International Journal of Master of Engineering Research and Technology, 2394-6172-(O)
Volume-7, Issue-6, May 2020

AUTHENTICATION AND MANAGEMENT OF MEDICAL IMAGE USING DIGITAL WATERMARKING

Rahul Singh
M. Tech. Scholar
Digital Communication
PCST, Bhopal (M.P.)

Mr. Jitendra Mishra
Associate Professor & HOD
Department of Electronics & Communication
PCST, Bhopal (M.P.)

Abstract

Now a day's various authors use feature selection based watermarking technique. The feature selection based watermarking technique gives better security strength in compression of another transform- based technique. In this proposed work, a new watermarking technique is used which is based on the classification of data, so that it can reduce the geometrical attack and for the minimization of attack we used Gabor transform, Support Vector Machine and SIFT for the embedding process, it also extract the features from the images and it is done by the pattern generation which uses support vector machine.

Keywords: Watermarking, Gabor Transform, SVM, SIFT

Introduction

watermarking of sight and sound substance has transformed into an especially exceptional research zone over the range of the most recent a noteworthy drawn-out timeframe[1, 2]. A general structure for watermark presenting and recognizing verification/unraveling is appeared near to an investigation of a touch of the estimations for various media types portrayed in the creation[3]. They incorporate a piece of the capabilities subject to application, for example, copyright assurance, endorsement, change unmistakable evidence, and information stowing interminably and separates in headway and framework necessities for various media types, for instance, electronic pictures, video, sound and substance[4, 5]. The investigation mastermind has seen much movement in the zone of modernized watermarking as an extra mechanical assembly in anchoring propelled substance and various mind-boggling father pers have appeared in uncommon issues, and what's more dedicated gatherings and workshops. New associations gave to watermarking advancement are rising furthermore, things like Digimarc's MediaBridge are showing up[6, 7]. As opposed to encryption, which is helpful for transmission at any rate does not give an approach to manage look at the primary information in its ensured shape, the watermark stays in the substance in its unique edge and does not pre-vent a client from looking at, seeing, inspecting, or controlling the substance[8, 9]. In like way, as opposed to the probability of steganography, where the system for camouflaging the message might be confound and the message itself is mystery, in watermarking, ordinarily the watermark presenting process is known and the message (adjacent to the utilization of a puzzle key) does not ought to be mystery[10, 11]. In the rest part of this paper, II. SIFT (Scale Invariant Feature Transform), III. Proposed Methodology, IV. Simulation & Result Analysis and finally V. Conclusion & Future Scope.

II. SIFT (Scale Invariant Feature Transform)

The SIFT algorithm was uses to extraction of multimedia information features. The SIFT algorithm was developed by Lowe. SIFT transform function finds the local -invariant features segments. The multi- segment feature segments combined and generates features matrix[12, 13].

Step 1 - Scale-Space Selection[14, 15]:

The scale-space approach is to define a scale parameter into the $2D - image$ data working model and get 2D image working data at different scales by regular updating scale parameters. Then, the data is upgraded to expand the required properties of $2D - image$.

Step 2 - Feature segment[16, 17, 18]:

The goal at orientating the location of feature segments precisely. A huge number of extreme segments are got in this manner. But not all extreme segments are feature segments. Afterword's, a

Paper ID:- 2020/07/IJMERT/05/402

desired technique is required to calculate some segments.

Step 3 - Feature segment orientation assignment.

III. Proposed Methodology

Ant colony optimization (ACO) algorithm was discussed by Dorigo. It is based on population heuristic evolutionary algorithm; it is inspired by the biological ant and it's combined nature of the ants. It has been shown that defined algorithm finds on a comparable good optimization result's solution in solving issues. The ACO algorithm based on the process of several individualities and responsive data. Although the process of ant is natural, the process of complete ant colony is acceptable. The ACO technique has the distributed computing's properties, heuristic search and positive feedback. It is a heuristic global optimization calculation in the evolutionary calculation. In this process, the data interaction based on pheromone plays a significant role. Behinds the merits of the ACO algorithm, it is widely applied in sort-out the combinatorial optimization issues, likes traveling salesman, assignment, job-shop scheduling, vehicle routing, graph coloring, network routing and so on. A lot of experts have devoted them-selves to the ACO algorithm's research, and some modify ACO algorithms are discussed to solve the complex optimization problems. Some compared good results and effects are got in last decade.

