www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 6 Issue 6 June 2017, Page No. 21563-21567
Index Copernicus value (2015): 58.10 DOI: 10.18535/ijecs/v6i6.03

Watermark Image Enhancement from various Attacks by SWT Using Hybrid Meta-heuristics

Vikas Sharma, P.S Mann
M.Tech Scholar Department of CSE,
DAV institute of engineering and technology, Jalandhar, India
vsharma4400@gmail.com
Assistant Professor, Department of IT
DAV institute of engineering and technology, Jalandhar, India
psmaan@hotmail.com

Abstract: ***Digital watermarking enables one to protect the document; it is the kind of material authentication. The major problem in hypermedia technology is attacks on digital watermarking.In digital watermarking single attack on a given watermark image has effective outcome but multiple attacks on a given watermarked image and other watermark scrambling need to be improved. This paper purposes a new watermarking technique using integrated approach of SWT with GA and PSO for watermarking scrambling is used. The proposed methodology enhances imperceptibility and robustness in the watermarked image which has result in improving the visual quality of watermark.***

Keywords: watermarking techniques, SWT, SVD, PSOGA**.**

1. Introduction

Watermarking is likewise a sub-order of data covering up. The watermarking procedure is by and large material to waveform sort of data sources. Computerized watermarking is a method, which allows a man to incorporate covered copyright sees, or other check messages to cutting edge sound, video or picture banners and records. Such a message is social event of bits depicting data identifying with the sign or to the maker of a sign. The technique takes its name from watermarking of paper or money as a security measure. Progressed watermarking can be a kind of stenography, in which data is concealed in the message without the end customer's learning. The watermarking method contains two phases the watermark embedding and watermark recovery.

2. Watermarking Techniques

2.1 Distinct Cosine Transform

The DCT turns or buttons a signal from spatial domain in to a frequency domain. DCT is real-valued and offers a better approximation of a signal with few coefficients. This technique reduces how big the standard equations by discarding higher size DCT coefficients. Crucial structural data is contained in the paid off size DCT coefficients. Thus, breaking up the high-frequency DCT coefficient and using the lighting advancement in the low–volume DCT coefficient, it'll acquire and cover the edge information from satellite images. The increased picture is reconstructed by utilizing inverse DCT and it is likely to be sharper with excellent contrast. DCT is popularly used within data force approaches these for case JPEG and also MPEG. The top great things about DCT consist of their massive electric power compaction buildings and also handiness so that we can promptly data to the working out regarding transform. The force compaction house from the DCT results within transform coefficients with only very few coefficients getting costs, as a result which makes it suitable for watermarking **[18]**.

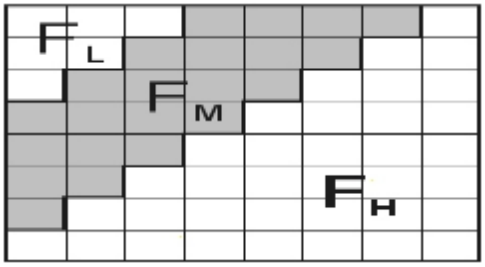

Figure 1: Discrete Cosine Transform regions [5]

2.2 Discrete Wavelet Transform

The DWT is only an arrangement of filters. You can discover two channels included, one could be the "wavelet channel", and the other could be the "scaling filter". The wavelet filtration is a high pass filtration, while the scaling filtration is a low pass channel. In the wake of utilizing a 1-level DWT on a photo, we have the estimate sub-band LL, the outside sub-band LH, the straight sub-band HL, and the corner to corner sub-band HH. Moreover, on the off chance that we need to utilize a 2-level DWT on the photo, we simply utilize yet another 1-level DWT on the estimation sub-band LL. Taking after utilizing a 2-phase DWT, we likewise have the estimation sub-band LL2, the outside sub-band LH2, the straight sub-band HL2, and the corner to corner sub-band HH2 of the guess sub-band LL other than sub-groups LH, HL, HH. Figure 1.7 shows Workflow of DWT. Favorable position of DWT over various changes is it permits great limitation both in time and spatial recurrence space. In light of these characteristic multi-determination natures, wavelet coding plans are exceptionally perfect for projects where versatility and average pulverization are essential. DWT is favored, since it gives both a parallel spatial confinement and a recurrence spread of the watermark inside the host picture. The progressive property of the DWT offers

the shot of examining a sign at different guarantees and introductions [19].

