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Video Watermarking using Hybrid Technique (Fractal & RLE Encoding)

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ABSTRACT: Visual Cryptographic methods are not sufficient to solve all image security related issues. Digital data can be stored efficiently with a very high quality and it can be manipulated very easily using computers. Therefore, we have great need of secure transmission of the concerned data. Watermarking is used as a key solution to make the data transferring secure from illegal interferences. A watermark is a secondary image, which is overlaid on the host image, and provides a means of protecting the image. So we have need the new hybrid technique which will be able to hide watermark in such a way so that it cannot be extracted easily. A new research in same field a method with efficient results will be proposed to hide watermark in image to provide robust and secured watermarking. The method used is a collaboration of fractal encoding and RLE encoding. In this, analyzed the results on the basis of different parameters (Peak Signal to Noise Ratio, Mean Square Error, Bit Error Rate).

KEYWORDS: Video watermarking, Principle & characteristics of video watermarking, Fractal encoding, RLE encoding

I.INTRODUCTION

In multimedia, everyday tons of data is embedded on digital media. This data, which include still images, video, audio, or text are stored and transmitted in a digital format can be easily copied without loss of quality and efficiently distributed. Thus the protection of intellectual property rights has become increasingly important. Publishers, artists, and photographers, however, may be unwilling to distribute pictures over the Internet due to a lack of security, images can be easily duplicated and distributed without the owner's consent. Watermarking have been proposed to solve this tough issue. Watermark is a code that is embedded inside an image. Watermarking however adds the additional requirement of robustness. It is inserted invisible in host image so that it can be extracted at later times for the evidence of rightful ownership [1]. Typically the watermark contains information about the origin, ownership, destination, copy control, transaction etc. Video watermarking is different from image watermarking, because additional data are available here that allows information to be more redundantly and reliably embedded. Digital video is a sequence or collection of consecutive still images. The amount of information that can be embedded in the video sequence is called payload. In reality video watermarking techniques need to meet other challenge such as large volume of the inherently repeated sequence of data between frames.

II.RELATED WORK

Kharate and Patil had proposed that the compression ratio as well as the quality had been considerably improved by appropriate selection of the mother based on the nature of images. The technique they have proposed had been based on Threshold Entropy with enhanced run-length encoding based wavelet packet best tree. As complete tree had not been decomposed, their method had minimized the time complexity of wavelet packets decomposition. Sub bands that include significant information based on threshold entropy had been chosen by their algorithm.

AnupGarg had proposed a new method for image compression fractal image compression encoding algorithm is used with thresholding and fractal decoding algorithm to get decompressed image. A new developed thresholding method is applied

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to the whole image after taking the fractal encoding algorithm. To the obtained range blocks revised threshold is applied with hard thresholding function to get the new range blocks. Decompressed image is obtained after applying fractal decoding algorithm. The improved algorithm is tested against pure fractal encoding algorithm. The pure fractal image compression has the disadvantage of having long encoding time with some compromise with quality of image. The method improves the encoding time with higher compression ratio.

D.Venkatasekhar and P. Aruna had proposed that Genetic algorithm is used to find the best block of replacement, so fractal image is done easily. Here Genetic algorithm with Huffman coding is used for fractal image compression. Intuitively, Huffman coding can offer better fast fractal compression than Arithmetic coding. When compare to Arithmetic coding, Huffman coding is best for compression, It increase the speed of compression and produces high PSNR. Totally genetic algorithm with Huffman coding increases the speed.

William Robson Schwartz and HelioPedrini had proposed an encoding method for reducing computational cost to find matching blocks for range blocks. The combination of a partition-based method using quadtree decomposition with robust feature descriptors in their work allowed the search to consider only blocks sharing similar properties, providing significant speed-up.

Chakrapani and SounderaRajan had proposed a back propagation based neural network for fractal image compression. One of the image compression techniques in the spatial domain was Fractal Image Compression (FIC) but the main drawback of FIC using traditional exhaustive search was that it involves more computational time due to global search. In order to improve the computational time and compression ratio, artificial intelligence technique like neural network had been used. Feature extraction reduces the dimensionality of the problem and enables the neural network to be trained on an image separate from the test image thus reducing the computational time.

