ISSN: 2321-8169
4307 - 4308

A Survey on Water Marking techniques for Secure Sharing of Medical Data

Vathsalya.G.N [1], VaishakSundaresh[2].

Student, Department of CSE, Acharya Institute of Technology, Bangalore, India[1]
Assistant Professor, Department of CSE, Acharya Institute of Technology, Bangalore, India[2]

Abstract- The technique of transmitting biomedical signals through communication channels have become an important issue in many clinical practice related application. So a digital large capacity watermarking technique for singular value decomposition (SVD) is used for hiding these secure, confidential, private data. The Singular value decomposition (SVD) is used to realize the compression of watermark in the watermarking pre processing stage. Discrete Wavelet Transform technique is applied for image compression for better quality. For JPEG, BMP and PNG images this method is essential for construction of accurate targeted and blind steganalysis methods.
Keywords: *ECG, DWT, SVD, watermarking*

*****

I. Introduction

Transmission techniques of biomedical signals through communication channels are currently an important issue in many applications related to clinical practice. These techniques can allow experts to make a remote assessment of the information carried by the signals, in a very cost-effective way. Secure and confidential method of sharing this data is very necessary. So we go for different watermarking approaches. Most popular watermarking systems are these that work in frequency domain.

These systems make use of some transforms like Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT) [6] and Discrete Wavelet Transform (DWT). The main advantage of Discrete Fourier Transform (DFT) is that its coefficients stay unaltered after translation attacks. DFT is a complex transform and during this transform the image is divided into two matrices, of amplitude and phase. The phase matrix is more crucial for the quality of the image. Therefore embedding the watermark in the phase matrix makes it more robust against attacks (inducing however more degradation in the quality of the image). This is also coherent with the communication theory that states that frequency modulation is more robust to noise in comparison to amplitude modulation.

Watermarking schemes that use DFT transform have some disadvantages too. In order to real values for the image luminosity or colour after the inverse DFT transform (iDFT), the conjugate complex factors must remain symmetric. This demand of symmetry divides in half the given space for information embedding reducing the capacity of the scheme in half. Another disadvantage is that DFT coefficients and especially phase coefficients are susceptible to compression attacks (e.g. JPEG, MPEG).[7]

II. General Survey Techniques for watermarking

Watermarking is a technique which is used to hide information by applying cover image to it and by embedding image which protects the original image from attackers. Below are few techniques which are used generally used for efficient watermarking.

2.1. Discrete wavelet transforms (DWT) Feature.

DWT is linear in nature that operates on a data vector and its length is an integer power of two, transforming it into a numerically different vector of the same length. DWT is a tool that separates data into different variations of frequency components and then finds every component with resolution matched to its scale. DWT is computed with a sequence of filtering followed by a factor 2 sub sampling [1] as shown in Figure 1.1.

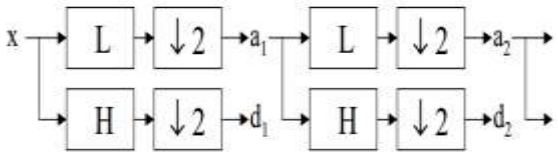

Figure 1.1: Block Diagram of DWT

H denotes the high pass filters and L denotes the low-pass filters, ↓ 2 represent sub sampling. Outputs of these filters are given by equations (1) and (2).

$$a_{j+1}[p] = \sum_{n=-\infty}^{+\infty} l[-2p]a_j[n] \quad (1)$$

$$d_{j+1}[p] = \sum_{n=-\infty}^{+\infty} h[-2p]a_j[n] \quad (2)$$

Elements of a_j are used for next level of transform and d_j denotes coefficients, that determines the transformation result. Here l[n] denotes coefficients of low pass filters and h[n] denotes coefficients of high-pass filters. One assumption is to be taken, i.e. on scale $j + 1$ there is only half from number of a and d elements on scale j. So that, Transformation should be done until only two a_j elements remain in the signal. Finally coefficients of scaling function obtained. DWT mechanism is similar for all two-dimensional images. DWT is applied for rows and then applied for columns [4].