2.3 Singular Value Decomposition

SVD is a successful numerical investigation device used to examine grids. The Singular Value Decomposition of picture I of size m x n is acquired by the operation: I= USV (5) where U is section orthogonal lattice of size m x m, S could be the askew framework with positive or zero components of size m x n and transpose of n x n orthogonal grid V. The inclining passages of framework S are alluded to as the solitary estimations of I. The sections of U network are alluded to as left solitary vector and the segments of the framework V are alluded to as the best possible particular vector of I. In this way, every solitary worth speaks to the luminance of picture layer and the relating couple of particular vector speaks to the geometry of the picture layer. In SVD based picture watermarking, a few methodologies are conceivable. A typical technique is to use SVD to the whole cover picture and change the majority of the solitary qualities to insert the watermark. The vital property of SVD based watermarking is that the expansive of the adjusted solitary estimations of picture will change by tiny qualities for various sorts of assaults.

3. ATTACKS APPLIED

3.1 Sharpening Attack

Picture sharpening refers to any change methodology that highlights edges and fine points of interest in a picture. Picture honing is broadly found in printing and photographic ventures for raising the neighbourhood differentiate and honing the images. In idea, picture honing contains adding to the primary picture a sign that is relative to a high-pass sifted adaptation of the main picture. The primary picture is initially separated by method for a high-pass channel that concentrates the high-recurrence segments, and a scaled adaptation of the high-pass channel efficiency is put into the main picture, consequently making a honed picture of the first.

3.2 Gamma Correction Attack

Gamma rectification could be the name of a nonlinear operation used to code and translate luminance or tristimulus values in motion picture or however picture frameworks. Gamma rectification is, in the least difficult cases, characterized by the following force law appearance:

$$V_{\text{out}} = AV_{\text{in}}{}^{\gamma}$$

Where A will be a steady and the criticism and result costs are non-negative genuine costs; in the most prominent instance of A = 1, inputs and segments are regularly in the number 0–1. A gamma cost $\gamma < 1$ is some of the time called a coding gamma, and the technique for coding with this particular compressive force law nonlinearity is called gamma weight; then again a gamma cost $\gamma > 1$ is known as an interpreting gamma and the applying of the broad force law nonlinearity is called gamma extension.

3.3 Histogram Attack

Histogram equalization frequently provides unlikely outcomes in photographs. It offers superior unwanted outcomes (like apparent snapshot gradient) when don graphics along with reduced shade depth. Like, if perhaps don 8-bit snapshot displayed along with 8-bit gray-scale system it's going to much lower shade place (number associated with exclusive colors associated with gray) with the image. The actual histogram struck quotes some sort of watermark by using exclusively histogram of an image. A operation termed complementary may possibly go for graphics to further improve the actual histogram attack. A problem associated with the procedure can be it is indiscriminate. It might improve the compare associated with historical past racket, while reducing the useful signal that can be officially used on shade graphics using exactly the same process singularly towards Crimson, Natural in addition to Glowing blue pieces of the actual RGB shade valuations with the impression **[26].**

