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Watermarking Technique to Enhance Image Security in Cloud Computing

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Abstract:-With the rapid growth of internet, the various digital methods have been proposed to protect the multimedia information from the non-authorized accesses use and change. Among all the proposed methods the watermarking technique is the most common technique for protecting the multimedia data for unauthorized access. A novel method is proposed which deals with secure extraction of data by utilizing transform-based image watermarking techniques. The image is embedded with a watermark using a combination of Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT) and Discrete Wavelet Transform (DWT) in this scheme. The conventional transforms are applied in an optimized mode in these schemes in different spatial regions of the image to embed a watermark. The scheme is subjected to Signal processing attacks and Geometric attack to test against the robustness of the image. The watermarking of image is made secure by testing against unauthorized detection techniques employed by attackers. This is realized by a correlation-based detector applied to the scheme. Experimental results show that the watermarked image is robust and secure against Signal Processing attacks, Geometric attacks and unauthorized Detection attacks. The water marking methods have been categorized as spatial domain method and frequency domain method. In spatial domain method we modify the lower order bits of cover image to embed the water mark. To embed the water mark in the image simply changes the coefficient value of these transforms according to the watermark and the inverse transform is applied to the original image. These methods are too complicated and require more computational power. These methods are also provides more reverts to the security attacks. The method is GLCM technique.

Keywords: - Digital watermarking, GLCM, PCA

I INTRODUCTION

Digital watermarking is a process in which some information is embedded within a digital media so that the inserted data becomes part of the media. This technique serves a number of purposes such as broadcast monitoring, data authentication, data indexing and so forth. A digital watermarking system must successfully satisfy trade-offs between conflicting requirements of perceptual transparency, data capacity and robustness against attacks. These trade-offs are investigated from an information-theoretic perspective. Watermarks have two categories of roles: In the first category, the watermark is considered as a transmission code and the decoder must recover the whole transmitted information correctly. In the

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second category, the watermark serves as a verification code. In the latter system, the watermark detector must simply determine the presence of a specific pattern.

Digital watermarking is a technique which allows an individual to add hidden copyright notices or other verification messages to digital audio, video, or image signals and documents. Such hidden message is a group of bits describing information pertaining to the signal or to the author of the signal (name, place, etc.). The technique takes its name from watermarking of paper or money as a security measure. Digital watermarking is not a form of steganography, in which data is hidden in the message without the end user's knowledge, although some watermarking techniques have the steganography feature of not being perceivable by the human eye.

The enormous popularity of the World Wide Web in the early 1990's demonstrated the commercial potential of offering multimedia resources through the digital networks. Since commercial interests seek to use the digital networks to offer digital media for profit, they have a strong interest in protecting their ownership rights. Digital watermarking has been proposed as one way to accomplish this.

A digital watermark is a digital signal or pattern inserted into a digital image. Since this signal or pattern is present in each unaltered copy of the original image, the digital watermark may also serve as a digital signature for the copies. A given watermark may be unique to each copy (e.g., to identify the intended recipient), or be common to multiple copies (e.g., to identify the document source). In either case, the watermarking of the document involves the transformation of the original into another form. This distinguishes digital watermarking from digital fingerprinting where the original file remains intact, but another file is created that "describes" the original file's content. As a simple example, the checksum field for a disk sector would be a fingerprint of the preceding block of data. Similarly, hash algorithms produce fingerprint files.

The example below shows that digital watermarking allows hiding information in a totally invisible manner. The original image is on the left, i.e. figure1; the watermarked image is on the right, i.e. figure1.2 and contains the name of the author.

Fig. 1.1:- Original image **Fig. 1.2:- Watermarked image [7]**

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II APPLICATIONS OF DIGITAL WATERMARKING

Ownership Assertion
'A' uses a private key to generate a watermark and embeds it in the document
'A' makes the watermarked image publicly available
'B' claims that he owns the image derived from the public image
'A' produces the unmarked original and establishes the presence of 'A's watermark [5]

Fingerprinting
Used to avoid unauthorized duplication and distribution.
A distinct watermark (a fingerprint) is embedded in each copy of the data.
If unauthorized copies are found, the origin of the copy can be determined by retrieving the fingerprint [16].

Authentication & integrity verification
Watermarks should be able to detect even the slightest change in the document.
A unique key associated with the source is used to create the watermark and then embed in the document.
This key is then used to extract the watermark and the integrity of the document verified on the basis of the integrity of the watermark.

