Topics in Coding, Cryptography and Information Security

Editors:

Mohammad Umar Siddiqi
Sigit Puspito Wigati Jarot
Othman Omran Khalifa

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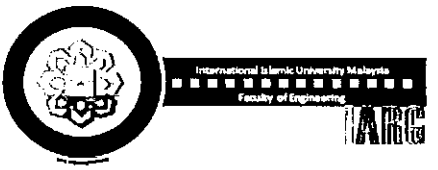

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Chapter 1

Performance Analysis of Image Data Compression using Zero-Tree Wavelet Transform

Othman O. Khalifa, Emir Tabakovic, Zlatko Memisevic and Aisha-Hassan Abdullah

1.1. Introduction

With the growth of technology and the entrance into the digital age, the world has found itself amid a vast amount of information. Dealing with such enormous amount of information can often present difficulties. Digital information must be stored and retrieved in an efficient manner, in order to be practical. Wavelet compression is one way to deal with this problem. The row data (graphics, audio and video) requires considerable storage capacity and transmission bandwidth. Despite rapid progress in mass-storage density, processor speeds, and digital communication system performance, demand for data storage capacity and data-transmission bandwidth continues to outstrip the capabilities of available technologies. The recent growth of data intensive multimedia-based web applications have not only sustained the need for more efficient ways to encode signals and images but have made compression of such signals central to storage and communication technology [1, 2, 3, 4].

1.2. Compression Fundamentals

Compressions rely on two main strategies: getting rid of redundant information (redundancy reduction) and getting rid of irrelevant information (irrelevancy reduction).Redundancy reduction is often used when the image is being encoded (or re-encoded). It looks for patterns and repetitions that can be expressed more efficiently. If, for example, there are 25 black pixels in a row, it is clearly better to record the information for one pixel and state that the next 24 are all the same, than to record each pixel separately. This particular example is known as run-length encoding (RLE).Irrelevancy reduction aims to remove or alter information that makes little or no difference to the perception of the image. This usually happens prior to the encoding and involves a transformation of the image. Some of an image's color information, for example, can be safely simplified without being perceptible to the human eye. However, when carried to an extreme this sort of compression becomes visibly obvious and compromises the quality of the image.