4. Related Work

Kang, Xiangui et al.(2003)[1] introduced strength is a critically essential issue in watermarking. Vigour against geometric twisting and JPEG pressure in the meantime with visually impaired extraction remains particularly difficult. A visually impaired discrete wavelet change discrete Fourier change (DWT-DFT) composite picture watermarking calculation that is hearty against both relative change and JPEG pressure is proposed. Liu ,L., et al.(2006) [3] displayed another solitary worth decay discrete wavelet change (SVD-DWT) composite picture watermarking calculation that is vigorous against relative change and normal picture preparing is exhibited. They utilize DWT and IDWT change to get four distinctive recurrence pictures. Watermarking is installed in high recurrence picture by solitary worth disintegration. Minwei zhao et al(2008)[4]. This proposed consolidates the visual attributes of low recurrence sub-picture of DWT and the capacity of DCT to expel connection between's DWT coefficients. By doing this, this paper enhances a visually impaired DCT watermarking calculation to get another shading picture advanced watermarking mapping in light of DWT and DCT. The pattern applies a self-adjusted shading segment picking methodology; Pre-forms the watermark by Logistic riotous encryption. Dorairangaswamy, et al. (2009) [6] has clarified an imperceptible and visually impaired watermarking plan for copyright security of computerized pictures with the objective of protecting against advanced robbery. In this watermarking plan, a double watermark picture has been imperceptibly installed into the host picture for accomplishing copyright assurance. Ghosh,sudip et al. (2009) [7] has presented watermarking procedure spread range adjustment based strategy which incorporates more noteworthy strength. As watermarking applications, request advancement of low valued watermark calculations with a specific end goal to execute continuously environment. With this, a square based various piece spatial space spread range picture watermarking plan has been spoken to the spot where a dim scale watermark picture is appeared by less number of double digits utilizing novel channel coding and spatial biphase regulation standard.

Prsasad. R.M. et al (2010) [9] has talked about a successful imperceptible watermarking plan for installing and removing an electronic watermark in a photo to defend it from copyrights. The undetectable insertion of the watermark picture into the first picture is led in wavelet area utilizing Haar wavelet change. In this, the creators make a mask network using the first picture with help from MD5 calculation and irregular grid. Kehsav ,s.rawat et al. (2010)[10] This paper presents computerized watermarking techniques for approval against replicating or theft of shading pictures. Watermarking is an essential field for copyrights of different electronic archives and media. With pictures generally accessible on the Internet, it might infrequently be attractive to utilize watermarks. Advanced watermarking is the handling of joined data into a computerized signal. A watermark is an auxiliary picture, which is overlaid on the host picture, and gives a method for ensuring the picture lattices for examinations the power of watermarking meth.

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5. Methodology

Step 1: Read watermarked image as wmkd.

Step 2: Inverse stationary wavelet transform

```
[LL HL LH HH]=swt2(double(CWW),1,'sym1');
U2,S2,V2]=svd(LL);
SN=U1*S2*V1';
WN=(SN-S)/af;
WNN=zeros(mm1,nn1);
for i=1:mm1
   for j=1:nn1
      WNN(i,j)=WN(i,j);
   end
end
```

Step 3: Inverse scrambling of watermark

```
[a b c]=size(watermark_ww);
N=a*b;

key=0.2345;
mm(1)=key;
mu=4;
for i=1:N-1
   mm(i+1)=mu*mm(i)-mu*mm(i)^2;
end
mm=mod(1000*mm,256);

n=1;
for i=1:a
   for j=1:b
      WNN(i,j)=bitxor(mm(n),watermark_ww(i,j));
       n=n+1;
   end
end
```

Step4: Calculate objective function

```
   NC=corrcoef(watermark,WNN);
   Imp =
NormalizedCrossCorrelation(im2bw(Image),im2bw(CWI1));
   Robust=NormalizedCrossCorrelation(W, WNN);
   Error1=(1/mean(Robust))-Imp;
   if Error>Error1
      Error=Error1;
      alpha1=af;
   end
end
```

