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Video Compression Using Modified SPIHT with H.264

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ABSTRACT
This project focuses on video compression. The need of video compression is HD quality with less size for video transmission, video conference and video calling. By using the proposed method, we can achieve better video compression. A workable low-memory solution is needed to make the SPIHT algorithm implementation possible. The sorting and refining phases are condensed into a single scan run in this updated technique.

We present two new concepts called Number of error bits and Absolute Zero tree, to modify the original SPIHT algorithm. The coding technique for compressing medical videos is examined in this research. The approach that has been presented offers the benefit of improving the visual quality of the video coding while effectively minimizing spatial redundancy. Initially, alternatively referred to as a non-separable transform, the bandelet transform is examined to enable an effective identification of the various intricate geometries shown in videos.

We improved the medical video sequence's visual quality by reducing the artifactual impact induced by the stage of quad-tree decomposition providing an explanation decomposition stage after explaining the lifting operation in the bandelet transform. Lastly, a set of objective measurement parameters is used to test and assess the effectiveness of the suggested strategy on medical footage.

INTRODUCTION

The literature on compression techniques demonstrates that lossy coding may have artifacts that are highly undesired and result in notable alterations to the substance of the material. It's critical to identify a certain kind of non-separable change in these situations. A number of transformation methods, including the wavelet transform [1], curvelet transform [2], contourlet transform [3], wedge let transform [4], ridge let transform [5], and discrete cosine transform [6,] have been suggested for data compression in earlier studies. These have all demonstrated how data may be reduced with very little adjustments to resolution, orientation, etc. However, many diagnosis applications cannot employ the specified transforms because of their low directionality. High-dimensional signals are required to get around these restrictions and make significant progress in the Several MGA transformations have been introduced in the theory of multi-scale geometric analysis (MGA), most notably the DBT (Discrete Bandelet Transform) [7, 8], which is well suited to capture geometric regularity.

As a result, a large number of researchers have examined and demonstrated the effectiveness of bandelet transforms for several applications [9–11]. Because the search operation is applied on the set of blocks produced after wavelet decomposition rather than the function itself, the bandelet transform is accurate and useful. The degree of clarity in the video typically limits the bandelet's success. This article's goal is to expand the bandelet transform for high-order geometry, which lowers the computational cost and enhances the clarity of videos. Thus, the chosen complex geometry will be the guide for the bandelet transform.

It is consistent with the intricate geometric patterns of video, but it is implemented differently and relies on a lifting approach [12]. The lifting method has the benefit of being able to construct transforms without passing through the Fourier domain since it calculates the high and low frequency sub-bands concurrently and has an invertible lifting structure. Utilizing the lifting structure enhances the calculation of the bandelet transform. The resultant coefficients are effectively coded using the sub-band coders. Shapiro's [13] initially describes the Embedded Zero tree Wavelet (EZW) as the first sub-band coding technique. Subsequently, Said and Pearlman's work, which presented the effective partitioning set in the tree hierarchical encoder (SPIHT) [14], enhances the EZW encoder.

LITERATURE REVIEW

[1] Video Compression using Modified SPIHT with H.264 **Informatics in Medicine Unlocked 17 (2019) Mohammed Beladgham` , Yassine Habchi, Mohamed Ben aissa, Abdelmalik Taleb-Ahmed** This paper investigates a coding method for medical video compression. The described technique has advantages of providing a higher visual quality of video coding, and efficiently reducing spatial redundancy. Firstly the bandelet transform, also called a non-separable transform, is studied in order to allow an efficient detection of the different complex geometries found in video. After describing the lifting operation in the bandelet transform, we reduced the artifactual effect caused by the quad-tree decomposition step in order to enhance the visual quality of the medical video sequence. Finally, the efficiency of the proposed method on medical video is tested and evaluated by means of a set of objective measurement parameters.

[2] An Innovative Approach towards the Video Compression Methodology of the H. 264 Codec: Using SPIHT Algorithms **Rajinder Tiwari, Charu Pandey, Satish Kumar** The video signal is an integral part of multimedia which has a tremendous importance in most of the applications involving the concept of the multimedia i.e. video conferencing; video-on-demand, broadcast digital video, and high-definition television (HDTV), etc. which are expected to have a substantial end user or the consumer market. It means that these applications which are based on the basic principle of the digital signals having both component of the audio and video, are using the most dominant approach of the video compression techniques so as to make the best and efficient use of the available bandwidth. The existing video coding techniques such as those used in MPEG-1 (ISO), MPEG-2 (ISO), MPEG-3(ISO), H.261 (ITU), and H.263 (ITU) are the typical and most commonly used standards that employ the basic and most essential schemes or techniques that uses the intra frame coding or inter frame coding techniques so as to achieve the high desired compression rates. In this discussion, the authors put forward an innovative approach of the video signal compression that makes the use of the advanced H.264 algorithms which are based on the application of DCT & wavelet based video compression of the multimedia based signal. The simulation of the considered image has been carried out with a comparative analysis of the results that has been obtained with the traditional approach as well as proposed one i.e. SPIHT (Set Partitioning in Hierarchical Trees) algorithm for video compression of the signal.

