IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-6, Issue-1 E-ISSN: 2347-2693

Mitigation of Geometrical Attack in Watermarking Technique Using Support Vector Machine

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Available online at: www.ijcseonline.org

Received: 20/Dec/2017, Revised: 01/Jan/2018, Accepted: 14/Jan/2018, Published: 31/Jan/2018

Abstract- The current decade of watermarking technique faced a problem of geometrical and some other attack. The minimization of security attack in watermarking technique is major issue. For the minimization of geometrical attack used various transformed based technique. The transform based watermarking technique used some well know function such as DWT, DCT and combination of more wavelet based transform function. Now a day used various authors feature selection based watermarking technique. The feature selection based watermarking technique gives better security strength in compression of another transform based technique. In this paper proposed a classification based watermarking technique and reduces the mitigation of geometrical attack for the process of watermark security strength. For the minimization of attack used correlation coefficient matrix for the processing of embedding and the process of embedding done by the pattern generation. The process of pattern generation used support vector machine. The support vector machine is classifier; it classifies the data on the biases of guidance.

Keywords: Watermarking, Geometrical Attack, DCT, DWT, SVM.

I. INTRODUCTION

Digital watermarking technique provides the great potential security strength of multimedia data. Now a day's multi-media data faced a problem of privacy security and copyright protection act due to illegal marketing of multi-media data. In current business trend some illegal group of persons break the watermark symbol and sell out in market multi-media data against violation of copyright act [4]. Security and privacy protection is critical issue in multi-media data. So various researcher and developer try to improve security strength and copyright validation of multimedia data such as color image, video and movie, for improvement of strength used different algorithm such ad discrete wavelet transform function, single value decomposition technique, pixel based technique and some used neural network based technique[1-2].

In the journey of research feature based watermarking technique are used in current research tend. Feature based watermarking technique provide great security strength against geometrical attack. The feature based water marking technique used wavelet transform function for feature extraction in the form of layer [7].

The extracted feature from watermark image and host image passes through support vector machine for the generation of valid pattern for watermark image and host image. For the measurement of correlation coefficient of both pattern used Pearson coefficient and finally watermark image is performed. A pearson coefficient is mathematical function used for coefficient selection of watermark is used [14-15]. The rest of papers discuss as section II**.** Gabor Wavelet Transform. In section III discuss the proposed methodology. In section IV discuss simulation & result analysis and in section V finally discuss conclusion and future scope.

II. GABOR WAVELET TRANSFORM

Feature extraction technique is important phase of digital watermarking technique [14]. In watermark image basically three types of features are color, texture and dimensions. Feature extraction can be defined as the act of mapping the image from image space to the feature space. Now days, finding good features that effectively represent an image are still a difficult task [9]. In this section discuss a feature are used for pattern generation using support vector machine. Features basically represent the visual content. Visual content can be further divided into general or domain specific. Here used Gabor filters for extraction process. Texture analyzers implemented using 2-D Gabor functions produce a strong correlation with texture data in color image [3,5]. Gabor functions are Gaussian modulated by complex sinusoids. In the two dimensions they take the form:

$$g(x,y) = \frac{1}{2\pi\sigma_x\sigma_y}\exp\left(-\frac{1}{2}\left(\frac{x^2}{\sigma_x^2}+\frac{y^2}{\sigma_y^2}\right)+2\pi jWx\right) \dots (1)$$

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A dictionary of filters can obtain by appropriate dilatations and rotations of g(x, y) generating function:
$g_{mn}(x,y) = a^{-m}g(x',y')$ where m=0,1,…..,S-1
$x' = a^{-m}(x\cos\theta + y\sin\theta)$, $y' = (-x\sin\theta + y\cos\theta)$……..
....(2)
where μ = n¼/K, K the number of orientations, S the number scales in the multi resolution, and a = (Uh/Ul)−1/S−1 with Ul and Uh the lower and upper center frequencies of interest. Compact representation needs to be derived for learning and classification purposes. Given an image I(x, y), its Gabor wavelet transform is then defined as[6]:

$$W_{mn}(x,y) = \int I(x,y)\, g_{mn} * (x - x_1, y - y_1)dx_1 dy_1 \ldots\ldots(3)$$

Where* represents the complex conjugate. Mean μ_{mn} and the standard deviation ¾mn of the magnitude of the transform coefficients are used to represent the image.

$$\mu_{mn} = \iint |W_{mn}(x,y)|dxdy$$

And $\sigma_{mn} = \sqrt{\iint (|W_{mn}(x,y)| - \mu_{mn})^2 dxdy}$ .....(4)
Then a feature vector is constructed using μ_{mn} and σ_{mn} as feature components:

f= [μ00 σ_{00} μ_{01} σ_{01} …. μ_{mn} σ_{mn}]
……..(5)
As result, we obtain a numerical vector of 30 dimensions for 6 orientations and 5 scales changes. Also note the texture feature is computed only for rectangular grid as it is difficult to compute the texture vector for one arbitrary region. The extracted texture feature generates a feature matrix for pattern generation.