III.PROBLEM FORMULATION

The problem in digital watermarking, the actual bits are scattered in the image in such a way that they cannot be identified and show resilience against attempts to remove the hidden data. Fractal compression, based on fractals is a lossy compression method for videos. Fractal encoding is a mathematical process used to encode bitmaps containing a real-world image as a set of mathematical data that describes the fractal properties of the image. Fractal encoding relies on the fact that all natural, and most artificial, objects contain redundant information in the form of similar, repeating patterns called fractals. A challenging problem of ongoing research in fractal image representation is how to choose the f_1, \dots, f_N such that its fixed point approximates the input video and how to do this efficiently. The fractal encoding in video watermarking was used for video transformation into compressed form and the watermark pattern was embedded into the video. The security of the watermarked image with fractal encoding was lower as the data could be encrypted by any unauthorized user also. The PSNR of the resultant video also needs to be improved. Combining these factors, it is known that a new technique needs to be proposed which produces efficient results than the conventional techniques. The security of the system and data compression should be improved by rising the PSNR using new technique. Need is of better quality technique that should be efficient and should have less error probability.

IV.PROPOSED WORK

For better results, proposed technique introduced video watermarking with hybrid technique i.e. fractal encoding and RLE. Fractal image compression exploits the natural affine redundancy present in typical images to achieve high compression ratios in a lossy compression format. Fractal image coding consists of finding a set of transformations that produces a fractal image which approximates the original image. RLE algorithms are lossless, and work by searching for runs of bits, bytes, or pixels of the same value, and encoding the length and value of the run. So, the aim of this hybrid technique is to overcome the disadvantages of the conventional techniques like data compression, less security and more error probability. This hybrid technique number of bits will reduce, so the PSNR of the system improves. It also decreases error probability and so

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the security of the technique increases. By this hybrid technique a better quality watermarking is achieved which yields better and efficient results than the conventional techniques.

V. THE PRINCIPLE AND CHARACTERISTICS OF VIDEO WATERMARKING

A. The principle of video watermarking

A complete digital watermarking system should include three basic parts [3]: watermark generation, watermark embedding and watermark extraction or detection. Watermark embedding algorithm uses the symmetric key or public key to make the watermark information embed into the original carrier to get concealed carrier. Watermark detection / extraction algorithm using the corresponding key vector from the hidden watermark is detected or recovered without the key. The attacker is very difficult to find and modify the hidden watermark vector.

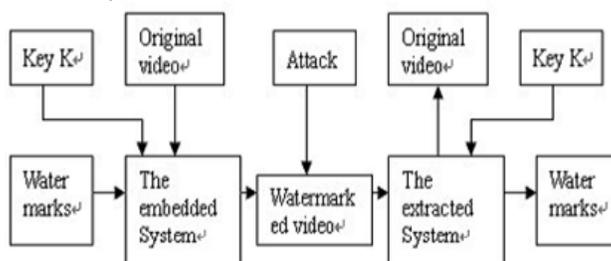


Figure 1: Block diagram of water mark embedded/extracted

B. Characteristics of Video Watermarking

Video watermarking not only has the characteristics of digital image watermarking, but also has its unique characteristics [4-6]:

- **High real-time:** Three-dimensional video signal has more the amount of data than the image does. So calculation quality is larger and embedding / detection needs more times. The process of embedding, using video compression standard for these specific structures such as motion vector coding, VLC code word, etc., can achieve efficient algorithms.
- **Random detection:** The watermark is detected in any position of the video rather than the position according to the video playback order to detect the watermark. The combination of video codec standard. Video is compressed formats in the storage or transmission process, so information hiding technology research cannot do anything without specific video codec standard. Only combined with the encoding and decoding standard, video information hiding technology can make the real-time requirements fulfillment.
- **Better robustness.** Video watermarking scheme must ensure it can resist almost kinds of processing or attacks.
- **Blind detection scheme:** Non-blind detection needs the original host signal, but it is very inconvenient to use the original data, because of the huge video data. Blind detection does not need the original host signal.