THE ACO ALGORITHM

It has number of iterations. Using heuristic information, A several ants create complete solutions and the stored trained of recent ant's populations in each iteration. These stored experiences are shown by for the pheromone trail, which is collected on the constituent a solution's part. The pheromone can be collected on the parts and in a solution based on the solving issue. The pheromone's process of working update rule is defined here.

THE RULE OF TRANSITION:

In the ACO algorithm, an ant is work as agent for simple computation. At hand, It iteratively creates a solution for the issue. Every iteration of the ACO, All ants move from a state r to state s for to get other intermediate solution. The k^{th} ant from state r to state s is $selected\ among\ the\ unvisited\ states\ memorized$ in J_r^k considering to the numerical equation:

$$s = \begin{matrix} arg \\ u\epsilon j_r^k \end{matrix} max\left[\tau_i\,(r,u)^{\alpha}.\eta\,(r,u)^{\beta}\right]\ if\ q \leq q0(Exploitation) \quad (1)$$

The trail level describes a posteriori notation of the move's expectation. Trails are regular modify when all ants have finished their route like solution, the stage of trails behalf to moves reduced or increased that were part of worst and best solution results. Normally, the k^{th} ant go through from state r to state $s\ with\ the\ probability\ p_k(r,s)$,

$$p_k(r,s) = \begin{cases} \frac{\tau_i\,(r,u)^{\alpha}.\eta\,(r,u)^{\beta}}{\sum_{u\epsilon j_r^k}\tau_i\,(r,u)^{\alpha}.\eta\,(r,u)^{\beta}} & if\ s \in j_r^k \\ 0 & otherwise \end{cases} \quad (2)$$

where,

$p_k(r,s)$ - $transition\ probability$

$\tau(r,s)$ - $pheromone\ concentration\ between\ the\ state\ r$ and the state u in the $i^{th}\ population$

$\eta(r,s)$ - $length\ of\ the\ trail\ from\ the\ state\ r\ and\ the\ state\ u$

J_r^k - $set\ of\ unvisited\ states\ of\ the\ k^{th}\ ant\ in\ the\ i^{th}\ population,$

α and β - $control\ parameters$

q - $uniform\ probability\ [0,1]$

THE RULE OF PHEROMONE UPDATE

To get higher performance of the result, the pheromone trails may be modifying. Trail modifying involves global and local modifying. The local trail modifying mathematically is defined as follow:

$$\tau(r,u) = (1-\rho)\tau(r,s) + \sum_{k=1}^{m}\Delta\tau_k(r,s) \quad (3)$$

Where,

$\rho\ (0 <\ \rho\ < 1)$ - $pheromone\ trial\ evaporating\ rate$

$\Delta\tau_k(r,s)$ - $amount\ of\ pheromone\ trail\ added\ to\ the\ edge\ (r,s)\ by\ ant\ k\ -\ between\ time\ t\ and\ t\ +\ \Delta t\ in\ the\ tour$

It is defined as below:

$$\Delta\tau_k(r,s) = \begin{cases} \frac{Q}{L_k} & (r,s)\epsilon\pi_k \\ 0 & otherwise \end{cases} \quad (4)$$

