A REVIEW OF INTEGRATION OF WAVELET AND HUFFMAN COMPRESSION MECHANISM TO IMPROVE SECURITY WITH FINE IMAGE QUALITY

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Abstract: The Huffman and wavelet compression mechanism have been discussed to improve security with fine image quality. There are several researches related to the compression of graphical content which are discussed here. Huffman compression has been applied on first layer and wavelet mechanism has been applied to compress the content on second layer. The first step of Huffman coding technique is to reduce input graphical contents to order histogram. Two performance parameters are considered to measure the performance of graphical content compression algorithm. The proposed integration is beneficial to compress the data without losing its quality.

Keywords: Image Compression, Huffman, Wavelet Mechanism, PSNR, Mean square error

[1] INTRODUCTION

Image compression is known as one sort of data compression. It has been done in order to decrease cost to store such graphical content & transmission. The Algorithms are applied based on visual conception & statistical properties of graphics. Such are used in order to offer superior results. In this process, quality of graphical contents does not get reduced. If there would be graphic content in sort size, user can store data in available size of disk & memory space. There would be decrement in time of transmission of such compressed data via Internet. It reduces downloading time from Web pages.

The process followed to reduce size of graphical contents is known as graphical contents compression. There are two mechanisms to compress image. One is lossy mechanism where quality of graphical contents is degraded. The second mechanism is lossless where quality graphical contents are retained even after graphical contents size reduction.

Huffman coding is one of the basic compression technique. It is very helpful for Graphical content compression. It is significant technique for video compression standards as well. When Huffman encoding mechanism on graphical content is applied, source symbols are pixel intensities related to Image.

Initial step of Huffman coding mechanism is to decrease input graphical data. It is done with help of ordered histogram. Here chances of occurrence of a definite pixel intensity value is as

prob_pixel = numpix/totalnum.

[2] REVIEW FO LITERATURE

There are several researches related to the compression of graphical content which are discussed here.

Khan, Umhara & Mairaj, Sanna & Nazeer, Tamanna & Ahmed, Suhaib. (2017) proposed Wavelet Based graphical content Compression Mechanisms: Comparative Analysis & Performance Evaluation.[1]

In this paper, wavelet based compression mechanisms are discussed in detail & a comparison of performance is made in terms of graphical content quality metrics viz. PSNR, MSE, BPP & Compression ratio. In this paper, Haar, Daubechies, Biorthogonal, Coiflets & Symlet wavelets are applied to graphical content. This paper is a guide to developers to choose better wavelet compression system for their particular applications. Choice of color space has become very significant as it has to be optimal in terms of compressibility & in terms of visual distortion prediction properties. For every color space contrast, sensitivity has been measured & has been incorporated. Finally objective has been measured using signal properties and Signal Properties have been aligned to get output for understanding better performance.

Nedhal Mohammad Al-Shereefi (2013) "Image Compression Using Wavelet Transform" [2]

The procedure performed to reduce size of graphical contents is known as graphical contents compression. There are two mechanisms to compress image. One is lossy mechanism where quality of graphical contents is degraded. Second mechanism is lossless where quality graphical contents are retained even after graphical contents size reduction.

Rachit Patel (2016) "A Fast & Improved graphical content Compression mechanism Using Huffman Coding "[3]
Image Compression with support of Huffman coding mechanism is a simple & easy compression mechanism. Compression of graphical content is essential because of easy implementation. Point of research is to analyse Huffman coding mechanism that has been basically used to delete redundant bits from information by analysing various characteristics or specification. Examples are like Peak Signal to Noise Ratio, Mean Square Error, Bits per Pixel & Compression Ratio for various input graphical content. Input graphical content may be of different size. Here the novel mechanism of splitting an input graphical content is considered into equal rows & columns. In final stage, sum of all individual compressed graphical contents is done. It has not only provided good solution but also information content is safe. Graphical content compression mechanism has several advantages including analysis of the graphical content & for security purpose of image.

Marcus J. Nadenau & Julien Reichel (1997) "Opponent Color, Human Vision & Wavelets for graphical content Compression"[4]
Modern graphical content compression has produced codec that has embedded bit streams with optimal rate-distortion properties. Choice of color space has become very significant as it has to be optimal in terms of compressibility & in terms of visual distortion prediction properties. For every color space contrast sensitivity has been measured & has been incorporated. Finally, objective has been measured using signal properties and signal properties have been aligned to get output for understanding better performance.

Saenz, P Salama, K Shen (2001) "An Evaluation of Color Embedded Wavelet Mechanisms of graphical content Compression"[7]
The research work has considered use related to color transformations. Several spatial orientation trees are there that can make coding strategies. Such strategies are related to scalable color graphical content compression. It has been seen that SOT's applicability that has been exploited by better performance. Visually & PSNR are considered as naive concepts. It has been analyzed that wavelet transform mechanism is better than JPEG in all cases.