VI. COMMON ATTACKS IN VIDEO WATERMARKING

The common attacks of video watermarking are frame dropping, frame averaging, statistical analysis, lossy compression, cropping and various signal processing and geometrical attacks.

Intentional attacks: The intentional watermark attack include Single frame attacks like filtering attacks, contrast and color enhancement and noise adding attack. Or statistical attacks like averaging attack and collision attack.

Unintentional attacks: The unintentional attacks may be due to degradations that can occur during lossy copying, or due to Compression of the video during re-encoding or because of Change of frame rate and Change of resolution.

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VII. FRACTAL ENCODING

Fractal Image Compression (FIC) is a lossy compression technique for digital images, based on fractals. The FIC method is suited for textures and natural images based on the fact that parts of an image resemble other parts of the same image. Fractal algorithms convert these parts into mathematical data called fractal codes. These codes are used to recreate the encoded image. Similar blocks in a given input color image are identified using FIC (the matched domain blocks for each range block in an image). The Euclidean distance measure is used to calculate the similarity between the resultant images. Fractal Image Compression uses the property of self-similarity of fractal objects. It is used to avoid performing repetitive compression on the similar block. It must be used before encoding the quantized image. The quad-tree technique is used to partition the resultant image into four equal blocks, and then each block is tested to verify some condition of homogeneity. If a block meets the condition, it is not partitioned further. Else, it is partitioned again into four equal blocks, and the test condition is applied to those blocks. This process is repeated iteratively until each block meets the condition of homogeneity.

VIII. RUN LENGTH ENCODING

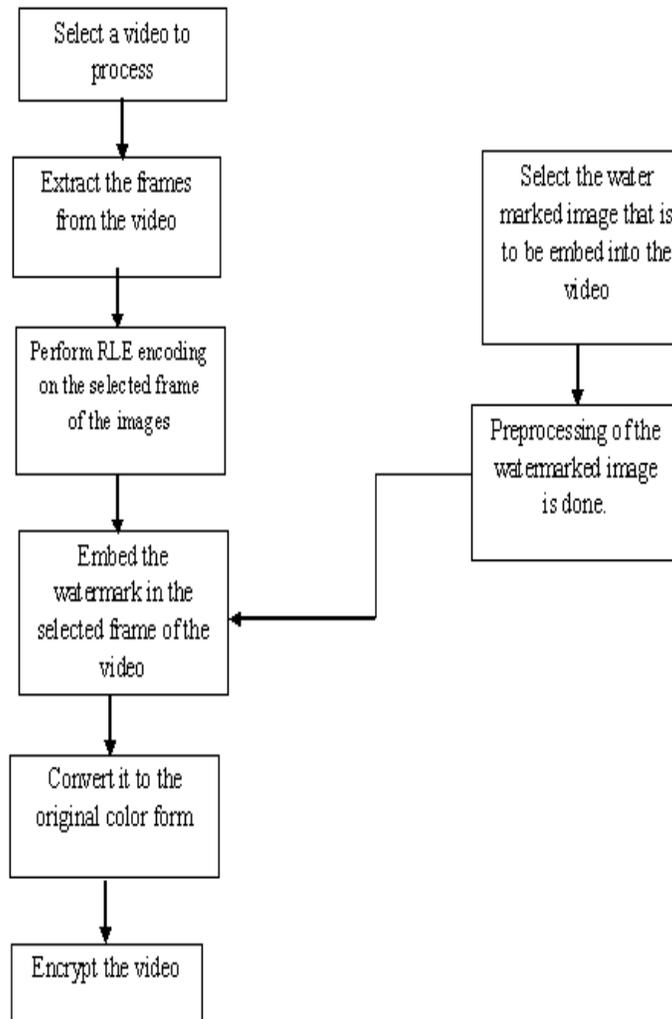
Run-length encoding (RLE) is a simple form of compression in which sequences of data are stored as a single data value and count, rather than as the original sequence. RLE technique achieves best results with images containing large areas of contiguous color. The first step in this technique is read file then it scans the file and find the repeating string of characters. When repeating characters found it will store those characters with the help of escape character followed by that character and count the binary number of items it is repeated. This method is useful for image having solid black pixels. This algorithm is also effective for repeating of characters. But it is not effective if data file has less repeating of characters. Run Length Encoding is a very simple lossless compression technique in which runs (sequence) of data are stored as a single data value and count. Run length encoding (RLE) achieves best results with images containing large areas of contiguous color, and especially monochrome images. Run length encoding represents a string by replacing each subsequence of consecutive identical characters with (char; length). The string 111112222233331111 would have representation (1; 6) (2; 5) (3; 4) (1; 4). Then compress each (char; length) as a unit. This method works well when the characters repeat often. In the proposed method, RLE is used to compress the image effectively.