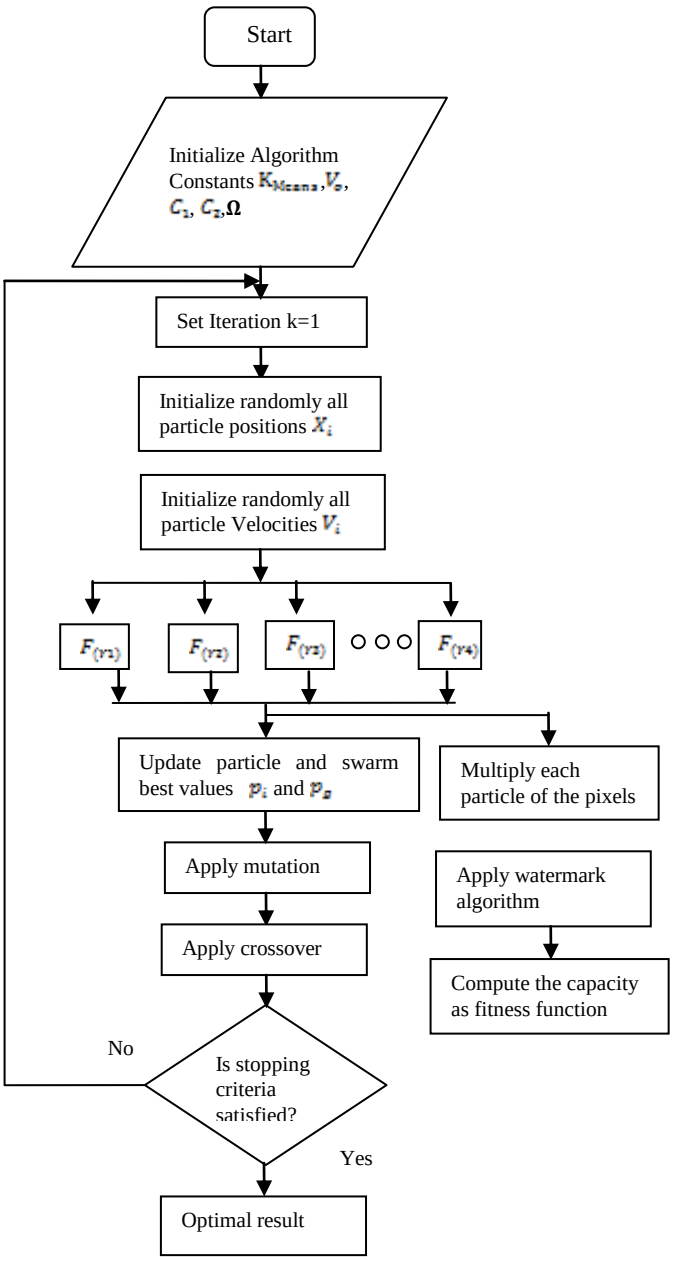

Figure 2: Flowchart of PSOGA based Proposed Technique.

6. Experimentation and Results

Figure indicates the input images for experimental analysis. Fig. (a) is showing the Cover image and fig. (b) is showing the Watermark image. The overall purpose is to combine relevant information from multiple images into a single image that's more informative and suitable for both visual perception and further computer processing.

(a): Cover image

(b): Watermark image

Now to extract the watermark image from the embedded image we can apply various attacks to watermarked image. Attacks are the factor that can degrade the strength of watermark**.** Attacks on watermarked image are distortions in the watermarked image. Attacks on digital watermarks should consider both watermark survival and disturbances in the watermarked image.

Without attack

Gaussian noise attack

Histogram attack

7. Performance Analysis

This proposed method is implemented by using MATLAB tool u2013a.The algorithm results are concluded by using various performance parameters Root Mean Square Error (RMSE) and Bit error rate (BER).

7.1 Root Mean Square Error

RMSE is a frequently used measure of the differences between values (sample and population values) predicted by a model or an estimator and the values actually observed.