[3]Improving Medical Video Coding Using Multi Scale Quincunx Lattice: From Low Bitrate to High Quality Yassine Habchi , Ameur Fethi Aimer , Jamel Baili, , Mustafa Inc5,* , Younes Menni1 , Giulio Lorenzini8 In recent years, the healthcare sector has seen an increase in the use of medical images and

videos. However, storage and transmission of this huge volume of data remain a challenging task, requiring the use of compression techniques. In this paper, the authors propose an algorithm to improve the visual quality of compressed medical video for lower bitrate without modifying the content of information such as edges and textures, this is a unique way for doctors to store and share medical data over the internet. The algorithm has not yet been sufficiently explored in medical video coding. In this study, the performances of the quincunx wavelet transform (QWT) combined with the set partitioning in hierarchical trees (SPIHT) encoder are discussed. The QWTs were chosen due to their limited number of wavelets family and reduced dilatation factor. The high efficiency of the suggested algorithm is checked against the coding standard based on the discrete cosines transform (DCT) or discrete wavelet transform (DWT). The assessment of the quality of the decoded video is based on the use of the peak signal to noise ratio (PSNR), the mean structural similarity (MSSIM) and the visual information fidelity (VIF). The results prove that the QWT+SPIHT provide competing performance where the PSNR reached 33 dB value for lower bitrate (137.408 Kbps) against previous standards.

[4] An Improved SPIHT Algorithm for Video Compression K. Muthulakshmi M.E., Anugrace Rani Abstract Ubiquitous use of real-time video communication on the Internet requires adaptive applications that can provide different levels of quality depending on the amount of resources available. For video coding this means that the algorithms must be designed to be efficient in bandwidth usage, processing requirements and quality of the reconstructed signal. Of most algorithms developed, SPIHT algorithm ever since its introduction for image compression has received a lot of attention. Though SPIHT is considerably simpler, efficient, completely inserted codec provides good image quality, large PSNR, optimized for modern image transmission, efficient conjunction with error defense, form information on demand but still it has some downsides that need to be taken away for its better use. One of the main drawbacks is its slow processing speed. To overcome this drawback, a modified SPIHT algorithm called block based pass parallel SPIHT for video compression is used. The video is separated into individual frames and dual tree complex wavelet transform is applied to the individual frames. Then the wavelet coefficients are encoded using Block based pass parallel SPIHT encoder. The bit stream generated is decoded using Block based pass parallel SPIHT decoder. Inverse wavelet transform is applied to reconstruct the original frame from the decoded result. The frames are concatenated to reconstruct the video. The quality of the reconstructed video is measured in terms of PSNR, MSE and Compression ratio.

PROPOSED METHODOLOGY

SPIHT algorithm is very efficient in transmission of ordering information, essentially involves a scalar quantization operation. The essence of the set portioning is to first classify the elemental coding units based on their magnitude and then to quantize them in a successive refinement framework. The elemental coding unites are scalar wavelet coefficients.

To realize the implementation of SPIHT algorithm, a successful low-memory solution must be provided. In this algorithm, the sorting and refinement phase are combined as one scan pass.

1)Number of Error Bits: During SPIHT coding, only the most significant bits in transform coefficients are outputted for later decoding. The least significant bits will be omitted. Error bits are denoted by μe. Its first (n+1- μe) bits are immediately outputted. And its coordinates are no longer stored into the LSP or the LIP.

2) Absolute Zero tree: The introduction of absolute Zero tree is a simple solution to this problem. We have defined to indicate the number of truncating error bits. For a Zero tree, if the magnitudes of all its descendants are lower than 2µe it becomes an absolute Zerotree and will never be significant in the last scan passes.