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Block diagram of purposed work



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Decryption

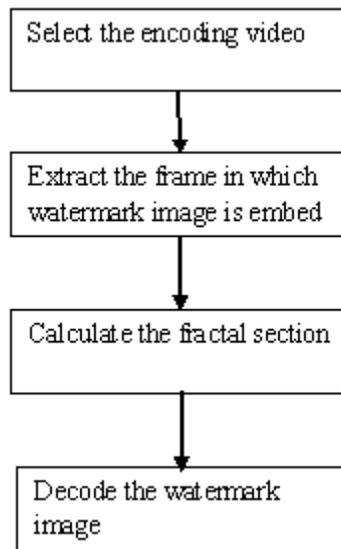


Fig 1: Block diagram of simulation encryption/decryption

IX.RESULTS

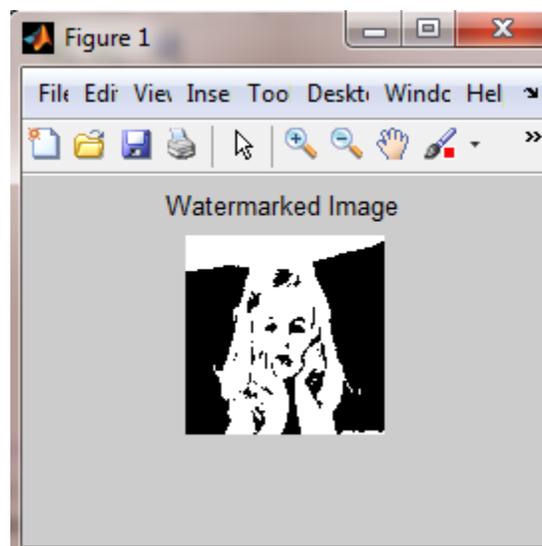


Fig 2: Watermarked Image

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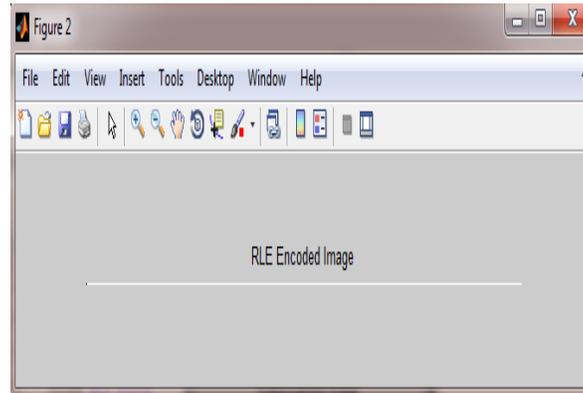


