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Highly Secured Data Hiding in Video by SVD Algorithm

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Abstract: *The internet is always susceptible to interception by unauthorized people over the world. So there is more importance to security. To protect the data from unauthorized people, various methods have been developed and they are in practice today. Reversible Data Hiding (RDH) is one technique to hide data in encrypted images. RDH in encrypted images by reserving room before encryption is a technique which maintains excellent property that the original image can be recovered without any loss after embedded data is extracted while protecting the hiding image content's confidentiality. In the proposed method RDH in encrypted images by reserving room before encryption can achieve real reversibility that is image extraction and original image recovery are free of any error. It is easy for data hider to reversibly embed data in encrypted image, but videos are more secure than images to hide data. so in proposed method it is possible to hide the data in videos by using singular value decomposition (SVD) algorithm.SVD algorithm is easy to implement in videos compare to RDH, and it gives excellent results. The Algorithm is developed and tested using Mat lab.*

Keywords: *Reversible Data Hiding (RDH), Image encryption, privacy protection, singular value decomposition (SVD).*

1. INTRODUCTION

Digital communication has become essential part of our day to life in communication. Now a day's lots of applications are online based. The amount of digital images and digital videos has increased rapidly in the internet. So, requirement of secure transmission of data and images also increased. It is necessary to find out efficient way to transmit data secretly without any data loss. Data hiding is the process of secretly embedded data into images and videos without changing its perceptual quality. Data Hiding is technique of writing hidden information in such a way that no one apart from the dispatcher and intended receiver even realizes there is a hidden message in that original image or video. In the proposed method we hide the data in video by using Singular Value Decomposition (SVD).

Data hiding in video is challenging task compare to data hiding in images.SVD algorithm is used to hide data in videos. It is easy to implement videos compare to Reversible Data Hiding (RDH) .By using SVD algorithm we can hide large payloads. We can embed and extract data without any loss of original data .The PSNR value also increased. It is more secure compare to previous methods. It is more secure than previous method. This technique is usually used in medical, military and law forensics.

2. PREVIOUS ARTS

In the previous methods [2] data can be hiding in the images by using RDH algorithm.RDH in images is a technique by which the original cover can be recovered without any loss after embedded data is extracted. It is also called the loss less data hiding. It means invisibly hides data (which is called a

payload) into host data (i.e. pixels in image) in reversible fashion. Two important measurement of RDH is embedding capacity and quality degradation. It achieves high capacity and low distortion. It is easy for the data hider to embed data in the encrypted image reversibly.

In this method we reserve the room prior to image encryption at transmission side, the RDH method in encrypted images would be more natural and much easier. Empty the room before encryption means we first empty out room by embedding LSBs of some pixels into other pixels with a traditional RDH method and then encrypt the image can be used to embed data. It achieves excellent performance in two different prospects i.e., genuine reversibility is realized, that is, extraction of data and original image recovery are free of any error and given embedding rates, the PSNR value is significantly improved.