Where,

Q - constant parameter

L_k - $distance\ of\ the\ sequence\ \pi_t\ toured\ by\ ant\ in\ \Delta t.$

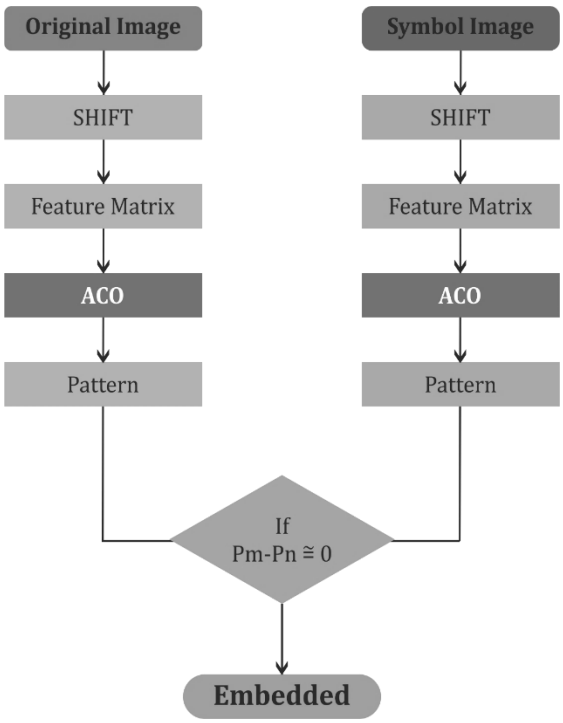

Figure 1: Proposed Model Based on SHIFT and ACO in our watermarking simulation using original image and symbol image.

IV. Simulation & Result Analysis

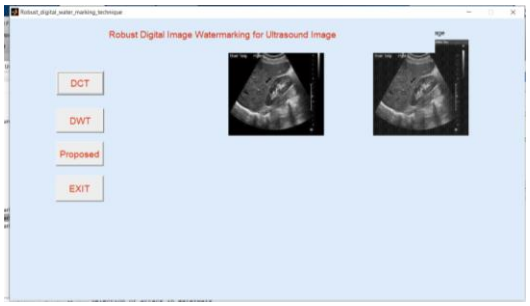

Figure 2: in the given window, it has three techniques button DCT, DWT and Proposed of robust digital image watermarking for ultrasound image. Here click on DCT technique and open the GUI.

Figure 3: in the given window, it has three techniques button DCT, DWT and Proposed of robust digital image watermarking for ultrasound image. Here click on DWT technique and output result.

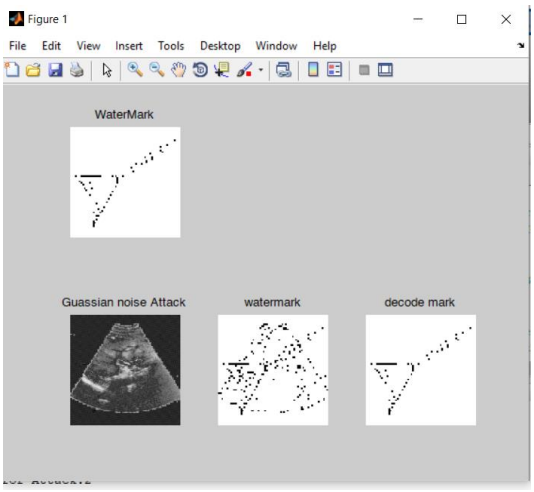

Figure 4: in the given window, it has three techniques button DCT, DWT and Proposed of robust digital image watermarking for ultrasound image. Here apply on DWT technique and result of the simulation.

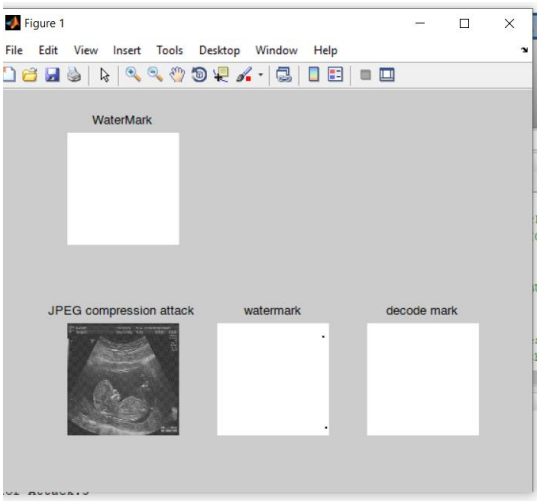

Figure 5: in the given window, it has three techniques button DCT, DWT and Proposed of robust digital image watermarking for ultrasound image. Here apply on Proposed technique and select

the watermark of the simulation. Here output of the simulation process.

