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Effective Secure Communication of Medical Data using Watermarking and Scrambling using Arnold Transformation

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Abstract: Medical records are extremely sensitive patient information and require uncompromising security during both storage and transmission. In this paper a multi secure and robustness of medical image based steganography scheme is proposed. The proposed technique provides an efficient and storage security mechanism for the protection of digital medical images. We proposed a viable watermarking technique using Discrete Wavelet Transform (DWT) to protect the MRI medical image into a single container image. At first the given image was resized and undergo watermarking using the svd and alpha blending and then it is applied with Arnold transformation to form scrambled image and recovered finally by descrambling using Arnold transformation and inverse svd on the obtained image The quality of the recovered medical image showed acceptable visual quality. It is observed that the quality parameters are improved with acceptable PSNR compared to the existing algorithms.

Keywords: PSNR, Arnold transformation, discrete wavelet transform, SVD-Singular value decomposing.

1. INTRODUCTION

Watermarking ultimate objectives, which are undetectability, robustness and capacity of the hidden Data, are the main factors that separate it from related Techniques such as Steganography and cryptography. Watermarking is the process of hiding a secret message within a larger one in such a way that someone cannot know the presence or contents of the hidden message.

An Electronic Health Record (EHR) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is theoretically capable of being shared across different health care settings. EHRs may include a range of data, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal stats like age and weight. It is important to note that an EHR is generated and maintained within an institution, such as a hospital, integrated delivery network, clinic, to give patients, physicians and other health care providers, employers, and payers or insurers access to a patient's medical record

2. METHODOLOGY

A. PRE-PROCESSING

Histograms are functions describing information extracted from the image. The histogram function defined over all possible intensity levels. For each intensity level, its value is equal to the number of the pixels with that intensity. Adaptive histogram equalization uses the histogram equalization mapping function supported over a certain size of a local window to determine each enhanced density value. Therefore regions occupying different gray scale ranges can be enhanced simultaneously.

B. WATERMARKING

A digital watermark is a kind of marker covertly embedded in a noise-tolerant signal such as an audio, video or image data. It is typically used to identify ownership of the copyright of such signal.

“Watermarking” is the process of hiding digital information in a carrier signal; the hidden information should but does not need to contain a relation to the carrier signal. Digital watermarks may be used to verify the authenticity or integrity of its owners. It is prominently used for tracing copyright infringements and for banknote authentication.

Singular value decomposing (SVD):

SVD decomposes an MxN real matrix A into a product of 3 matrices A=USV where U and V are mxm and nxn real and complex unitary matrices, respectively is an mxn diagonal matrix. The elements of S are only nonzero on the diagonal and are called the SVs of A.

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The watermarking procedures are described as follows: Watermark embedding:-Without loss of generality, let the size of the host image (I) and watermark (W) is NxN

1. Apply SVD to the host image:
   I=USV (1)

2. Modify the S with the W:
   Sm=S+kw (2)

3. Apply SVD to the S
   Sm=UwSwVw (3)

4. Compute watermarked image:
   Iw=USwV (4)

Watermark Extracting:- Generally, the extraction process is nothing but the inverse of the embedding procedure.

In the watermark extraction process, a possibly distorted watermark W is extracted from the possibly distorted watermarked image by I*W essentially reversing the above watermark embedding steps. The watermark extraction can be shown as follows:

1. Apply SVD to the watermarked (possibly distorted) image:
I*w=U*Sw*V* . (5)

2. Compute possibly corrupted Sm*:
Sm*=UwS*Vw (6)

3. Extract the watermark (possibly distorted) image:
W* = (Sm*-S) / k (7)

C. Scrambling Based On Arnold Transform

Arnold transform is a class of cropping transformation proposed by V.T. Arnold in research of ergodic theory. We put the digital image as a matrix, which will become “chaotic" after Arnold transform. The discrete digital image is equivalent to a class of special matrices in which there is a correlation between elements. The Arnold transform of this matrix and then a new matrix can be obtained in order to achieve image scrambling processing. Set the image pixel coordinatesorder of the image matrix, i, j €(O, I, 2" N-I) and the Arnold transform is:

$$\begin{pmatrix} X' \\ Y' \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \left(\text{Mod N} \right) \quad (7)$$

The above transform is one-to-one correspondence; the image can do iteration, iteration number can be used as a secret key for extracting the secret image. This transformation gives more security and robustness to our algorithm.