RESULTS

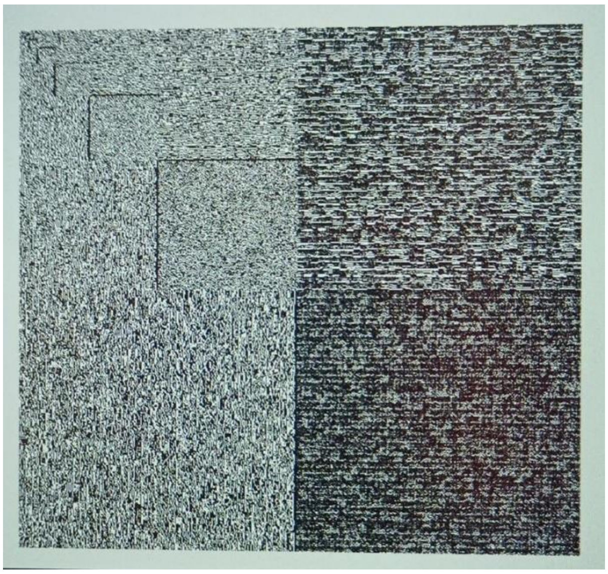

fig 1

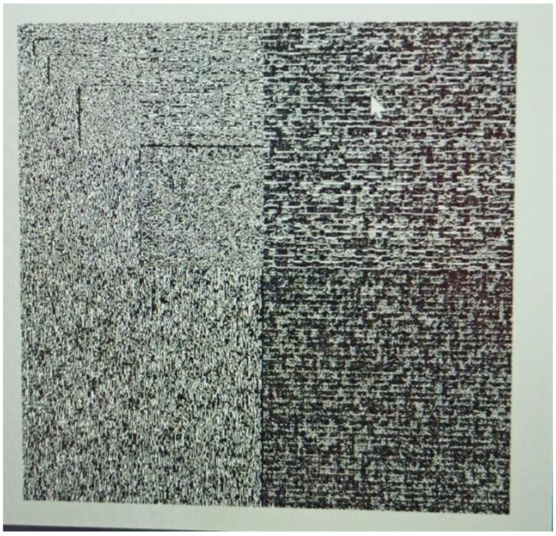

Fig2

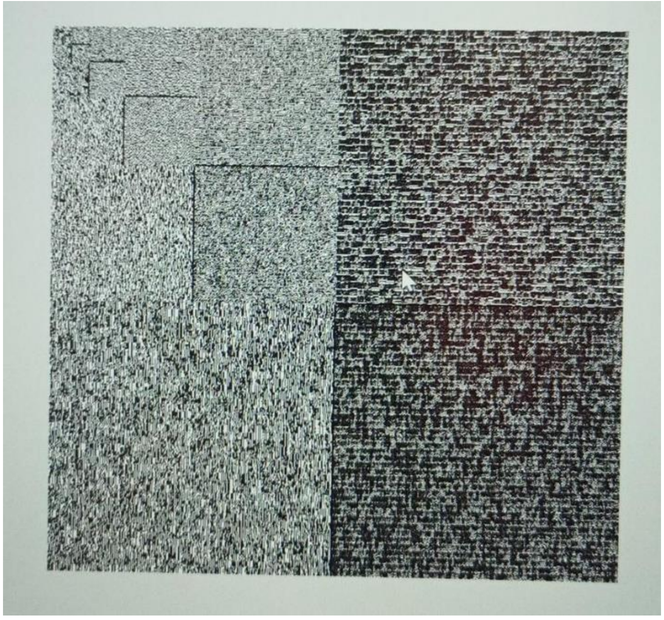

Fig3

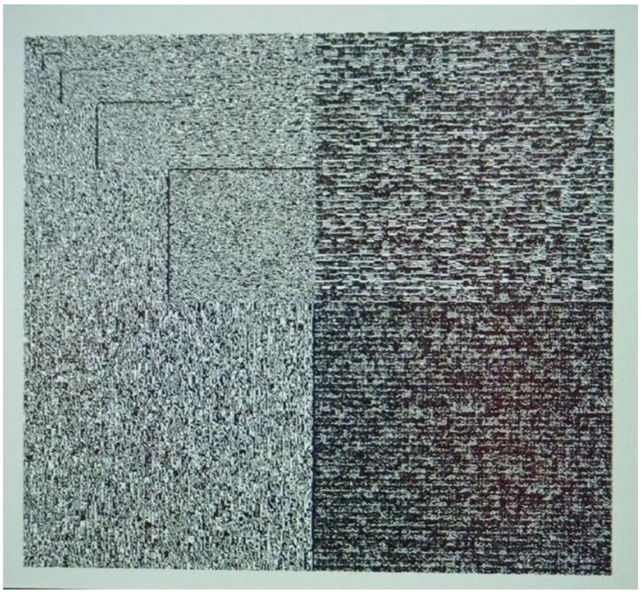

Fig4

CONCLUSION

In conclusion, coordination adjusted Set Apportioning in Various leveled Trees (SPIHT) with H.264 for video compression offers a promising approach to attain upgraded compression productivity whereas keeping up video quality. Through the combination of SPIHT's spatial excess lessening capabilities with H.264's transient and spatial compression procedures, critical changes in compression proportions, PSNR (Top Signal-to-Noise Proportion), bitstream measure, and execution time can be accomplished. The utilization of adjusted SPIHT for intra-frame compression inside the H.264 system gives an viable implies of lessening spatial excess inside person outlines, subsequently upgrading the by and large compression execution. Also, SPIHT-compressed outlines can consistently coordinated with H.264 encoding forms, where they can be treated as intra-coded outlines (I-frames), facilitating effective compression over the whole video arrangement.