Content labeling
Bits embedded in the data, comprise an annotation, giving some more information about the data.
Digital cameras annotate images with the time and date, when the photograph was taken.
Medical imaging machines annotate images (X-Rays) with patient's name, ID [22].

Usage control & Copy protection
Digital watermark inserted to indicate the number of copies permitted.
Every time a copy is made the hardware modifies the watermark and at the same time it would not create any more copies of the data.
Commonly used in DVD technology.

Content Protection
Content owner might want to publicly and freely provide a preview of multimedia content being sold.

III DIGITAL WATERWARKING TECHNIQUES

Based on various kinds of reports present, the computerized watermarking procedures are arranged into different classifications. They are:

1. Content watermarking: So as to give copyright insurance to the content archive, this methodology is utilized. These are three kinds of advanced watermarking gave here:
   . Line move coding: The vertical moving of area of content lines so as to encode the archive is given by this strategy.
   . Word move coding: The record can be encoded through the flat moving of the area of words.
   . Highlight coding: Explicit highlights are chosen here and changed inside his strategy.

2. Picture Watermarking: The watermark in pictures is included by this technique. It is difficult to expel the watermark from the picture as it is as of now a piece of that picture.
3. Video Watermarking: The cryptographic data that is created from the casings of computerized video

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is utilized to give the cryptographic data. This created cryptographic data is installed inside the some video is this procedure among the first, plain and checked video, the client can only with significant effort separate

4. Sound Watermarking: An electronic identifier is inserted inside the sound sign utilizing this strategy. Inside the sound record, the content or pictures are utilized to be installed in such a way inside different methods which can help is recuperation of the content.

III. (a) PURPOSE OF DIGITAL WATERMARKING

Invisible watermarks on the other hand are potentially useful as a means of identifying the source, author, creator, owner, and distributor or authorized consumer of a document or image. For this purpose, the objective is to permanently and unalterably mark the images so that the credit or assignment is beyond dispute. In the event of illicit usage, the watermark would facilitate the claim of ownership, the receipt of copyright revenues or the success of prosecution.

Watermarking has also been proposed to trace images in the event of their illicit redistribution. Whereas past infringement copyrighted documents was often limited by the unfeasibility of large-scale photocopying and distribution, modern digital networks make large-scale dissemination simple and inexpensive. Digital watermarking makes it possible to uniquely mark each image for every buyer. If that buyer then makes an illicit copy, the illicit duplication may be convincingly demonstrated.

IV WATERMARKING TECHNIQUES

Advanced picture watermarking plans chiefly fall into two general classes:
Spatial-domain and *frequency domain strategies*.

(A)Spatial domain strategy: - A portion of the spatial area strategies of watermarking are follows.

i. Least significant bit (LSB): It is the most straight-forward method of watermarking installing. This plan implants watermark in the LSB of the pixel. Given a picture with pixel, and every pixel being spoken to by a 8-piece succession, the watermarking are installed in the last (that is least critical), piece of chosen pixels of the picture. This technique is anything but difficult to actualize and doesn't produce genuine mutilation to the picture; be that as it may, it isn't extremely powerful against assaults. For example, assaults could just randomize all LSBS, which viably pulverizes the shrouded data.

ii. SSM-Balance Based Strategy: In Spread-range balance methods the vitality produced at various discrete frequencies is purposively scattered or appropriated in time, for secure correspondence foundation, expanding protection from normal impedance and sticking and for forestalling discovery. SSM watermarking calculation implants data in substance of picture watermarking, it install message by consolidating the spread picture with a little pseudo clamor signal adjusted by the additional watermark.

(B) Frequency domain strategy: The point of this procedure is to implant the watermarks in the otherworldly coefficients of the picture. The most regularly utilized changes are the discrete cosine transform (DCT), discrete Fourier change in the recurrence area is that the attributes of the human virtual framework (HVS) are better catch by the otherworldly coefficients. This methods give, more data concealing limit and high heartiness against different geometrical assaults. In this research we applied DWT strategies.