	Recover Time	PSNR	SSIM
DCT	0.7813	18.0048	0.9985
DWT	0.7031	20.6437	0.9962
PROPOSED	0.7031	21.0992	0.9998

Table 1: comparative result analysis of the DCT, DWT and PROPOSED method with given parameter recover time, PSNR and SSIM with symbol image watermark(1), host image ultrasound(1).

	Recover Time	PSNR	SSIM
DCT	3.7500	49.1795	0.9958
DWT	3.6875	42.7593	1.0000
PROPOSED	3.5469	57.7295	0.9841

Table 2: comparative result analysis of the DCT, DWT and PROPOSED method with given parameter recover time, PSNR and SSIM with symbol image watermark(2), host image ultrasound(2).

	Recover Time	PSNR	SSIM
DCT	2.1406	14.6305	0.9985
DWT	2.0781	14.6357	0.9990
PROPOSED	2.0781	14.6286	0.9975

Table 3: comparative result analysis of the DCT, DWT and PROPOSED method with given parameter recover time, PSNR and SSIM with symbol image watermark(1), host image ultrasound(1).

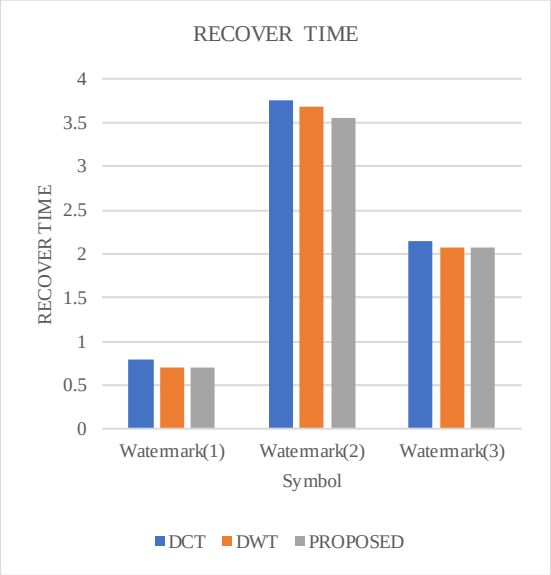

Figure 6: Show that the comparative performance of DCT, DWT, PROPOSED Techniques for RECOVER TIME using Ultrasound(1), Ultrasound(2), Ultrasound(4) images with sequence manner Watermark(1), Watermark(2), Watermark(3) watermark images on the behalf of our simulation model of watermarking and here we analysed that recover time of PROPOSED Technique is compared less to all other techniques likes DCT, DWT in the case of all symbol images likes Watermark(1), Watermark(2), Watermark(3). Proposed technique shows better result compare to others technique.