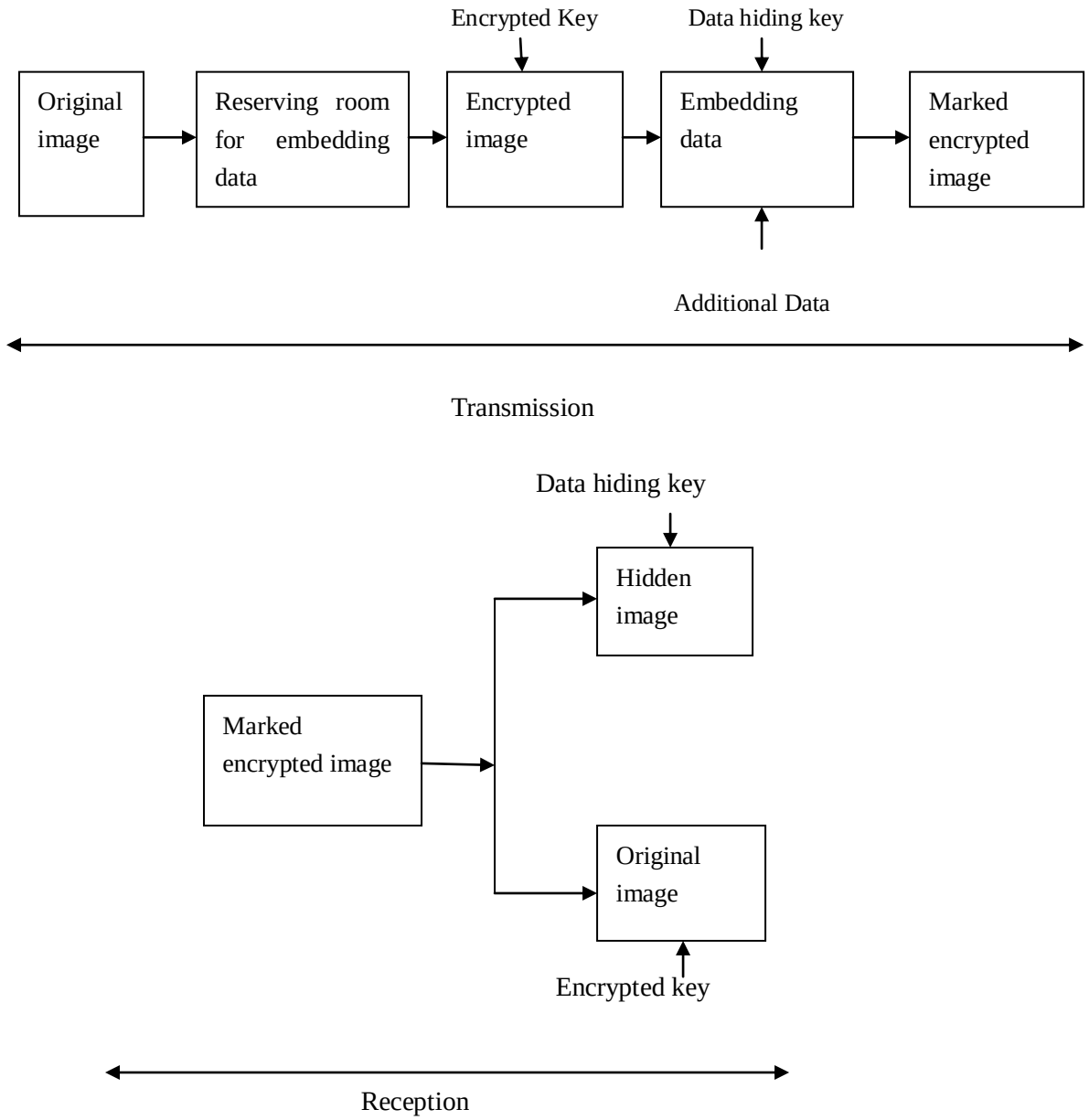

Figure 1. *Frame work of RDH in encrypted images by Reserving room before encryption.*

The frame work of Reserving room before encryption (RRBE) is shown in Figure 1 .In the receiver side, content owner first empty out some place in the original image by self reversible embedding some amount of data in the image. So some place is empty out in the original image. It is used for add additional hidden data after that original image is converts into its encrypted version by using

encrypted key. Now the data hider hides data in the previous emptied out extra space in the encrypted image. The data embedding process in encrypted image is naturally reversible for the data hider. Finally the marked encrypted image is formed. The marked encrypted image is sent to receiver. In the receiver side data extraction and image recovery is performed, to recover original image and to extract hidden image. To do this work standard RDH algorithm is used. It is ideal operator for reserving room before encryption and can easily applied to RRBE .data hiding key and encrypted key is used to recover original image and extract hidden data. It gives better performance. In this method first compress the redundant image without any loss of original data and then encrypts it with respect to protecting privacy. It consists of four stages they are encrypted image generation, hiding data in encrypted image, data extraction and original image recovery.