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The discrete wavelet change (DWT) is a straight change that deals with a data vector whose length is an entire number power of two, transforming it into a numerically remarkable vector of a comparable length. DWT is enrolled with a course of filtering followed by a factor 2 sub testing. The Discrete Wavelet Change (DWT) is used in a wide collection of sign taking care of utilizations. 2-D discrete wavelet change (DWT) disintegrates an image or a video plot into sub-pictures, 3 nuances and 1 gauge. The estimate sub-picture resembles the first on 1/4 the size of the first. The 2-D DWT is an utilization of the 1-D DWT in both the level and the vertical heading. DWT separates the repeat band of an image into a lower objectives estimation sub-band (LL) similarly as level (HL), vertical (LH) and awry (HH) detail sections. Introducing the watermark in low frequencies got by wavelet rot grows the quality with respect to ambushes that have low pass characteristics like filtering, lossy weight and geometric turns while making the arrangement continuously fragile to separate change, gamma alteration, and histogram balance. Since the HVS is less fragile to high frequencies, introducing the watermark in high repeat sub-bunches makes the watermark continuously unobtrusive while embeddings in low frequencies makes it progressively overwhelming against a variety of ambushes. It is useful for getting ready of non-fixed signs. The change relies upon little waves, called wavelets, of fluctuating repeat and limited term. Wavelet change gives both repeat and spatial depiction of an image. Wavelets are made by understandings and developments of a fixed limit called mother wavelet. DWT is the multiresolution depiction of an image the unraveling can be taken care of progressively from a low objectives to the more significant standards. The DWT parts the sign into high and low repeat parts. The high repeat part contains information about the edge sections, while the low repeat part will be part again into high and low repeat parts. The high repeat fragments are ordinarily used for watermarking since the common eye is less fragile to changes in edges. In two dimensional applications, for every level of rot, we at first play out the DWT in the vertical heading, trailed by the DWT in the level bearing. After the chief degree of breaking down, there are 4 sub-gatherings: LL1, LH1, HL1, and HH1. For every dynamic level of crumbling, the LL sub band of the past level is used as the information. To perform second level weakening, the DWT is applied to LL1 band which deteriorates the LL1 band into the four sub groups to perform third level rot, the DWT is applied to LL2 band which separate this band into the four sub-gatherings – LL3, LH3, HL3, HH3. These results in 10 sub-bunches per fragment. LH1, HL1, and HH1 contain the most important repeat bunches present in the image tile, while LL3 contains the least repeat band. DWT is starting at now used in a wide arrangement of sign dealing with applications, for instance, in sound and video allocation. Wavelets have their imperativeness amassed in time and are suitable for the examination of transient, time-moving signs. Since most of the certified signs experienced is time changing in nature, the Wavelet Change suits various applications very well.

V PROPOSED METHODOLOGY

The watermarking is the efficient technique to provide security to the image data. The watermarking techniques are broadly classified into blind and semi-blind watermarking techniques. In the base paper, the semi-blind watermarked image is generated using the OS-ELM technique which the machine learning technique. The four levels DWT technique is applied to extract the features of the original and watermark images. The training images which are analyzed with the DWT algorithm is given as input to generate final training sets for the generation of semi-blind watermarks. The DWT algorithm will analyze textual features of the images which can be replaced with the GLCM algorithm which has less

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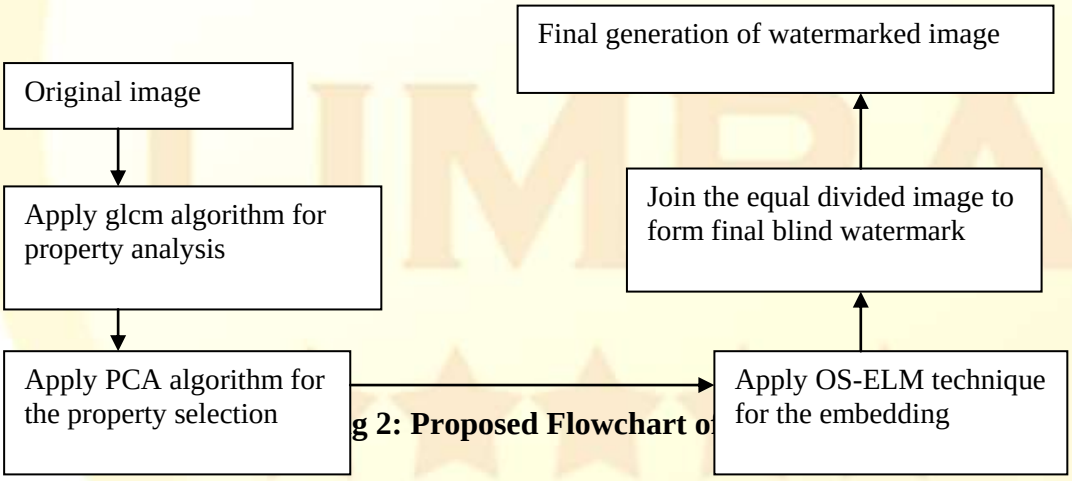
complexity and easy to generate training sets for the generation of blind watermarks .The main objectives of proposed technique are:

1. Improvement in DWT technique for the generation of semi-blind watermarking.
2. The proposed technique is based on the GLCM algorithm to analyze feature of the original image.
3. Comparisons with existing in terms of PSNR, BER, and MSE. The proposed algorithm can be applied in following steps:

V (a) PROPOSED ALGORITHM

The watermarking is the efficient technique to provide security to the image data. The watermarking techniques are broadly classified into blind and semi-blind watermarking techniques. In the base paper, the semi-blind watermarked image is generated using the OS-ELM technique which the machine learning technique. The four levels DWT technique is applied to extract the features of the original and watermark images. The training images which are analyzed with the DWT algorithm is given as input to generate final training sets for the generation of semi-blind watermarks. The DWT algorithm will analyze textual features of the images which can be replaced with the glcm algorithm which has less complexity and easy to generate training sets for the generation of blind watermarks.

System Architecture



g 2: Proposed Flowchart o

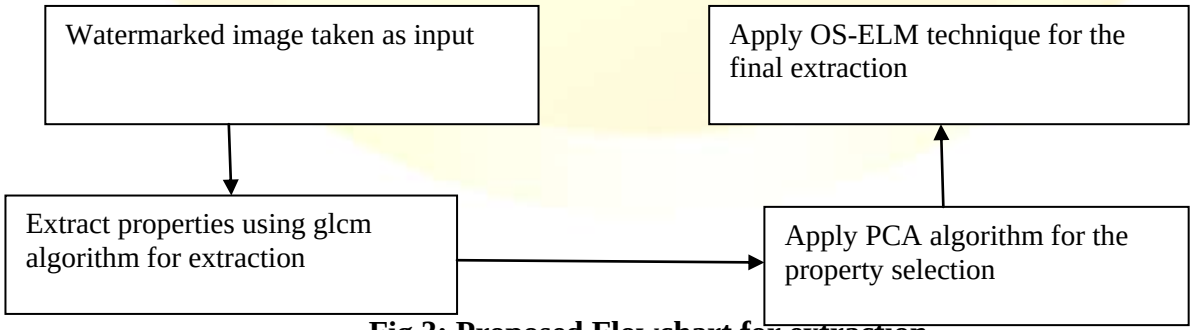


Fig 3: Proposed Flowchart for extraction

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Pre-processing phase: - The two images are taken as input. The first image is the original image and the second image is the image which needs to encrypt. The first image is used to generate key and second image will be encrypted with the key of first image.

Feature extracted: - The textual features of the first image is extracted using the GLCM algorithm. The GLCM algorithm will extract the features like energy, entropy etc. image.

The GLCM algorithm can be applied in following steps:

1. Count all the number of pixels in the matrix in which the data is saved.
2. Store the counted pixels in matrix P[I,j].
3. Check similarity between pixels in the matrix by applying histogram technique.
4. Calculate contrast factor from the matrix:

$$g = \exp[\frac{mean\ (I) - minimum\ (I)}{max\ imum\ (I) - mean\ (I)}] \quad \ldots (1)$$

5. The elements of g need to be normalized by dividing the pixels.

$$g = \begin{bmatrix} 0.8\ if\ g < 0.8 \\ 1.2\ if\ g > 1.2 \\ g\ otherwise \end{bmatrix} \quad \ldots (2)$$

Apply PCA algorithm: - In the third phase, the PCA algorithm is applied which will select the extracted features from the first image. Linear Discriminant Analysis (LDA), Independent Component Analysis and PCA are a portion of the techniques utilized for feature extraction, among them PCA is intense method in image formation, Data examples, similarities and differences between them are identified effectively. The other principle advantage of PCA is dimension will be reduced by maintaining a strategic distance from redundant information, without much loss. Better comprehension of principal component analysis is through statistics and a portion of the mathematical techniques which are Eigen esteems, Eigen vectors. PCA is a valuable statistical and common method that has discovered application in fields, for example, image recognition and compression. Principal Component Analysis (PCA) is a mathematical methodology that utilizations linear Transformations to map data from high dimensional space to low dimensional space. The low dimensional space can be controlled by Eigen vectors of the covariance matrix.
The steps involved in PCA include:

- The mean valve S of the given data set "S" is found
- Subtract the mean value say from S. from these valves a new matrix is obtained. Let say "A"
- Covariance is obtained from the matrix i.e., C = AAT Eigen values are obtained from the covariance matrixes that are V1V2V3V4…VN,
- Finally Eigen vectors are calculated for covariance matrix C
- Any vector S or $S - \bar{S}$or can be written as linear combination of eigen vectors shown in Equation below.
- Because covariance matrix is symmetric it form basis $V_1V_2V_3V_4 \ldots V_N$,

$$V_N S - \bar{S} = b_1u_1 + b_2u_2 + b_3u_3 + \cdots + b_Nu_N \quad \ldots(3)$$

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- Only Largest Eigens values are kept to form lower dimension data set:
  $\hat{S} - \bar{S} = \sum_{l=0}^{1} b_1 u_1 \; ; 1 < N$ …(4)
  The components in lower dimension space are called principal components which are ensured to be independent just if the data set is mutually typically appropriated. PCA is delicate to the relative scaling of the original variables. Contingent upon the field of application, it is additionally named as discrete Karhunen-Loève Transform (KLT), or the Hotelling transform.

VI RESULT ANALYSIS

In this section, we measure quality of watermarked images in terms of PSNR, MSE, and BER. The simulation is done in MATLAB.

PSNR:- Peak to signal ratio: It is utilized to quantify the indistinctness of the watermarked And the removed watermark images. It is characterized by the mean square error between the Comparing pixel estimations of the spread picture and the watermarked picture. This Capacity is generally utilized due to its effortlessness and clearness. On the off chance that The estimation of PSNR is higher it implies the remade picture would be wise to quality.

MSE:- MSE is the mean square error between the watermarked image and the original image. The error is lower when the value of MSE is lower.

BER:- Bit Error Rate: The bit error rate is the number of bit errors per unit time.

Watermark generation with proposed algorithm:- The GLCM and PCA algorithm is applied which select the scaling factor dynamically and according to trhat factor the watermarked image is generated.

Fig 4:- Image generation

The Sharpened, Contrast, and Salt and Pepper Attacks are applied to analyze the reliability or security of the generated watermark image which affect the image quality.

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Fig 6:- Watermark generation with proposed algorithm