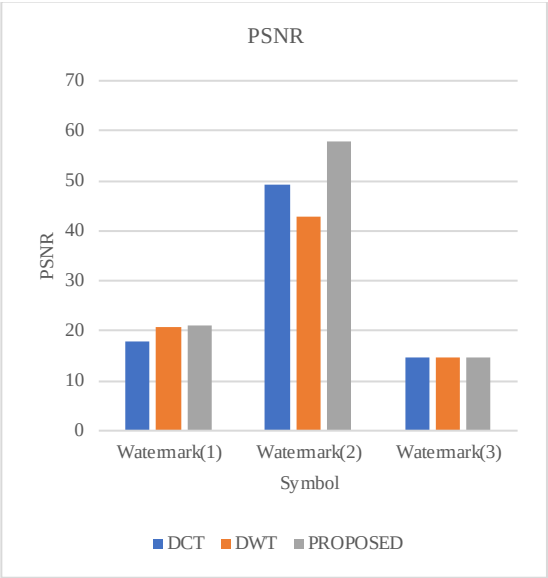

Figure 7: Show that the comparative performance of DCT, DWT, PROPOSED Techniques for PSNR using Ultrasound(1), Ultrasound(2), Ultrasound(4) images with sequence manner Watermark(1), Watermark(2), Watermark(3) watermark images on the behalf of our simulation model of watermarking and here we analysed that PSNR of PROPOSED Technique is compared less to all other techniques likes DCT, DWT in the case of all symbol images likes Watermark(1), Watermark(2), Watermark(3). Proposed technique shows better result compare to others technique.

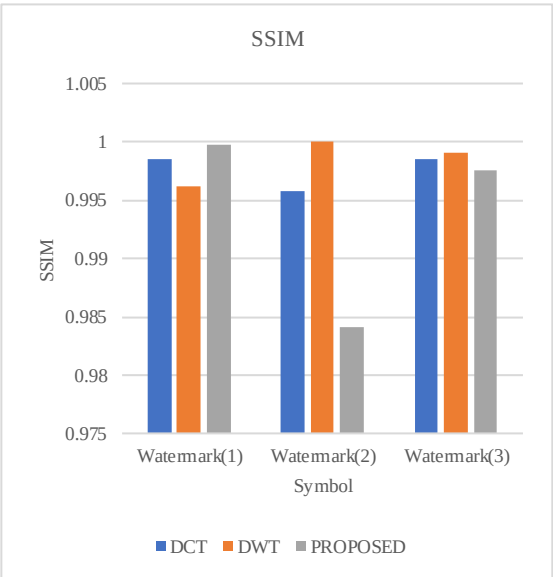

Figure 8: Show that the comparative performance of DCT, DWT, PROPOSED Techniques for SSIM using Ultrasound(1), Ultrasound(2), Ultrasound(4) images with sequence manner Watermark(1), Watermark(2), Watermark(3) watermark images on the behalf of our simulation model of watermarking and here we analysed that SSIM of PROPOSED Technique is compared less to all other techniques likes DCT, DWT in the case of all symbol images likes Watermark(1), Watermark(2), Watermark(3). Proposed technique shows better result compare to others technique.

V. Conclusion & Future Scope

In this dissertation proposed a classification based watermarking technique for medical images. The feature based watermarking technique for image used Gabor transform function for feature extraction. The extracted features going through support vector machine classifier for classification of feature pattern. The classified feature pattern of host and watermark image, for the selection of coefficient used person coefficient selection method. The person coefficient selection is mathematical function that function estimate the correlation of two feature pattern one is host pattern and other is watermark symbol feature pattern. If the value of feature pattern difference 0 then watermark embedding process is done. In that fashion of watermarking technique, the watermark image is stronger instead of DWT and another technique of water marking process. In the proposed method also consider the reduction of embedding time of watermark technique.

The proposed model is combination of wavelet transform function, support vector machine and persons coefficients. The proposed method provides a more security strength for geometrical attack for watermarking technique. The geometrical attack performs on digital watermarking measure the security strength. The strength of security is stronger in compression of DWT-SVM. Our empirical valuation of result analysis shows that better PSNR value and SSIM value for watermark image. The process of embedding time is also reducing. The reduces time increase diversity and flexibility of watermarking technique.

REFERENCES

[1]. Nuñez-Ramirez, Diana, Manuel Cedillo-Hernandez, Mariko Nakano-Miyatake, and Hector Perez-Meana. "Efficient Management of Ultrasound Images using Digital Watermarking." *IEEE Latin America Transactions* 18, no. 08 (2020): 1398-1406.