III. PROPOSED METHODOLOGY

In this section discuss the proposed methodology of digital watermarking technique based on support vector machine and Gabor wavelet transform function, the feature of transform function passes through support vector machine. The support vector machine classified the data of feature extracted by transform function, the extracted feature of transform function. Here used an important function for estimate the correlation coefficient of both the pattern host image pattern and watermark symbol pattern. If the correlation coefficient factor estimates the value of correlation is zero then embedding process is done. The process of proposed model divides into three sections first section deals with initially take host image and watermark image passes through gabor transform function for feature extraction after the feature extraction applied classification task done by support vector machine. Support vector machine generates the pattern of feature of host image and watermark image. Finally apply Pearson's coefficient correlation measure the strength of pattern for embedding process.

1. step feature extraction
   a. input the host image and water mark symbol image
   b. apply separately Gabor transform function for feature extraction
      F(x)=I(x,y) is host image F1(x)=I1(x1,y1) is water mark image
      M (F)= F(x) ×G(x)
      The convolution is performed in host image through transform function here M (F) stored the texture feature matrix of host image.

Then a feature vector is constructed using μ_{mn} and σ_{mn} as feature components:

f= [μ00 σ_{00} μ_{01} σ_{01} …. μ_{mn} σ_{mn}]
……..(1)
We obtain a numerical vector of 60 dimensions for 10 orientations and 6 scales changes. This moment feature value stored in M (F) matrix.

N (F) =F1(x) ×G(x)
The convolution is performed in host image through transform function here N (F) stored the texture feature matrix of host image.

Then a feature vector is constructed using $\mu 1_{mn}$ and σ_{1mn} as feature components:

f= [μ100 $\sigma 1_{00}$ μ_{011} σ_{01} …. $\mu 1_{mn}$ $\sigma 1_{mn}$]
……..(2)
We obtain a numerical vector of 60 dimensions for 10 orientations and 6 scales changes. This moment feature value stored in N (F) matrix.

2. Both the feature matrix convent into feature vector and pass through support vector machine
3. step two used here support vector machine for classification of pattern

Transform data to the format of an SVM that is X is original data R is transform data such that Xi∈ R^d here d is dimension of data.

Conduct scaling on the data

$\alpha = \sum_{i=1}^{m}\sum_{j=1}^{n} sim(Xi, xj) \because m * k$ here α is scaling factor and m is total data point and k is total number of instant and sim find close point of data.

Consider the RBF kernel K(x; y)

H(x) = $\exp((-(\delta - c)2 / (r2)$ this is kernel equation of plane.

Use cross-validation to 2nd the best parameter C and
Use the best parameter C and to train the whole training set

Ro=$\alpha\frac{1}{p}\sum_{i=1}^{p} min\,(xi - yi)$ where Ro is learning parameter of kernel function.

Generate pattern of similar and dissimilar pattern of both image.

4. Estimate the correlation coefficient of both patterns using person's coefficient.

Estimate the feature correlation attribute as

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$$Rel(a,b) = \frac{cov(a,b)}{\sqrt{var(a) \times var(b)}}$$ Here a and b the pattern of host image and water mark image.

The estimated correlation coefficient data check the total value of MSE

$$x(t) = w0 + \sum_{j=1}^{total\ data} wj \exp\left(\frac{-(total - xj)}{\sigma^2}\right)$$

Create the relative feature difference value

$$Rc = \sum_{k=1}^{r} \sum_{i=1}^{m} (hi - h)(eik - et)$$

if the relative pattern difference value is 0

5. watermark embedding process is done
6. calculate PSNR value of watermark image
7. calculate NC value of watermark image
8. Calculate embedding time of watermark image.

9. The water mark extraction process from a watermarked image are given below

1. apply 2-D Gabor wavelet transform function
2. find the texture feature of composite image
3. separate pattern of support vector machine
4. measure the correlation coefficient value
5. the correlation pattern value is dissimilar

Original watermark is obtained after that.