Fig 3: RLE encoded image

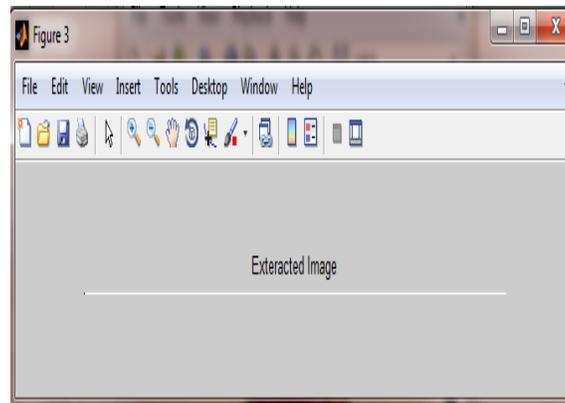


Fig 4: Extracted image

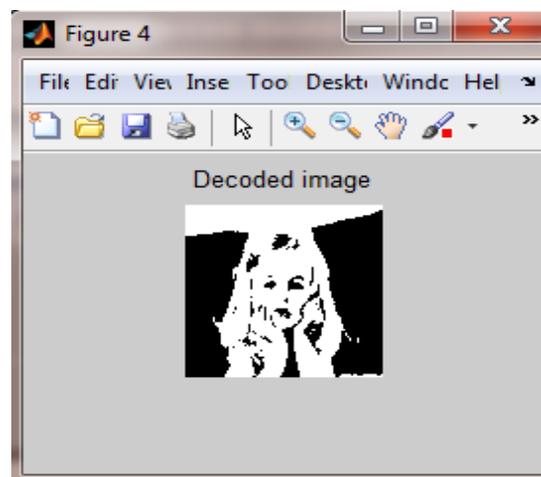


Fig 5: Decoded image

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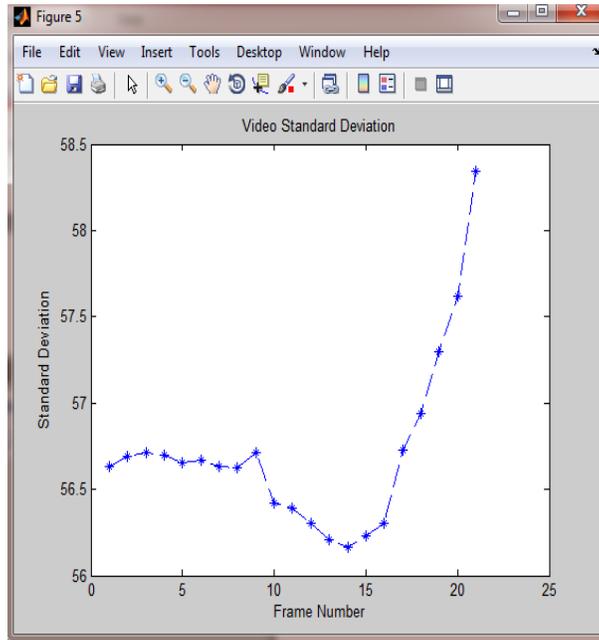


