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An Efficient Image Watermarking Based on Dual Noise and Rotation Attacks

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***Abstract*—** Digital watermarking is used for copyright protection of intellectual properties and hence it is important to protect and recover data from attacks. Existing systems work on and recover the image from single attacks. This paper aims at proposing a technique for retrieval of cover image and watermarked data from dual attacks like rotation and noise attacks. The proposed system takes as input, Color images and then embeds data using alpha blending method. And then try to recover from dual attacks using median filtering and pseudo Zernike moment. In this proposed approach we will be selecting LH band from the 4 sub bands DWT divides the image into and for reducing noise from the image SVD is used. Proposed approach is giving better results in terms of PSNR and MSE as compared to other existing systems using QWT.

Keywords—Digital Image Watermarking, Noise Attacks, Rotational Attacks, QWT, DCT, DWT, SVD, Pseudo Zernike Moment, Alpha Blending.

I. INTRODUCTION

In today's time more and more information is shared electronically and contains digital images, audio, videos and this trend is increasing gradually and will increase more and more in future. To avoid false sharing or theft of data watermarking on image have been more than necessary now.

Watermarking helps in identifying files copyright information by inserting pattern of bits into the image. Watermark can be of two types:

1) Visible watermark:

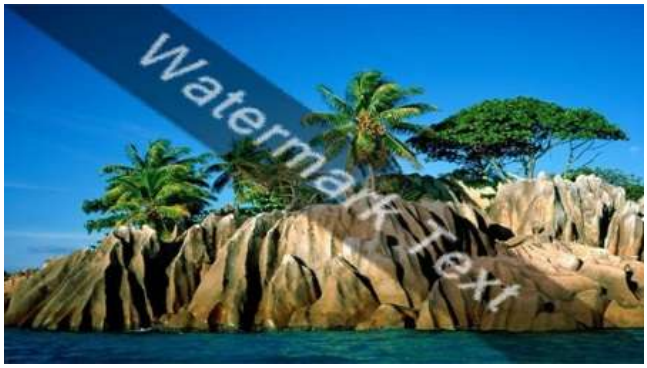

Figure 1.1: Visible Watermark

Which means watermark is visible to naked eyes. They are printed watermarks on the image.

2) Invisible Watermark:

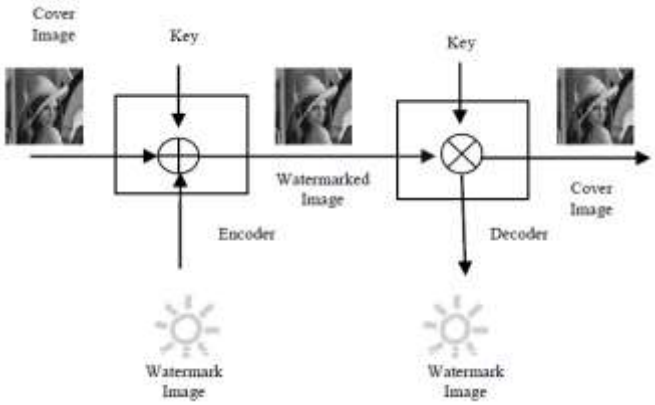

Figure 1.2: Invisible Watermark

Which means watermark cannot be seen directly to human eyes. These types of images have to go through mechanisms to extract the watermark or even to know if watermark exists or not.

The fundamental reason for advanced watermarking is to give copyright insurance to intellectual properties which are in digital form. A computerized watermark must be sufficiently robust to survive the changes made to the file it's embedded in or attempts to damage or remove the embedded data. These attempts of damaging the watermark are called as attacks. Watermarking attacks are classified into main four categories. Where, we will be working on Rotation attacks and noise attacks. Rotation attacks changes angles of images and noise attacks try to distort cover images by adding noise to cover image.

II. Related Work

In paper [1] authors have proposed a technique for robust and blind watermarking for RGB images in combined transform domain. Also they have used dual methods for encryption to increase security of watermark. In this method they separated host image into 3 components RGB. And after that, watermark was embedded into all three of them. As a result of experiment this method provides high security and robustness even after different attacks are performed on host image. Main goal of this scheme is to make a system which is highly resistant to all signal processing and geometric attacks.

In paper [2] teng zi, qui xiufeng and liu jianwei proposed a scheme which is based on DRT (discrete ridgelet transform) and DWT. This combination of both schemes can resist attacks like noise, JPEG compression, cropping. In this scheme they embedded dual copy of watermark into different domains so that performance can be enhanced. Main aim of copying one watermark into more domains that after attacks on image if any one of the watermarks survives they can extract the watermark which exists in image. In spite of improving robustness of system they have added some special characters which are in various colors, because these are more durable when under attack.