3. PROPOSED WORK

A. Embedding Process

The Container image was taken and preprocessing is performed on it and also another input image was taken and watermarked using svd transformation and finally this watermarked image is embedded into the container image and finally watermarked image was obtained and then Arnold scrambling was performed on the particular watermarked image and scrambled image was obtained.

1. Algorithm for embedding process.

Step 1: Read the Cl.
Step 2: Read the input image.
Step 3: Calculate DWT on the scrambled image and Separate the LL, LH, HL and HH bands.
Step 4: apply svd on each band and performed alpha blending scheme to watermark the image
Step 5: apply Arnold transformation on the obtained watermarked image and obtain scrambled image

2. Algorithm for Extracting Process

Step 1: Read the scrambled image
Step 2: Apply Arnold transform with a key to SSI and finally we obtained PDI.the LL, LH, HL and HH bands.
Step 3: Calculate IDWT on the PDI and recover the original image.
Step 4: Extract the watermark

4. RESULTS

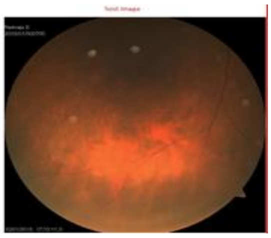

Fig1: HOST IMAGE

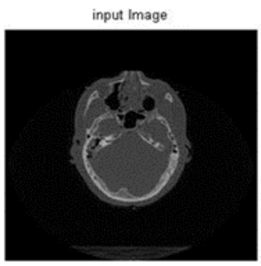

Fig2: INPUT IMAGE

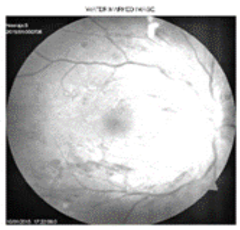

Fig.3.WATERMARKED IMAGE

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Fig.4.SCRAMBLED IMAGE

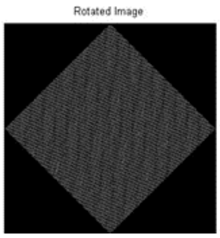

Fig.5.ROTATED IMAGE

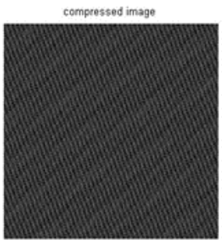

Fig.6. COMPRESSED IMAGE

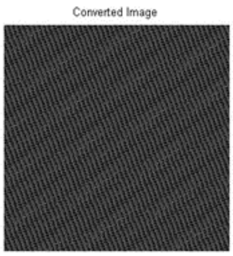

Fig.7.CONVERTED IMAGE

Fig.8.SHARPNESS ADJUSTED IMAGE

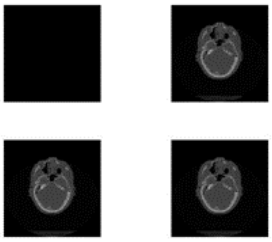
Fig.9.EXTRACTED WATERMARK

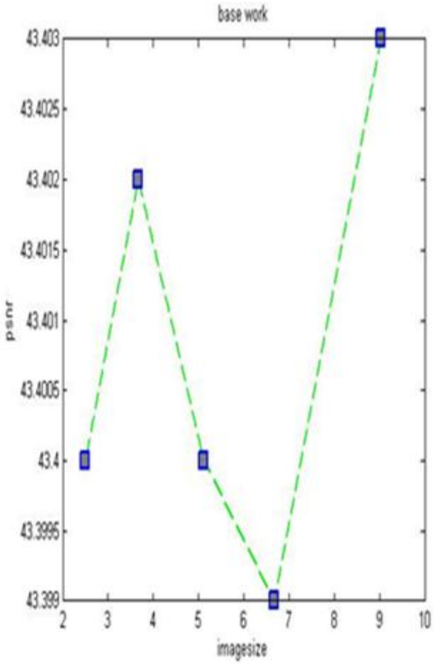

Fig.10: IMAGESIZE VS. PSNR (BASE WORK)