3. PROPOSED METHOD

In the proposed method we hide the data in the videos by using SVD algorithm.SVD method is easy to implement compare to RDH for data hiding in videos. Here video is the input. [4]So, first take the input video convert into number of frames .We can divide the video into number of frames as required according to size of video and embedding image size. After dividing into frames this frames are converting into JPEG format. Then pick the single frame compress it by using run length coding. Run length coding is the simple form of data compression. It is done for all frames. After that ,zigzag scan is done for all frames. The zigzag scanning pattern for run-length coding of the quantized DCT coefficients was established in the original MPEG standard. The purpose of zigzag scanning is to group the low frequency coefficients in the vector.ac and dc scanning is done by using zigzag scanning. The low density and high density pixels are calculated. Then block processing is done by using DCT for color separation. After that embedding process is done by using SVD algorithm. After embedding process completed the watermarked video is formed. Then we send it to receiver. We can send it in channel. So we use LDPC for channel purpose. In the receiver side extract the data which is hidden and original video also extracted in the receiver side without loss of original content.

3.1 Singular Value Decomposition (SVD)

In linear algebra, SVD is factorization of a real matrix or complex matrix. It is used in several applications in signal processing [5] . The SVD can be seen as a simplification of the spectral theorem to arbitrary, and it is not necessarily a square matrices. It can be any matrix. The fundamental idea to taking SVD algorithm is, it converts high dimensional and highly variable set of data points in to a lower dimensional space that represents the foundation of the original data more clearly. The Singular Value Decomposition of image A of size m X n .m is obtained by the operation

$$A=UDV^{T}$$

Where U is the column matrix. It orthogonal matrix of size m*n, D is the diagonal matrix. It contains positive elements or zero elements of size n*n .V is the orthogonal matrix . The diagonal matrix D represents the singular values of A. The U matrix columns are known as left singular vector and the V matrix columns are known as right singular Vector of A. Thus each Singular value represent the luminance of image layer and the corresponding pair of singular vector represent the geometry of the image layer .In SVD based image embedding the modified singular values of image will change by very small values for special types of attacks.

3.2 Discrete Cosine Transform (DCT)

Discrete Cosine Transform (DCT) is a orthogonal transform for digital image processing and signal processing with advantages as, small BER, high compression ratio (CR),good information integration

ability and good synthetic effect of calculation complexity. DCT method is used to convert time domain signal into frequency domain signal. Using DCT, an image is easily split into pseudo frequency bands and in this work watermark is inserted into all those frequency bands like as low, middle and high. A DCT is a Fourier related transform similar to Discrete Fourier Transform (DFT) but using only real numbers. DCTs are equivalent to DFTs of roughly double the length, operating

on real data with even symmetry. Robustness, capacity and imperceptibility are the three important requirements of an efficient watermarking scheme. SVD based watermarking scheme has high imperceptibility. Although the SVD based scheme with stands definite attacks, it is not challenging to attacks like sharpening, rotation, etc. Also SVD based technique has only limited capacity [3]. These limitations have led to the development of a new scheme that clubs the properties of DCT and SVD. This particular algorithm proves to better than ordinary DCT based watermarking and ordinary SVD based watermarking scheme. Embedding and extracting is used in this paper is DCT and SVD algorithm [1]. Embedding algorithm using SVD

Various steps in the Embedding process:

- Read input video
- Convert it into multiple no. of frames
- select the input frame in which, to hide the data
- Apply zigzag scanning for frames..
- Apply DCT
- Separate RGB components Red , Green and Blue
- Apply SVD to obtain singular values.
- Take logo as hiding image
- Embedded the hiding image into frames.
- Apply inverse SVD and DCT
- Reconstruct the frames using RGB
- Reconstruct the video

These are the steps involved in the embedding process in the receiver side. Block diagram of the embedding process is shown in below Figure 2(a)