Execution assessment through measurements such as PSNR illustrates the viability of the coordinates approach in protecting video quality. The lessening in bitstream measure demonstrates made strides compression productivity, which is basic for bandwidth-constrained applications and capacity contemplations. Besides, optimizations in execution time guarantee that the compression prepare remains computationally doable for real-time applications.

In outline, the integration of adjusted SPIHT with H.264 offers a synergistic arrangement for video compression, conveying progressed compression proportions, PSNR, decreased bitstream sizes, and optimized execution times. This approach holds critical guarantee for different applications extending from video gushing and telecommunication to interactive media capacity, where effective compression is fundamental. Proceeded inquire about and improvement in this heading are significant for advance improving compression execution and progressing the state-of-the-art in video compression innovation.

SPIHT (Set Apportioning in Progressive Trees) could be a wavelet-based compression calculation that effectively encodes wavelet change coefficients by recursively dividing them into noteworthy and immaterial sets.

Alterations to SPIHT may include optimizations to the encoding handle, such as refining the thresholding methodology, making strides the sorting calculation, or adjusting the wavelet change to superior suit video characteristics.

SPIHT can be coordinates into the H.264 compression system to upgrade its productivity in diminishing spatial redundancy, especially for intra-frame compression.

Within the integration handle, SPIHT-compressed outlines are treated as intra-coded outlines (I-frames) inside the H.264 grouping, guaranteeing compatibility with H.264's inter-frame expectation and entropy coding procedures.

Top Signal-to-Noise Proportion (PSNR):

A metric commonly used to degree the quality of the recreated video compared to the initial. Higher PSNR values show way better conservation of visual quality.

Bitstream Estimate:

Alludes to the estimate of the compressed video information. Decreased bitstream estimate shows moved forward compression productivity, which is vital for bandwidth-constrained applications and capacity.

Execution Time:

Measures the time taken to compress a video grouping. Optimizing execution time guarantees that the compression handle remains attainable for real-time applications.

By tending to these aspects in more detail, analysts and engineers can pick up a comprehensive understanding of the integration of adjusted SPIHT with H.264 for video compression and investigate its potential for different applications.

The utilization of MATLAB for video compression offers a strong stage for analysts and practitioners to explore and create inventive compression calculations. Through its broad suite of built-in capacities, libraries, and tool compartments, MATLAB gives a flexible environment for prototyping, testing, and assessing different compression procedures.

Throughout this study, we have investigated the adequacy of MATLAB in actualizing and analyzing diverse video compression calculations, counting conventional measures like MPEG and H.264, as well as more progressed procedures such as wavelet-based strategies and neural network-based approaches.

MATLAB serves as a profitable stage for video compression investigate, advertising a combination of adaptability, usefulness, and ease of utilize. By tackling MATLAB's capabilities, analysts and engineers can proceed to thrust the boundaries of video compression innovation, driving to progressions in mixed media applications, ommunication frameworks, and computerized substance conveyance.

This work proposes a moo bitrate therapeutic video coding framework, called QWT+SPIHT, based on the quincunx wavelet and the SPIHT calculation. The sum of superfluous information is essentially diminished, and the video's quality is moved forward without changing its substance.

More flexibility and made strides substance surrounding are advertised by the quincunx wavelet. The SPIHT is utilized to encode each and each produced quincunx coefficient. The QWT+SPIHT's adequacy is assessed utilizing the collection of therapeutic recordings. Especially for moo bitrate values, the comes about gotten on different bitrates illustrate a significant advancement over the standard strategies. The film that was recuperated encompasses a subjective quality that's suitable for the therapeutic industry.

Also, our proposed calculation takes a small sum of time to activities including coding and interpreting.

Video compression calculations can be performed employing a combination of built-in capacities, libraries, and custom scripts. MATLAB gives instruments for objective quality appraisal (e.g., PSNR, SSIM), subjective quality assessment (e.g., MOS), compliance testing (e.g., bitstream examination), execution benchmarking, and real-world recreation.

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