AN EFFICIENT COMPRESSION OF IMAGES IN VARIOUS ASPECTS

ABSTRACT

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Abstract

In the ever growing field of digital technologies, a huge amount of information is being transmitted all around the world over the public networks. Compression is required for fast transmission and efficient storage of information, which is a well established field but compression of images while enabling new applications is an emerging field which has gained a lot of interest in the current era. In this thesis, various novel image compression techniques are introduced in various aspects such as in security, fusion etc.

At first, we have attempted to reduce the bit rate by using a coding technique as coding based compression techniques are simple and effective for data reduction. Wavelet Difference Reduction (WDR) coding along with the Principal Component Analysis (PCA) are used to reduce the original amount of image data. The effectiveness of proposed work is analyzed by comparing it with existing works and it is found that our work has improved the compression performance without much more degradation in the quality of reconstructed images.

In the current era, people prefer to view the color information rather than gray scale therefore, further efforts are made to achieve better compression performance for color images by reducing the correlation among the color planes. In this work, the color images are compressed by reducing the correlation among the planes using YC_bC_r transform. This work is based on WDR coding using YC_bC_r transform, in which a novel method is used for pixel prediction and efficient compression is performed on errors. Further, we have found that more efficient compression performance

can be obtained in transform domain therefore, another technique is proposed which is based on $YCoCg - R$ transform in integer wavelet domain, the work is efficient and applicable on both lossless and lossy image compressions.

Due to ever growing field of digital technologies, several mode of data transmission are available, the challenging task within such environment is to transmit the information securely and efficiently over the both secure or unsecure networks. Compression of images while providing security to transmitting images is one of the desirable applications which lead us to achieve the secure and fast transmission of information over the internet. At first, a simple prediction error based encryption then compression technique is proposed which performs an efficient compression by quantizing the errors. Further, an efficient compression technique on fully encrypted data has been developed using Wavelet Difference Reduction (WDR) coding. Again, a novel and more efficient encryption then compression technique has also been developed using Singular Value Decomposition (SVD) in wavelet domain. The core idea of this work is to identify the significant and less significant information in the transformed domain. The less significant information have been encrypted using pseudo random permutation while pseudo random number sequences have been used to mask the values of significant information. For compression, the less significant information is compressed using SVD and Huffman coding while significant information is compressed nearly lossless. Several standard test images are used to test the efficiency of proposed work and results are compared with the related works.

The methodologies proposed in this thesis have the potential to compress the images while enabling new applications. An approach for secure and efficient transmission of fused images has also been taken into consideration for fast transmission of multi-source or multi-sensor images. The original source images are wavelet transformed and the low and high frequency coefficients are fused using error measurement and maximum rule respectively. Further the low and high frequency coefficients are compressed and encrypted in a dependent way using the proposed methodology. The

quality of fused image is measured by comparing it with several existing techniques and security and compression performance of the proposed work has also been discussed in detail.

The techniques described in this thesis have been tested on various test images in Matlab and the effectiveness of proposed techniques have been compared with existing or state of art methods in this field. The proposed methodologies are novel and superior than existing works in terms of compression performance and perceptually having better image quality. Still, there is a scope of considering new applications of image processing while reducing the bit rate and maintaining the perceptually good quality of reconstructed images.