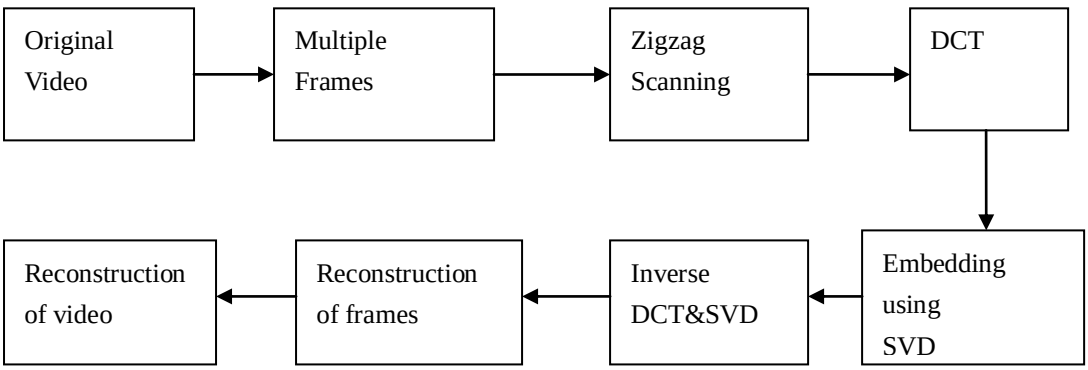

Figure 2(a). *Block Diagram of Embedding process*

Various steps in extraction process:

- Select the data embedding frame
- Apply DCT

- Apply SVD
- Extract hidden data
- Extract original video

These are steps involved in extraction process. The block diagram of extraction process is shown in Figure 2(b)

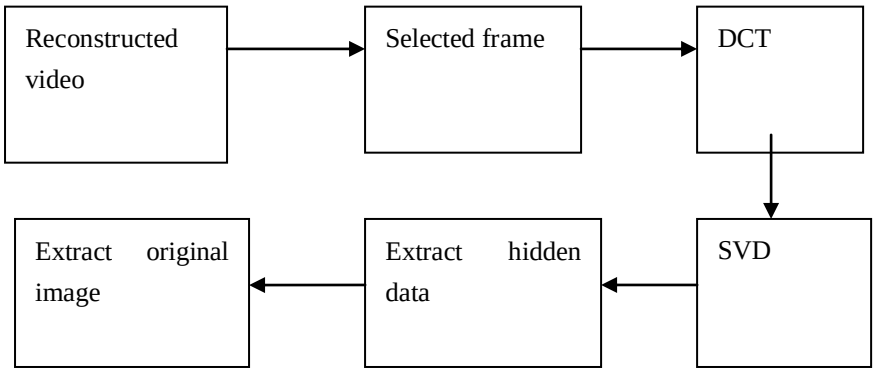

Figure 2(b). *Block diagram of Extraction process*

4. RESULTS

The Figure 3 shown below is multiple frames of the video

Figure 3. *Multiple frames*

The original frame which is used to embed data is shown in below Figure 4

Figure 4. *Original frame*

The logo shown in Figure 5 is hiding image in original frame.

Figure 5. *Hiding image*

The following Figure 6 shows embedded frame with hiding data.

Figure 6. *Embedded Frame*

Water mark image which is embedded in original frame is shown in below Figure 7.

Figure 7. *Extracted Hidden image*

Simulation results of highly secured data hiding in video are shown below Figure 8.