In paper [3] omar abodena, mary agoyi, erbug celebi proposed a novel plan for non-blind watermarking of pictures utilizing DWT, discrete time Fourier transform, and SVD. After decomposing host image into frequency bands using level 1 DWT, sub band having higher frequency receives DTFT application which is followed by SVD, and then watermark is embedded into singular matrix of cover image. Then inverse DWT, DTFT and SVD are applied

so that final watermark image we can get. This scheme provides robustness and high indistinct in opposition to various signal processing attacks as well as noise, histogram equalization, salt and pepper noise attacks.

In paper [4] liu tian have proposed zero- watermarking algorithm aim towards copyright protection of conceptual properties without causing distinguishable bending. And also shows strong robustness against strong geometric attacks and signal processing like noise and filtering. In this paper NMF with sparseness constraints on parts is proposed. Coefficient matrix is obtained in this method which helps in robustness against attacks. This proposed approach shows that combined with the geometric invariance of coefficient matrix, it is acquired by performing NMFSCP on video is utilized and robust zero watermarking is produced.

In paper [5] authors proposed another calculation for various advanced watermarking is suggested that depends on the mix of lifting wavelet transformation and DCT and after that Arnold transformation for encryption intention is utilized. The reason of embedding multiple watermarking is to prevent identity theft and illegal usage. Results shows that proposed approach is brisk and efficient also provides effective results than other wavelet transforms. Combine approach LWT, DCT and Arnold map is giving more security for watermark and there will be no degradation in quality of image, higher PSNR but this may imply higher payload of data.

III. DIFFERENT METHODS

A. QUATERNION WAVELET TRANSFORM[8]:

The quaternion wavelet transform is another multi scale examination apparatus. Quaternion wavelet transforms (QWT) joins discrete wavelet transform (DWT) and quaternion Fourier transforms (QFT). Quaternion wavelet transform (QWT) is another multi goals investigation device for depicting geometric qualities of the picture. Quaternion esteem is made out of one greatness and three point stages. Quaternion wavelet transform (QWT) breaks down uproarious picture into sub-groups. QWT conquers the disadvantages of wavelet transforms by move variation highlights. QWT has just been effectively connected in the field of picture processing, for example, picture denoising, image fusion, object recognition, digital watermarking, etc.

B. THE DISCRETE WAVELET TRANSFORMATION(DWT)[20]:

DWT is technique extensively used in digital signal processing, image compression, image watermarking and so on. Discrete Wavelet Transform is a standout amongst the most imperative strategies in transforming a spatial domain picture into frequency domain picture. Wavelet transform breaks down the picture into three spatial directions, for example horizontal, vertical and diagonal. They offer a simultaneous localization in both time & Frequency Domain, higher compression ratio, Multi resolution analysis which is relevant to human perception. DWT divides image into 4 bands of pixels LL, HL, LH, and HH respectively. LL band consist of lowest value component and hence cannot be used when more bits to be embedded into the image. In proposed system we are using LH band, because LH band consist of luminance bit of the image and is less likely to be damages when attacked. But highest resolutions can be compromised when attacked.

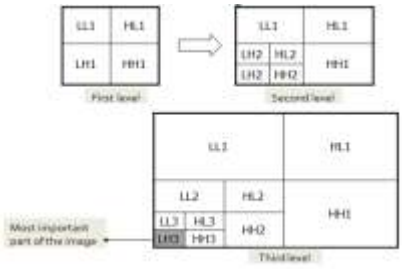

Figure 2.1: DWT

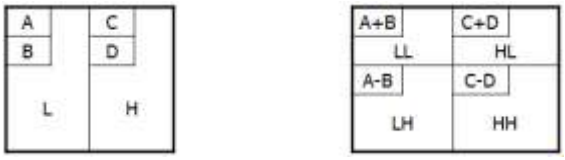

Figure 2.2: DWT HAAR transform

C. THE DISCRET COSINE TRANSFORMATION (DCT)[5]:

DCT speaks to information regarding frequency space as opposed to an amplitude space. It transforms a signal from spatial domain to frequency domain. Watermarking procedures which depend on DCT are increasingly strong contrasted with spatial domain methods. These calculations are strong against computerized image processing tasks like low pass filtering, brightness and contrast adjustment. We will be embedding data into middle frequency

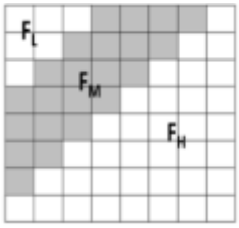

Figure 2.3: DCT

D. SINGULAR VALUE DECOMPOSITION (SVD)[20]:

SVD is numerical examination tool which is used to analyse metrics. It is a method for transforming correlated variables into a set of uncorrelated variables. This is a method to identify measurements alongside information focuses show the most variety. SDV can be viewed as a strategy for reduction of data. In this transformation, a matrix can be rotted into 3 frameworks that are having indistinguishable size from the first matrix. It is helpful to build up a stand out from Gaussian elimination and its equation. Singular value decomposition increases accuracy and decreases memory requirement. A simple application of SVD is noise reduction.