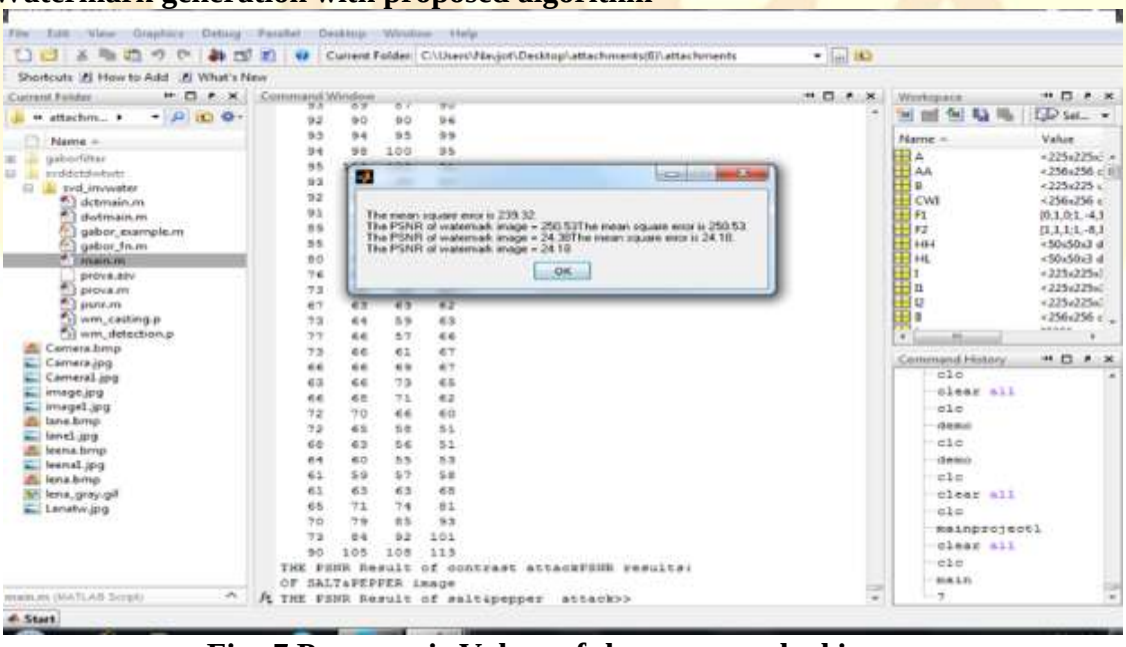

Fig:-7 Parametric Values of the watermarked image

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Technique	Parameter values	Base	Proposed
Watermarked image	PSNR	13.3917	18.0129
	MSE	3001.26	2874.83
	Correlation Coefficient	0.01	0.01
	Entropy	7.9990	7.9989
Contrast Attack	PSNR	20.0542	26.0537
	MSE	647.22	547.30
	Correlation Coefficient	0.96	0.01
	BER	4.2319	4.2200
Sharpened Attack	PSNR	23.6209	29.4842
	MSE	284.70	243.80
	Correlation Coefficient	0.97	0.98
	BER	7.003	6.9047
Salt & pepper Attack	PSNR	22.4476	27.484
	MSE	373.00	293.80
	Correlation Coefficient	0.96	0.91
	BER	7.9012	7.9036
Decrypted image	PSNR	13.3848	18.0130
	MSE	3006.02	3274.75
	Correlation Coefficient	0.01	0.00
	BER	7.6833	3.4237
Elapsed time		0.011795 sec	0.011994 sec

Table 1: Result comparison

As shown in table 1, the results of the proposed and existing schemes are compared and it has been analyzed that proposed method performs well in terms of PSNR, MSE, BER and coefficient correlation

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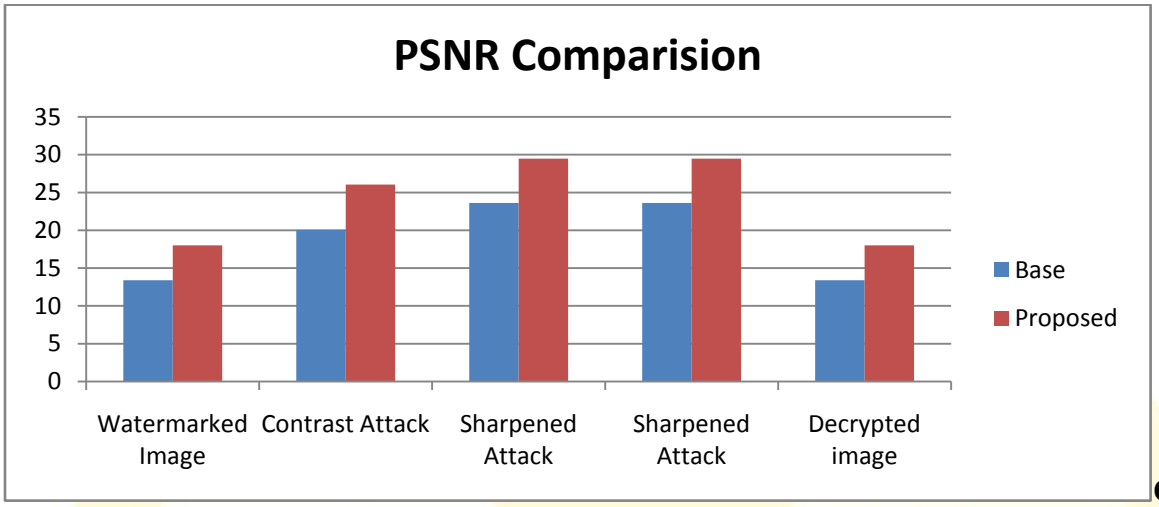
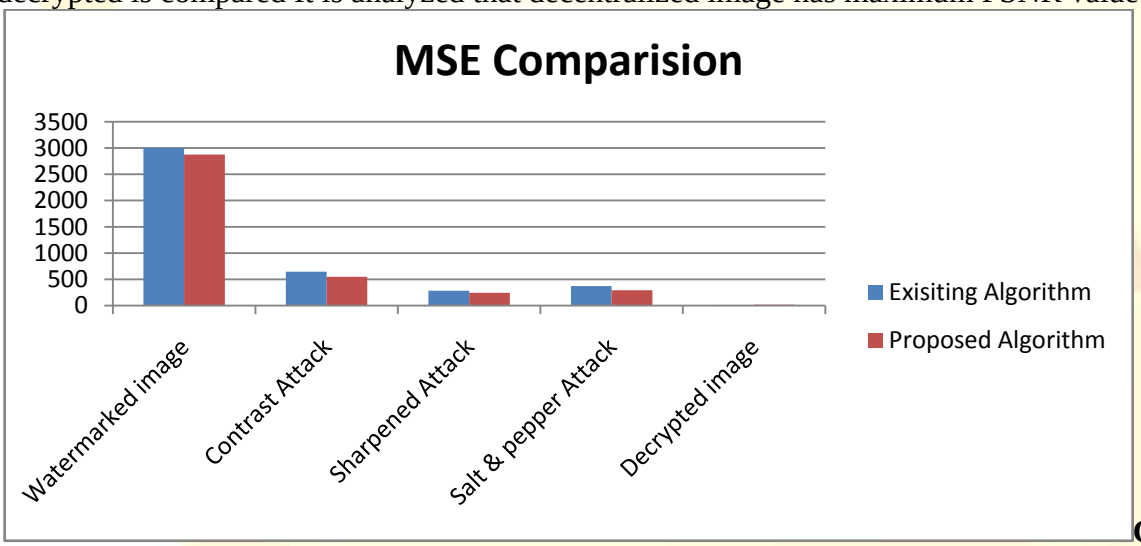


