Questions/Answers

1. Why do we use an asymmetric window for image prediction ?
Because the reconstruction of an image pixel luminance value is based on reconstructed pixels luminance values.

2. What are the advantages/disadvantages if we increase the size of the prediction mask?
The prediction is better because more pixels are taken into account, but the computational complexity for the calculation of the prediction factors increases.

3. What happens to the prediction when image statistics changes from an image region to its neighboring one?
In such cases the AR prediction model factors should be recalculated in order to achieve a better prediction based on the local image characteristics. Generally, great prediction errors happen in areas with changes (image edges).

4.7 Transform image coding

Questions/Answers

1. Why do we use usually DCT for transform based coding?
Because it is generally accepted, based on experimental results that DCT achieves better compression rates.

2. Which DCT coefficients are most severely quantized?
The DCT coefficients that have a probability density function with small variance.

3. What is the usefulness of Huffman coding of the quantized coefficients?
They are coded in order to reduce the bits which are used for the image coding.

4. What happens if in error occurs in the decoding of a block in JPEG ?
Then, erroneous luminance values are decoded in the block (blocking effect).