Anna Linderhed (2004) "Image Compression based on Empirical Mode Decomposition"[9]
Work has been done on Empirical Mode Decomposition in 2D and has generated a residue with several extreme points. The research has proposed an improved method to decompose a graphical data into a no. of Intrinsic Mode Functions & a residue graphical content with a low no. of extreme points. Method of using overlapping 7x7 blocks has been introduced for overcoming blocking artefacts. Also, variable sampling of blocks has been used.

Matthew J. Zukoski (2006) "A novel mechanism for medical graphical content compression"[11]
The research work has proposed a novel model-based compression technique. Clinically, relevant regions have been used as these are defined by radiologists. Graphical content compression, Lossless compression has been applied in such clinically relevant regions. Lossy compression has been used in some places.

P. Raviraj & 2M.Y. Sanavullah (2007) "The Modified 2D-Haar Wavelet Transformation in graphical content Compression.[12]
The research work has proposed a modified simple. On other hand, efficient calculation schema is also discussed. It is for two D-Haar wavelet transformation. This has been made within compression of graphical content. Aim of proposed work is development of algorithms. Such algorithms are computationally efficient & effective. These are used for lossy graphical data compression. In addition to this, wavelet mechanisms have been used.

Ahmed Nabil belbachir & Peter Michael(2010) "The Contour let Transform For graphical content Compression" [13]
A comparative study is performed between contour let & wavelet analysis in terms of result quality & information compaction using a new metric. Potential of contour let transform for graphical content compression & further coefficient coding & improvement of its implementation are discussed.

G. K. Kharate, V. H. Patil (2010) "Color graphical content Compression Based On Wavelet Packet Best Tree.[15]
Author suggested novel mechanism that is related to wavelet packet best tree. It varies as epr Threshold Entropy. Here updated run-length encoding has been determined. Proposed mechanism is able to decrease time complexity related to wavelet packets decomposition. It is similar to whole tree that is composed. Proposed algorithm chose sub-bands. It involves essential data as per threshold entropy.

Nidhi Sethi, Ram Krishna (2011), "Image Compression with use of Haar Wavelet Transform.[16]

The research has reported to aim at developing efficiently in computation & algorithm for lossy graphical content has been found effective for compression by using wavelet mechanisms. algorithm has been developed to compress graphical content in a time-efficient manner. Output has been obtained that has been concerned about reconstructed graphical content quality along with protection of significant graphical data details that have been found promising. There has been a decrease in encoding time with some degradation in graphical data quality in comparison to methods that are in existence.

A. Proch´azka, J. Pt´aˇcek, & I. (2012) "Wavelet Transform in Signal & graphical content Restoration" [18]

Research has presented selected mathematical mechanisms of digital signal. Graphical content processing has been based upon use of wavelet transform & signal decomposition with applications in system identification, analysis & modelling. Integral part of paper has been devoted to signal de-noising using hard & soft thresholding.

Akshay Kekre (2013) "Image Compression applying Wavelet Transform & Differential Pulse Code Modulation mechanisms" International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 7, July – 2013[20]

The aim of graphical content compression is to decrease irrelevance & redundancy of graphical content data for making it able to store or transmit information in an efficient form. A lot of work needed to be done on graphical content compression & still a lot of scope has been widely open. Research has been evaluating performance of graphical content compression algorithm that is based upon wavelet transform & Differential. Simulation has resulted in showing an improvement in performance that has been compared to wavelet transform mechanism.

T. Karthikeyan et al (2014) "Wavelet Based graphical content Compression Algorithms – A Study[24]

The research has been providing a explained survey on some of popular wavelet coding mechanisms. It can contribute in development of more efficient compression algorithm. This would benefit interested researchers to carry out more & more work in thrust region of research.

Dr. Vineet Richariya et al (2014) introduced Image Compression mechanism Using Different Wavelet Function.[25]

Analysis motivation has been done to encourage amateur researcher in areas of graphical content compression, such as they could easily understand concept of graphical content compression. It could contribute in development of more efficient compression algorithm. This would benefit interested researchers to carry out more & more work in thrust region of research.

Neha Pandey, Himani Agrawal (2014) wrote research paper on "Hybrid graphical content Compression Based on Fuzzy Logic Technology"[26]

Graphical content compressions methods are like DCT, DWT, & Hybrid are discussed. Hybrid graphical content Compression has been done by using DWT & DCT. These have been used to perform discrete cosine transformation on discrete wavelet transformed coefficients. Compression mechanisms have been found significant for compressing one graphical data for high value of PSNR. Method has been popularly known as hybrid compression mechanism.

Ali Tariq Bhatti et al (2015) Implementation of Lossless Huffman Coding: graphical content compression using K-Means algorithm & comparison vs. Random numbers & Message[28]

Huffman coding has been analysed from results that has been provided by help of MATLAB implementation. Implementation could be done by using random numbers, message displays that lies between for twenty six English alphabets & graphical content compression by K-Means mechanism that has been based upon performance metrics that more compression ratio of Huffman coding then lesser would be entropy. Average length has been increasing threshold value or not. Going in deep Huffman coding has been used for random numbers that shows lesser entropy output in comparison to Message that has been displaying.