Graph-1: PSNR Comparison

As shown in Graph-1, the PSNR value of the watermarking image, salt & pepper, sharpen, decrypted is compared It is analyzed that decentralized image has maximum PSNR value



Graph-2 MSE Comparison

As shown in Graph-2, the MSE value of the proposed and existing algorithm is compared under certain situations like contrast attack, sharpen attack, salt & pepper attacks. The decrypted image has least MSE value than other image.

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VII CONCLUSION AND FUTURE SCOPE

In our work, the efficiency of the watermarking approach is concluded as it hides all the sensitive information which is stored in the form of images. In this work, GLCM and PCA algorithm has been utilized in order to improve the working capability of the neural network based watermarking technique. The extracted features of an image are selected by the PCA algorithm and the features of the original image are extracted by the GLCM algorithm. The scaling factor defines the output of the PCA algorithm which is used for implementation. On the basis of simulation results it is concluded that proposed algorithm performs well in terms of PSRN and MSE. In the future work the proposed algorithm can be further compared with other algorithms of watermarking and improved using classification techniques. In future the proposed algorithm can be compared with other algorithms of watermarking and can be further improved using state of art classification techniques.

REFERENCES:

[1] Kashyap, Nikita, and G. R. Sinha. "Image watermarking using 3-level discrete wavelet transform (DWT)." International Journal of Modern Education and Computer Science (IJMECS) 4.3 (2012): 50.

[2] Lu, Chun-Shien, and H-YM Liao. "Multipurpose watermarking for image Authentication and protection." Image Processing, IEEE Transactions on 10, no. 10 (2001): 1579-1592.

[3] Martin, Alberto, and SabriTosunoglu. "Image processing techniques for machine vision." Miami, Florida (2000).

[4] Chaturvedi, Navnidhi, and S. J. Basha. "Comparison of Digital Image watermarking Methods DWT & DWT-DCT on the Basis of PSNR." image 2 (2012): 1.

[5] Al-Haj, Ali. "Combined DWT-DCT digital image watermarking." Journal of computer science 3, no. 9 (2007): 740.

[6] Singh, Surya Pratap, Paresh Rawat, and Sudhir Agrawal. "A robust watermarking approach using DCT-DWT." International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, Volume 2, Issue 8 (2012).

[7] Mansouri, A., A. MahmoudiAznaveh, and F. TorkamaniAzar. "SVD-based digital image watermarking using complex wavelet transform." Sadhana 34, no. 3 (2009): 393-406.

[8] Anthony T.S.Ho et.al, "A Robust Digital Image-in-Image Watermarking Algorithm Using the Fast Hadamard Transform", Springer, 2011

[9] Alexander Sverdlov, "Secure DCT-SVD Domain Image Watermarking: Embedding Data in All Frequencies", Proceedings of IEEE Region 10 Technical Conference on Convergent Technologies for the Asia-Pacific, Bangalore, India, October 14-17, 2003

[10] Fang Li, **"**Salt and Pepper Noise Removal by Adaptive Median Filter and Minimal Surface Inpainting", Image and Signal Processing, 2009. CISP '09. 2nd International Congress on, 2009

[11] T. Vimala, "Salt and Pepper Noise Reduction Using Mdbtum Filter With Fuzzy Based Refinement", IJMIE, Volume 2 Issue 5, 2012

[12] D. Gabor, "Theory of communication," Journal of Institution of Electrical Engineers, vol. 93, pp. 429–457, 1946.