2.2. The Singular value decomposition (SVD)

For the development of wide variety of applications SVD technique is used. It is widely used in applications like image compression, image hiding, noise reduction and watermarking. Usually some hybrid SVD based algorithms such as DWT, DCT have been developed when applying SVD alone on an image so here in our paper we made use of DWT as explained above. The watermark is embedded in the transform coefficients of the cover image instead of the pixel values in these algorithms. SVD is usually used to analyze matrices as it is a numerical analysis tool. SVD has many obvious calculation advantages which could directly solve the non matrix, discrepancy between the before and after embodiment can be easily estimated. Quality and embedment location of water mark can be estimated easily. These unique characteristics of SVD is very helpful to strengthen the imperceptive and robustness of embedded information.[2]

A matrix The SVD type of $A \in C^{m\times n}$ is given below:

$$A = USV^T = U\begin{bmatrix} r_{11} & & \\ & r_{22} \ddots & \\ & & r_{mn} \end{bmatrix} V^T \qquad (3)$$

Where $U \in R^{m\times n}$ and $V \in R^{m\times n}$ are orthogonal matrix, that is $UU^T = I, S \in R^{m\times n}$ is a diagonal matrix, the diagonal values of matrix A is the singular value. Thus the SVD can be applied directly to digital images represented as matrix arrays [3].

2.3. LSB Technique

LSB encryption process usually consists of two main process namely masking process and generation of stego image. Masking process involves replacing LSB of all pixel values with 0. This is done by undergoing AND operation with 111111101(254). Now the LSB of all pixels will be filled with zeros. By identifying the position of 1s binary value of the information is placed in the LSB of respective pixel values. For Example, we have binary message of n bit, and now AND operation is performed between binary message and 1 in the position n, rest all are set to zero. Then OR operation is performed between the binary value of nth pixel and above AND operation. This process is completed until it completes all LSB. This LSB of pixel values are embedded with message and this can be called as stego image. LSB decryption process contains extraction of secret message from pixel values LSB [5].

2.4. ECG Signal Preprocessing

ECG Signal can be fetched from the patient's body by using body area network sensors which holds patient's blood pressure, heart rate and other medical information. Preprocessing is carried out to this signal by applying cover image to this ECG signal. Data hiding is performed here.[8]

III. Conclusion

By applying DWT technique image compression quality is high in sub bands, noise disturbance at the other end obtained.SVD technique which is applied for watermarking cover image which converts image value into singular value, by applying this technique data hiding is done by applying cover image to it. Finally LSB technique is applied for embedded the watermarked image which improves the embedded capacity for large number. All this techniques increases the efficiency of medical data transfer by hiding data which helps in secure transmission of medical data.

References:

[1] M. Nagabushanam, Cyril Prasanna Raj p, S. Ramachandran, "Design and FPGA Implementation of Modified Distributive Arithmetic Based DWT-IDWT Processor for Image Compression" 978-1-4244-9799-7111/ ©20 11 IEEE conference

[2] Seema and Sheetal Sharma, "DWT-SVD Based Efficient Image Watermarking Algorithm To Achieve High Robustness and Perceptual Quality", Volume 2, Issue 4, 2012.

[3] Er.Abdul Sayeed, "ECG Data Compression Using Dwt & Hybrid", International Journal Of Engineering Research And Applications (IJERA) ISSN, Volume. 3, Issue 1, pp.422-425, 2013.

[4] Karishma Qureshi and V. P. Patel, "Efficient Data Compression of ECG Signal Using Discrete Wavelet Transform", IJRET: International Journal of Research in Engineering and Technology, Volume 02, Issue 04 ,2013.

[5] Suresh Kalyanasundaram, Vinod Ramachandran, and Laurange Mariasoosei Collins, "Performance Analysis and Optimization of the Window-based Least Significant Bits Encoding Technique of ROHC", Motorola India Private Limited1930-529X/07/$25.00 © 2007 IEEE.

[6] Bokan Omar Ali And Ghazali Bin Sulong, " Blind RGB Color Image Watermarking Using DCT and Two level SVD", Signal & Image Processing : An International Journal (SIPIJ) ,Volume 4, No.5, 2013 .

[7] Mr. Krunal R Patel Mr .Lokesh P. Gagnani, "Current classification and introduction of Watermarking Techniques in Digital Images", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 1, January-February 2013, pp.840-846.

[8] Ayman Ibaida, Ibrahim Khalil and Dhiah Al-Shammary, "Embedding Patients Confidential Data in ECG Care Information" 32nd Annual International Conference of the IEEE EMBS Buenos Aires, Argentina, August 31 - September 4, 2010