Malwinder Kaur(2015)A Literature Survey On Lossless graphical content Compression [29]

Author has introduced basic concepts of graphical content compression. Author has not discussed subject in much detail and only significant parts are discussed in this paper. Paper has discussed an overview of various existing coding standards & lossless graphical content compression mechanisms.

Anurag, Sonia Rani (2017) "JPEG Compression Using MATLAB" 2017 IJEDR | Volume 5, Issue 2[31]

Creating, editing, & generating graphical contents in a very regular system is the top most priority today. Original graphical content data generated by camera sensor is too large to store, Hence, efficiency is not high. Mobile or bandwidth-limited systems become particularly cumbersome, where object is a conservative bandwidth cost, such as World Wide Web. This situation requires use of efficient graphical content compression mechanisms, such as JPEG algorithm mechanisms, that perceive graphical contents with almost no loss of compressed graphical content height. Today, JPEG algorithm has become actual standard for graphical content compression.

Ali Tariq Bhatti, Dr. Jung Kim (2015) Implementation of Lossless Huffman Coding: graphical content compression using K-Means algorithm & comparison vs. Random numbers & Message[33]

Huffman coding has been analyzed from provided results with help of MATLAB implementation. For this random numbers, message display has been used in between for 26 English alphabets. Graphical content compression via K-Means mechanism is based on performance metrics. This results in more compression ratio of Huffman coding. The lesser would be entropy & average length as by if increasing threshold value or not. Furthermore, Huffman coding using random numbers show less entropy result as compare to Message display using 26 alphabet characters & graphical content compression. For this the K-Means algorithm has been used. Lesser the entropy, better would be graphical data compression. For this the K-Mean algorithm mechanism has been used for Huffman coding.

[3] WAVELETS IMAGE PROCESSING

A wavelet is a wave-like oscillation with amplitude. It starts at zero, increases. After that it decreases back to zero. It has been basically visualized as a "brief oscillation" as one recorded. It has been done by a seismograph / heart monitor. Basically, wavelets are intentionally crafted to have specific properties. Such make them beneficial for signal processing. With the use of a "reverse, shift, multiply & integrate" technique called convolution, wavelets could be combined with known portions of a damaged signal to extract information from unknown portions.
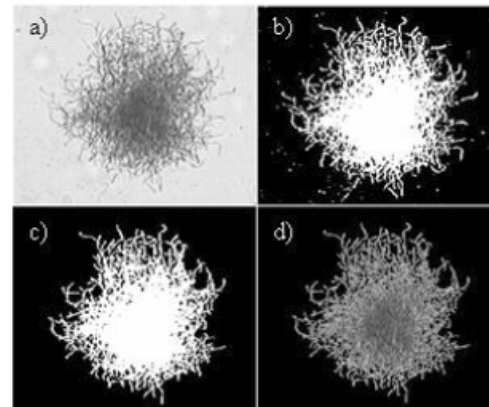

Fig1 Wavelets Image Analysis

[4] PROBLEM FORMULATION

Graphical contents are the documents that are in demand and prevailing in current scenario. While working on them there is a frequent requirement of compressing data. Compression is dependent on data where it can be applied. Some algorithms perform compression in different ways. Compressed graphical contents may be lossless & keep same data as actual graphical content without any loss after compression. Some data get lost in compressing pictorial text. There are several compression methods designed for particular kind of graphical data. There have been some algorithms that helped in changing basic parameters. Traditional model has been required to be updated for improving compression ratio & PSNR value of graphical data after decompressing data. A mechanism would be required to integrate and hence increasing compression ratio. Furthermore, there has been a need to integrate a graphical data adjustment mechanism for increasing quality of graphical data.

[5] CONCLUSION

In the research work the Huffman and wavelet based image compression has been discussed. For the security of the graphical content, the compression and decompression of data has been done on two layers. The wavelet based image compression has been integrated in order to increase the compression ratio in proposed work. At first layer, the compression of content has been done using Huffman and at second layer, contents have been compressed using wavelet mechanism. In same way, the contents have been decompressed on both layers using these techniques. It has been concluded that the proposed integration of Huffman and wavelet based integration is beneficial to secure the graphical content.

[6] FUTURE SCOPE

This research has focused on wavelet based graphical content compression that would be beneficial to increase compression ratio of graphical content. It would be beneficial to compress the content at two layers for double security. Proposed Mechanism may be updated and suitably designed in order to compress more than one images in a single compressed file for convenience of sending and receiving graphical content on a computer network. More layers may be added in mechanism of proposed layer to generate even better results of compressing graphical content but at the same time taking account of PSNR value. Audio and video content may also be compressed by applying suitable compressing mechanism at the compressing and decompressing layers of the proposed algorithm.

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