[13] J. Ilonen, J.-K.Kamarainen, P. Paalanen, M. Hamouz, J. Kittler, and H. K¨ alvi¨ ainen, "Image feature localization by multiple hypothesis testing of Gabor features," IEEE Trans. on Image Processing, vol. 17, no. 3, pp. 311–325, 2008.

[14] J. Ilonen, J.-K.Kamarainen, and H. K ¨ alvi¨ ainen, "Fast extraction of multi-resolution gabor features," in 14th IntConf on Image Analysis and Processing (ICIAP), 2007, pp. 481–486.

[15] E. Simoncelli, W. Freeman, E. Adelson, and D. Heeger, "Shiftablemultiscale transforms," IEEE Transactions on Information Theory, vol. 38,no. 2, pp. 587–607, 1992.

[16] J. Sampo, J.-K.Kamarainen, M. Heili ¨ o, and H. K¨ alvi¨ ainen, "Measuring translation shiftability of frames," Computers & Mathematics with Applications, vol. 52, no. 6-7, pp. 1089–1098, 2006.

[17] M. Hamouz, J. Kittler, J.-K.Kamarainen, P. Paalanen, H. Kalviainen, and J. Matas, "Feature-based affine-invariant localization of faces," IEEE Trans. on PAMI, vol. 27, no. 9, pp. 1490–1495, 2005

[18] T. Serre, L. Wolf, S. Bileschi, M. Riesenhuber, and T. Poggio, "Object recognition with cortex-like mechanisms," IEEE Trans. on PAMI vol. 29, no. 3, 2007.

[19] J.-K. Kamarainen, V. Kyrki, and H. K ¨ alvi¨ ainen, "Invariance properties of Gabor filter based features - overview and applications," IEEE Trans. on Image Processing, vol. 15, no. 5, pp. 1088–1099, 2006.

[20] H. Hwang and R. A. Hadded, "Adaptive median filter: New algorithms and results," IEEE Trans. Image Process., vol. 4, no. 4, pp.499–502, Apr.1995.

[21] S. Zhang and M.A. Karim, "Anew impulse detector for switching Median filters", IEEE signal process.Lett, vol.9, no.11, pp. 360-363, Nov.2002.

[22] P. E. Ng and K. K. Ma, "A switching median filter with boundary discriminative noise detection for extremely corrupted images," IEEE Trans. Image Process., vol. 15, no. 6, pp. 1506–1516, Jun.2006.

[22] KS. Srinivasan, D. Ebenezer, "A New Fast and Efficient DecisionBased Algorithm for Removal of High-Density Impulse Noises," IEEE Signal Processing Papers, Vol. 14, No. 3, pp. 189-192, March 2007.

[23] R.H. Chan, Chung-Wa Ho, M. Nikolova, "Salt and Pepper Noise Removal by Median Type Noise Detectors and Detail –Preserving Regularization," IEEE Transactions on Image Processing, Vol. 14, No.10, pp. 1479-1485, October 2005.

[24] T. S. Huang, G. J. Yang, and G. Y. Tang, "Fast two-dimensional median filteringalgorithm,"IEEE Trans. Acoustics, Speech, Signal Process., Vol. ASSP-1, No. 1,pp. 13–18, Jan. 1979.

[25] C. A. Pomalaza-Racz and C. D.Macgillem, "An adaptive non linear edge preserving filter," IEEE Trans. Acoustics, Speech, Signal Process., Vol. ASSP-32, pp.571–576, Jun. 1984.

[26] T. Sun and Y. Neuvo, "Detail-preserving median based filters in image processing," Pattern Recognition. Lett., vol. 15, pp. 341–347, 1994

[27] H. Hwang and R. A. Haddad, "Adaptive median filters: New algorithms and results," IEEE Trans. Image Process., Vol. 4, No. 4, pp. 499–502, Apr. 1995.

[28] S. Zhang and M. A. Karim, "A new impulse detector for switching median filters," IEEE Signal Process. Lett,.Vol. 9, No. 11, pp. 360–363, Nov. 2002.

[29] H.-L. Eng and K.-K. Ma, "Noise adaptive soft-switching median filter," IEEE Trans. Image Process., vol. 10, no. 2, pp. 242–251, Feb. 2001.