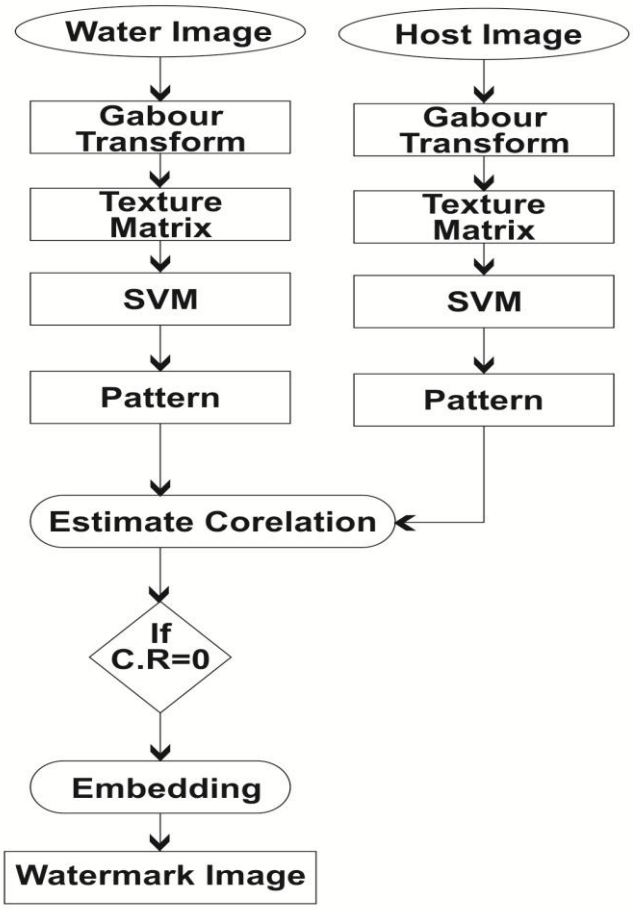

Figure 1: shows that proposed model of watermarking technique.

IV. SIMULATION & RESULT ANALYSIS

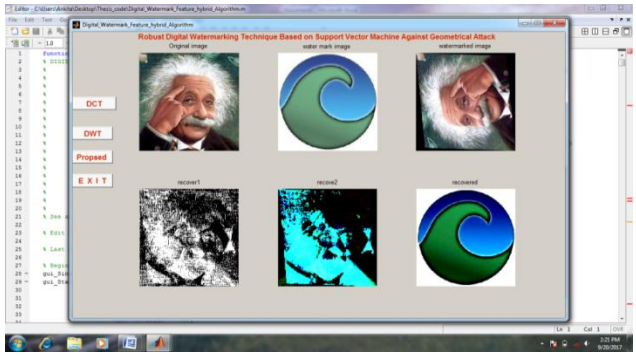

Figure 2: Shows an image for Robust Digital image watermarking based on DCT on Shear Attack

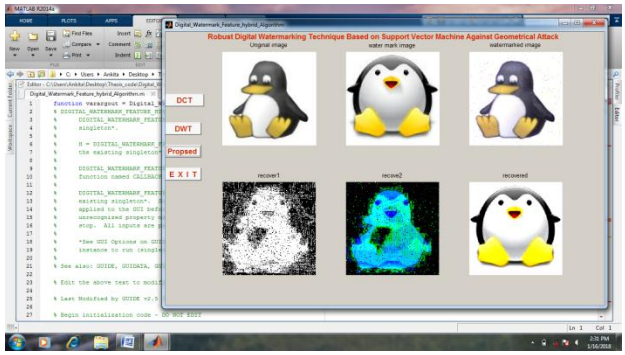

Figure 3: Shows an image for Robust Digital image watermarking based on DWT Method on Noise Attack

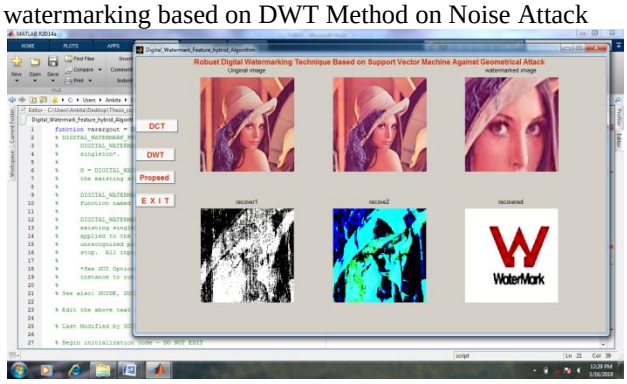

Figure 4: Shows an image for Robust Digital image watermarking based on Proposed Method on Cropping Attack

RESULT ANALYSIS

Method	Types of Attack	Attack_ Recovery time	PSNR	NC
DCT	Noise	4.4616	22.7278	0.2908
	Cropping	11.4036	22.6285	0.5692

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	Shear	8.0028	22.8389	0.1772
DWT	Noise	4.3524	21.2740	0.2709
	Cropping	10.3272	21.0920	0.5524
	Shear	6.9732	21.3860	0.1571
Proposed	Noise	1.5444	24.7275	0.7136
	Cropping	1.5444	25.0868	0.8308
	Shear	1.6380	24.8389	0.6108