Table1: RMSE Values

SNO	COVER IMAGES	WATERMARK	RMSE (ABC based DWT)	RMSE (PSOGA based SWT)
1	C1	W1	0.4418	0.3448
2	C2	W2	0.8128	0.6352
3	C3	W3	0.6294	0.4921
4	C4	W4	0.2935	0.2295
5	C5	W5	0.7051	0.5523
6	C6	W6	0.6144	0.4807
7	C7	W7	0.4805	0.3743
8	C8	W8	0.9234	0.7213
9	C9	W9	08173	0.6388
10	C10	W10	0.9319	0.7283

RMSE is minimum in the case of the proposed algorithm therefore proposed algorithm provides better results compared to the existing technique.

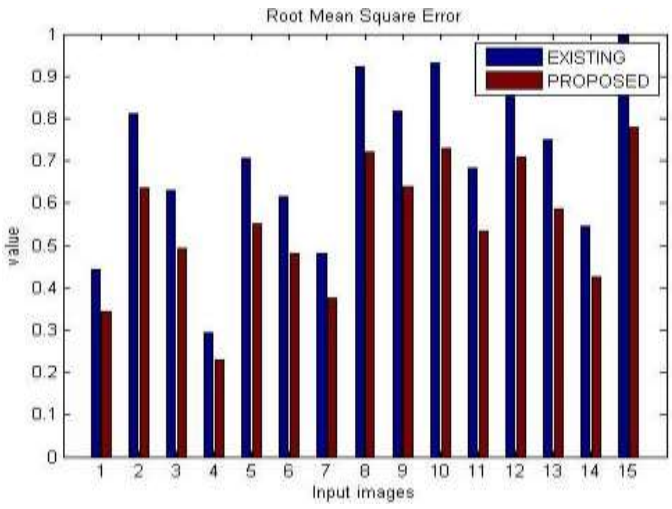

Figure 3: Root mean square error

7.2 Bit Error Rate

Bit error rate (BER) the rate at which errors occur in the transmission of digital data.

Table 2: BER Values

S NO:	COVER IMAGES	WATERMARK	BER (ABC based DWT)	BER (PSOGA based SWT)
1	C1	W1	0.0181	0.0174

2	C2	W2	0.0200	0.0192
3	C3	W3	0.0192	0.0184
4	C4	W4	0.0170	0.0164
5	C5	W5	0.0195	0.0188
6	C6	W6	0.0191	0.0184
7	C7	W7	0.0183	0.0176
8	C8	W8	0.0205	0.0196
9	C9	W9	0.0200	0.0192
10	C10	W10	0.0205	0.0197

Bit error rate have to be reduced therefore the proposed algorithm is showing the better results compared in comparison to existing technique.

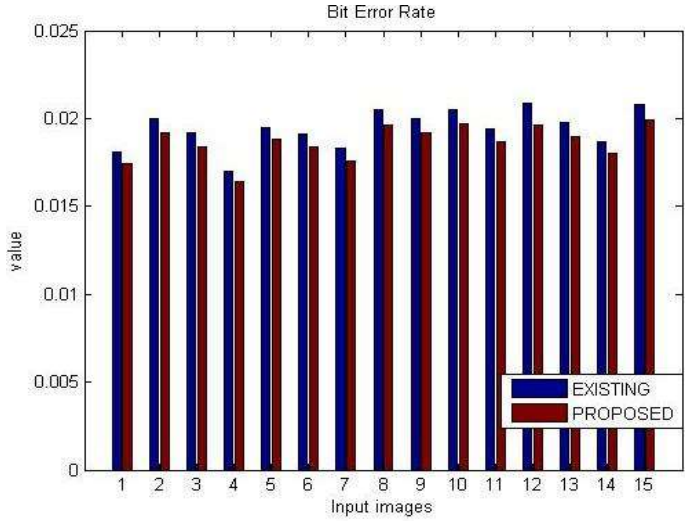

Figure 4: Bit error rate

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