[2]. Thakur, Sriti, Amit Kumar Singh, Satya Prakash Ghrera, and Mohamed Elhoseny. "Multi-layer security of medical data through watermarking and chaotic encryption for tele-health applications." *Multimedia tools and Applications* 78, no. 3 (2019): 3457-3470.

[3]. Cedillo-Hernandez, M., A. Cedillo-Hernandez, M. Nakano-Miyatake, and H. Perez-Meana. "Improving the management of medical imaging by using robust and secure dual watermarking." *Biomedical Signal Processing and Control* 56 (2020): 101695.

[4]. Kavitha, C., and S. Sakthivel. "An effective mechanism for medical images authentication using quick response code." *Cluster Computing* 22, no. 2 (2019): 4375-4382.

[5]. Dagadu, Joshua C., and Jianping Li. "Context-based watermarking cum chaotic encryption for medical images in telemedicine applications." *Multimedia Tools and Applications* 77, no. 18 (2018): 24289-24312.

[6]. Thanki, Rohit, Surekha Borra, and Deven Trivedi. "Security of Biometric and Biomedical Images Using Sparse Domain Based Watermarking Technique." In *Handbook of Multimedia Information Security: Techniques and Applications*, pp. 209-232. Springer, Cham, 2019.

[7]. Ahmed, Ahmed Shihab, Hussein Ali Salah, Jalal Q. Jameel, and Reyadh Shaker Naoum. "A robust Image Watermarking Based on Particle Swarm Optimization and Discrete Wavelet Transform."

[8]. Ayad, Habib, and Mohammed Khalil. "QAM-DWT-SVD Based Watermarking Scheme for Medical Images." *International Journal of Interactive Multimedia & Artificial Intelligence* 5, no. 3 (2018).

[9]. Gul, Ertugrul, and Serkan Ozturk. "A novel hash function based fragile watermarking method for image integrity." *Multimedia Tools and Applications* 78, no. 13 (2019): 17701-17718.

[10]. Qasim, Asaad F., Farid Meziane, and Rob Aspin. "A reversible and imperceptible watermarking scheme for MR images authentication." In *2018 24th International Conference on Automation and Computing (ICAC)*, pp. 1-6. IEEE, 2018.

[11]. Thakur, S., A. K. Singh, and S. P. Ghrera. "NSCT domain–based secure multiple-watermarking technique through lightweight encryption for medical images." *Concurrency and Computation: Practice and Experience* (2018): e5108.

[12]. Swaraja, K. "Medical image region-based watermarking for secured telemedicine." *Multimedia Tools and Applications* 77, no. 21 (2018): 28249-28280.

[13]. Fadoua, Sabbane, and Tairi Hamid. "Medical Video Watermarking Scheme for Telemedicine Applications." In *2020 1st International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET)*, pp. 1-6. IEEE, 2020.

[14]. Allaf, Abdehay Hassani, and M'hamed Aït Kbir. "Usage of watermarking techniques in medical imaging." In *Proceedings of the 3rd International Conference on Smart City Applications*, pp. 1-6. 2018.

[15]. Shekhar, Sushant, and M. A. Ansari. "Image Analysis for Brain Tumor Detection from MRI Images using Wavelet Transform." In *2018 International Conference on Power Energy, Environment and Intelligent Control (PEEIC)*, pp. 670-675. IEEE, 2018.

[16]. Rahman, Atta. "Optimum information embedding in digital watermarking." *Journal of Intelligent & Fuzzy Systems* 37, no. 1 (2019): 553-564.

[17]. Ananthaneni, Venkateswarlu, Rani Nelakuditi, and A. P. Guntur. "Hybrid Transforms Based Watermarking Algorithm for Multi-Modal Medical Imaging Modality Applications." *International Journal of Pure and Applied Mathematics* 119, no. 15 (2018): 1-18.

[18]. Habib, Rafi Ullah, and Hani Ali Alquhayz. "Medical Image (s) Watermarking and its Optimization using Genetic Programming."