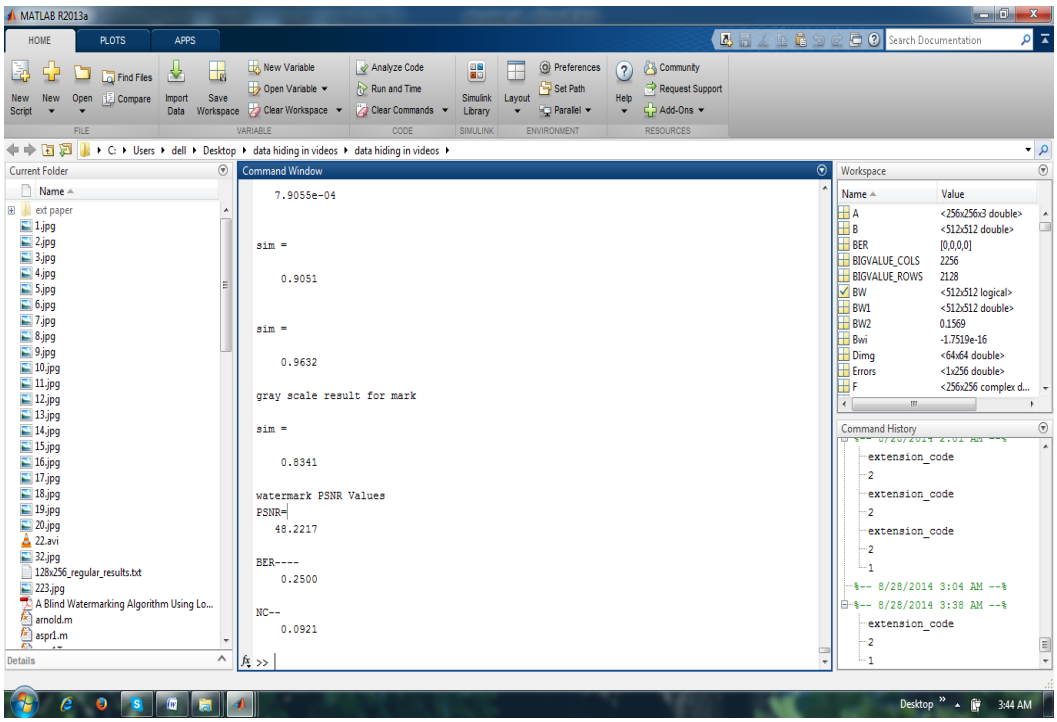

Figure 8. *Simulation Results*

The table 1 shows the obtained PSNR, NC, BER values of image given video.

Table 1. *Metric Values of image in video*

PSNR	48.227
BER	0.250
NC	0.0513

5. CONCLUSION

In this proposed method, highly Secured data hiding in video by using SVD algorithm is to provide security, privacy for data transmission. Extraction of original video and hiding image without any loss is achieved by using SVD algorithm. The PSNR, BER, NC values shows that this method provides best quality of reconstructed video. It is more secured against attacks.

REFERENCES

[1] "A hybrid DWT-SVD Method for Digital Video Watermarking" by Rathod Jigisha D., Rachana V.Modi.Dept. of Information Technology Proceeding of IJARCCE ISSN-2319-5910,Vol-2. 2771-2775, July 2013.

[2] "Reversible data hiding in Encrypted Images by Reserving Room Before Encryption," by Ma, K. , Weiming Zhang, Xianfeng Zhao, Nenghai Yu , Fenghua Li, IEEE Trans. Inf. Forensics Security , Vol. 8 ,no.3,march.2013

[3] "Robust Digital Watermarking Using DWT-DCT-SVD" by Sumit Kumar P .Rajapati, Amit Naik,Anjulata Yadav Dept.of E&TC ,Indore.pracedding of IJERA ISSN:2248-9622,vol.2,pp.991-997 ,June 2012.

[4] "Digital steganography (Data Hiding in Video Signal)" Priyanka Sonawane, Prof.J.S.Chitode Proceeding of the International Journal of Science & advanced Tech. ISSN 2221-8386 Volume 2 no.4 April 2012

[5] "No Blind watermarking scheme for colour images in RGB space using DWT-SVD" Proceeding of in 978-1-4244-9799-7/11 IEEE 2011 by Nagraj V. Dharwadkar B.B., Amberker & Avijeet Gorai. Dept. of Computer Science & Engg. Warangal

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