Fig 6: Video Standard Deviation vs Frame Number

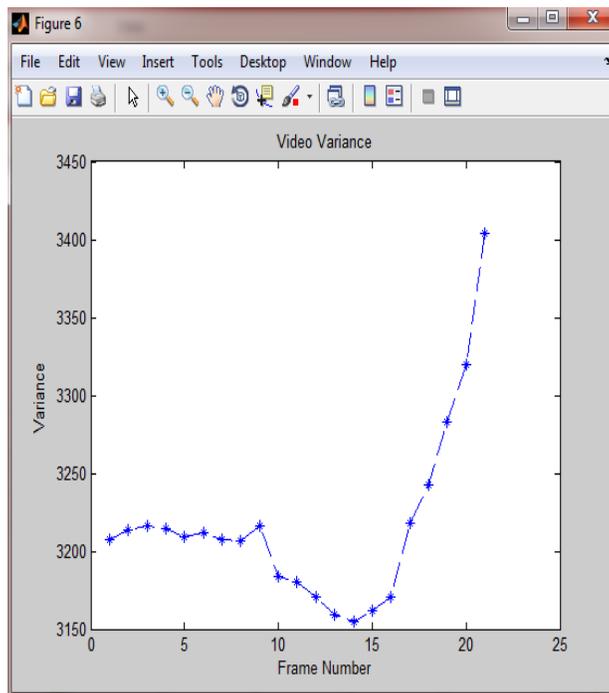


Fig 7: Video Variance vs Frame Number

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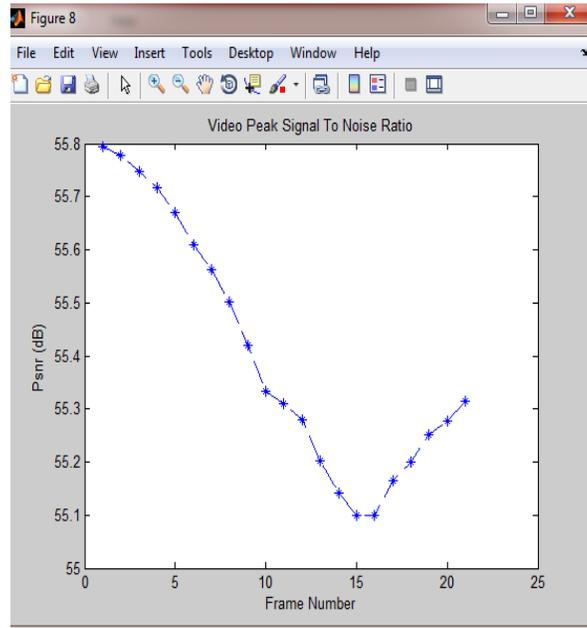


Fig 8:Video PSNR vs Frame Number

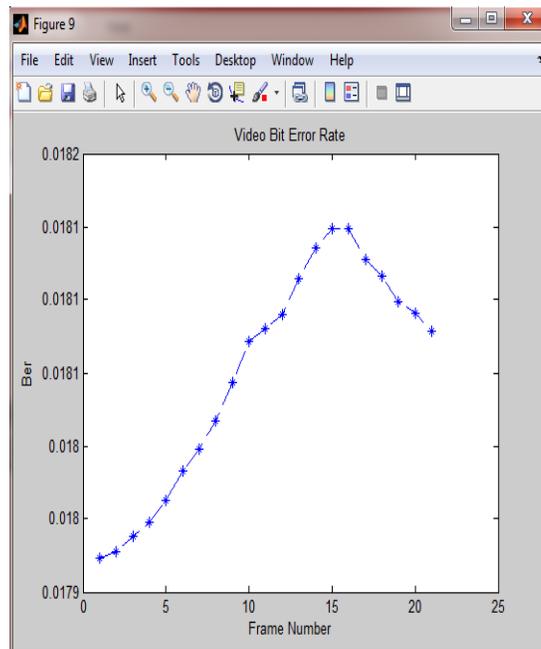


Fig 9:Video BER vs Frame Number

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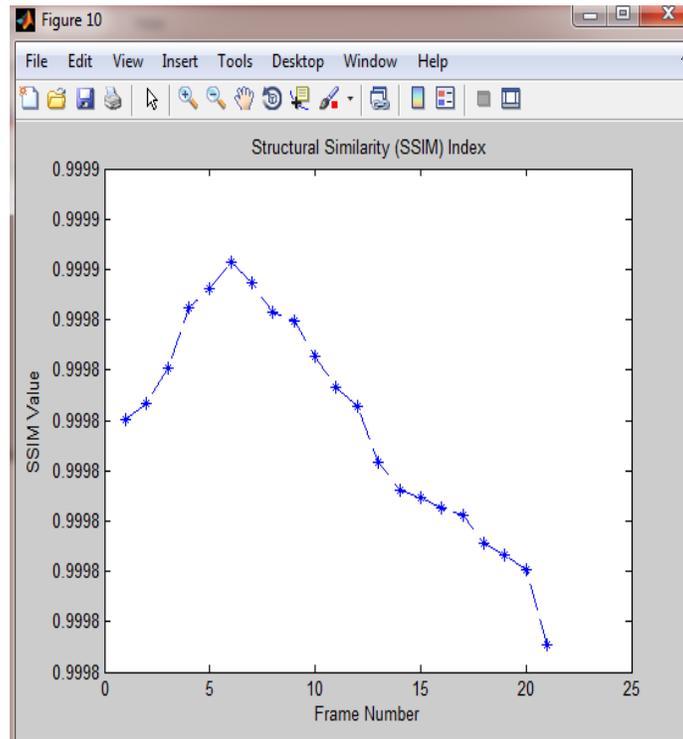


Fig 10: SSIM vs Frame Number

X.CONCLUSION

The field of fractal compression is relatively new, as is the study of fractals, and as such there is no standardized approach to this technique. In previous approaches the techniques used results in less security; high data compression and probability of error were more. In this, hybrid technique is proposed by combining Fractal & RLE, this is considered to be more effect and better than previous techniques. By this the no. of bits get reduce, due to which the PSNR improves, also probability of finding error is less. It is more secure than previous.

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