Table 1: shows the comparative Attack Recovery time, PSNR and NC for Einstein image for Robust Digital Image Watermarking on the basis of three methods DCT, DWT and proposed method

Method	Types of Attack	Attack_ Recovery time	PSNR	NC
DCT	Noise	5.6940	23.8204	0.4079
	Cropping	9.6876	24.6043	0.4267
	Shear	7.1916	24.1992	0.3518
DWT	Noise	5.2104	22.3682	0.3878
	Cropping	7.8000	23.1136	0.4499
	Shear	7.1760	22.7476	0.3317
Proposed	Noise	1.6692	25.8222	0.7368
	Cropping	1.5756	26.6364	0.7180
	Shear	1.5132	26.1992	0.6392

Table 2: Show the comparative Attack Recovery time, PSNR and NC for Lena Image for Robust Digital image Watermarking on the basis of three methods DCT, DWT and proposed method.

PERFORMANCE ANALYSIS

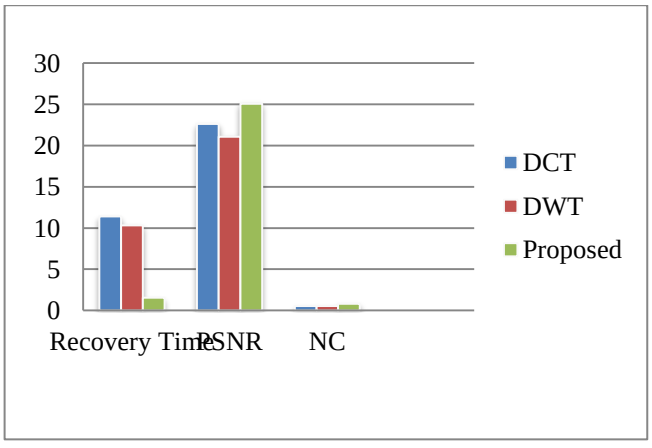

Figure 5: Shows that the performance of attack recovery time,PSNR & NC with cropping Attack on Einstein image based on the DCT, DWT and Proposed method.

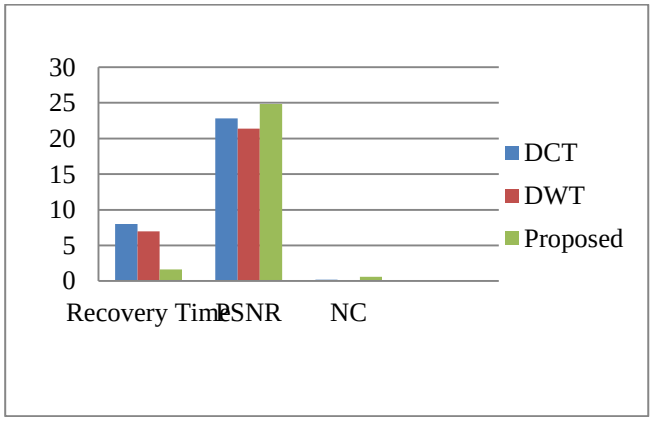

Figure 6: Shows that the performance of recover time, PSNR & NC with Shear Attack on Einstein image based on the DCT, DWT and Proposed method.

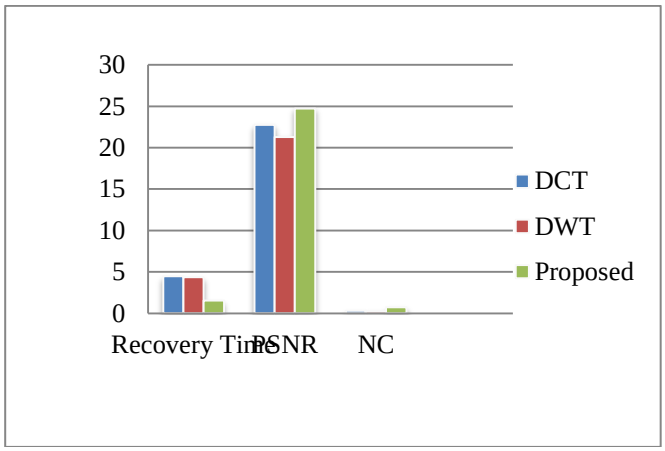

Figure 7: Shows that the performance of recovery time, PSNR & NC with Noise Attack on Einstein image based on the DCT, DWT and Proposed method.

V. CONCLUSION & FUTURE SCOPE

In this dissertation proposed a classification based watermarking technique. The feature based watermarking technique for image used Gabor transform function for feature extraction. The Pearson 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

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another technique of water marking process. The proposed model is combination of wavelet transform function, support vector machine and Pearson's 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 evaluation of result analysis shows that better PSNR value and NC value for watermark image. The process of embedding time is also reducing. This reduces time increase diversity and flexibility of watermarking technique.

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