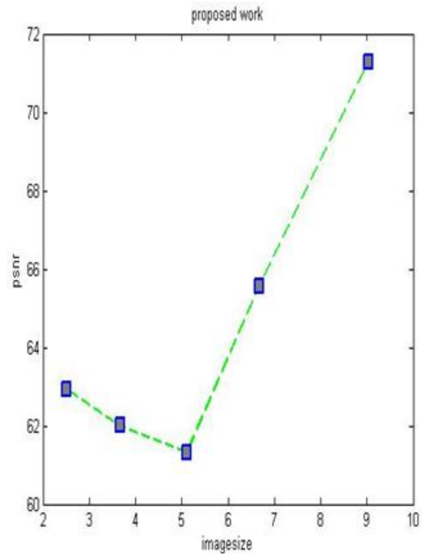

Fig: PROPOSED WORK

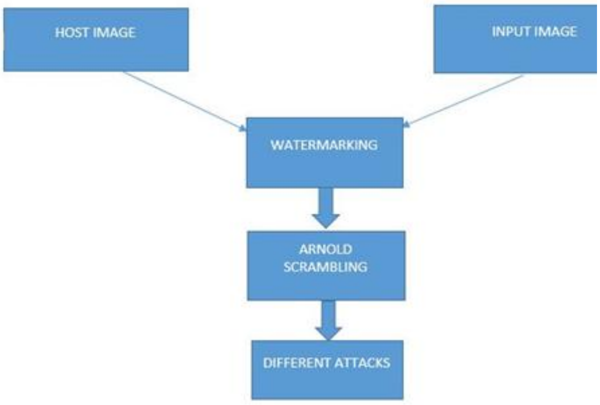

Fig: BLOCK DIAGRAM (SENDERS SIDE)

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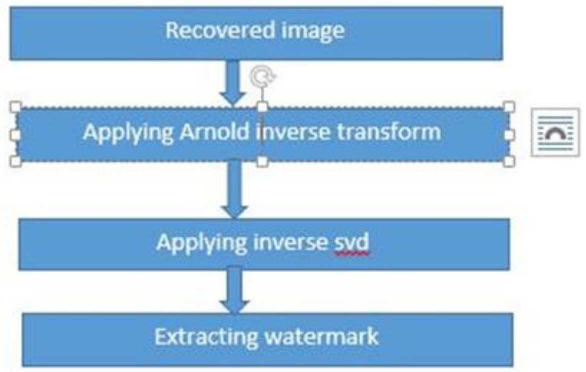

Fig.8: BLOCK DIAGRAM (RECEIVERS SIDE)

5. CONCLUSIONS

In this paper, we have analyzed the different image sizes and psnr values for different kinds of images of different formats. The different sizes of images those we have considered are 2.5kb, 3.67kb and 5.11kb etc. It is evident from the results that the psnr value for 9.03kb size image exhibits highest psnr about 71.2753. From the results it is observed that the psnr of all images whose size is below 5kb exhibits nearly same kind of psnr values. Further, it was concluded that the psnr range of image size greater than 9kb is improved by considering above method.

REFERENCES

[1] Tanushyam Chattopadhyay, Brojeshwar Bhowmick, AND Anirud dhasinha", Applications of Image Processing in Industries", Computer Society Of India Communications (Csic), Vol: 36, Issue4, Pp.8-11, and JUL.2012.

[2] Baisa L Gunjal, Suresh N Mali, "Applications Of Digital Image Watermarking In Industries", Computer Society Of India Communications (Csic), Issn: 0970-647x, Vol. 36, Iss. 6, , Pp. 5-7, Sep. 2012.

[3] Minati Mishra, Priyadarsini Mishra, Mc Adhikary And Sunit Kumar, "Image Encryption Using Fibonacci-Lucastransformation", INTERNATIONAL JOURNAL ON CRYPTOGRAPHY AND INFORMATION SECURITY (IJCIS), VOL.2, NO.3, PP. 131 -141, SEP. 2012.

[4] Minoru Kuribayashi," Simplified Map Detector For Binary Fingerprinting Code Embedded By Spread Spectrum Watermarking Scheme", Ieeetransactions On Information Forensics And Security, Vol. 9, No. 4, Pp. 610-623, Apr. 2014. N

BIOGRAPHIES

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