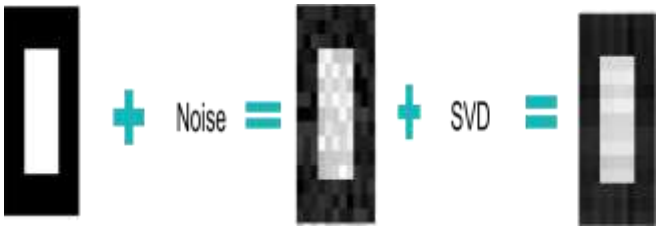

Figure 2.4: SVD

E. PESUDO ZERNIKE MOMENT[6]:

The meaning of pseudo-Zernike moments has a type of projection of the image power function onto the pseudo-Zernike polynomials, and they are characterized utilizing a polar organize portrayal of the image space. Consequently, they are generally utilized in acknowledgment assignments requiring turn invariance. Be that as it may, this facilitate portrayal does not actually yield a scale invariant function since it is hard to extricate a typical scale factor from the outspread polynomials. Therefore, vision applications by and large hotel to image standardization strategy or utilizing a mix of scale invariants of geometric or outspread moments to accomplish the comparing invariants of pseudo-Zernike moments. Pseudo Zernike moments are robust to noise and rotational

invariant. The Zernike and Pseudo-Zernike moments have been used as a feature extractor for image analysis in various applications. The use of these moments for the recognition is due to their rotation invariance.

F. MEDIAN FILTERING[18]:

Median filter is a nonlinear advanced filtering system, regularly used to remove noise from an image. Such commotion decrease is a commonplace pre-handling venture to enhance the consequences of later preparing. Median filtering is a broadly utilized in computerized picture preparing in light of the fact that under specific conditions it jelly edges while expelling noise.

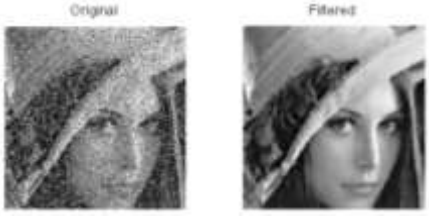

Figure 2.5: Median filtering

G. ALPHA BLENDING[14]:

Alpha blending method is utilized to approximate illumination calculations through transparent or translucent objects. Alpha blending is utilized to embed the watermark in the host picture. In this method the decayed segments of the host picture and the watermark are duplicated by a scaling factor and are included. Formula for blending the alpha in cover image goes by,

W= C+ (ALPHA * DATA)

Where,

W= Watermarked Image

C= Cover Image

Alpha= Value between 0-1

Data = Secret Data

IV. PROPOSED SYSTEM

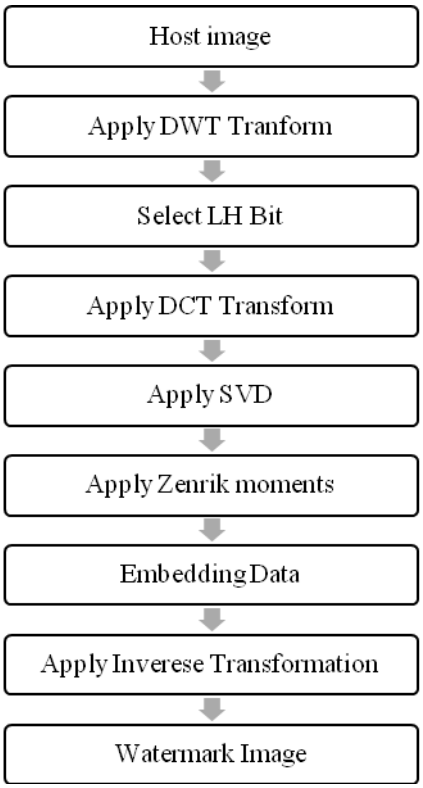

Figure 4.1: proposed system

Embedding Algorithm:
Step 1: In the first step we will input one image as host image for process next step.
Step 2: Now Extract we will apply 2-DWT transform
Step 3: Extract LH-bit from DWT transform.
Step 4: Now apply DCT transform on LH-bit.
Step 5: After that, Pseudo Zernike moments are applied to extract the features watermark image.
Step 6: Now by using alpha Belding method we will embed the data into 4x4 SVD blocks after applying inverse DCT and DWT transformation lastly.
Step 7: So finally we get the watermark image.
Step 8: When we send this image on network rotation and noise attacks are applied.

Extraction Algorithm
Step 1: Select the distorted image
Step 2: To calculate ensured Pseudo Zernike moms utilization
X=total (Y), Direction (A) = tan-1(img(A), rel(A)); PHI=direction (A)*180/π
Step 3: Apply 2-DWT Transform on recovered image.
Step 4: Now on LH band will be selected for next step.
Step 5: On LH-bit DCT transform is applied.

Step 6: DCT applied LH-bit is calculated SVD matrix
Step 7: From that extract S matrix and retrieve the bits using mod operation.
Step 7: Now we have Recovered data image. So, will calculate PSNR and MSE.

V. RESULTS AND ANALYSIS

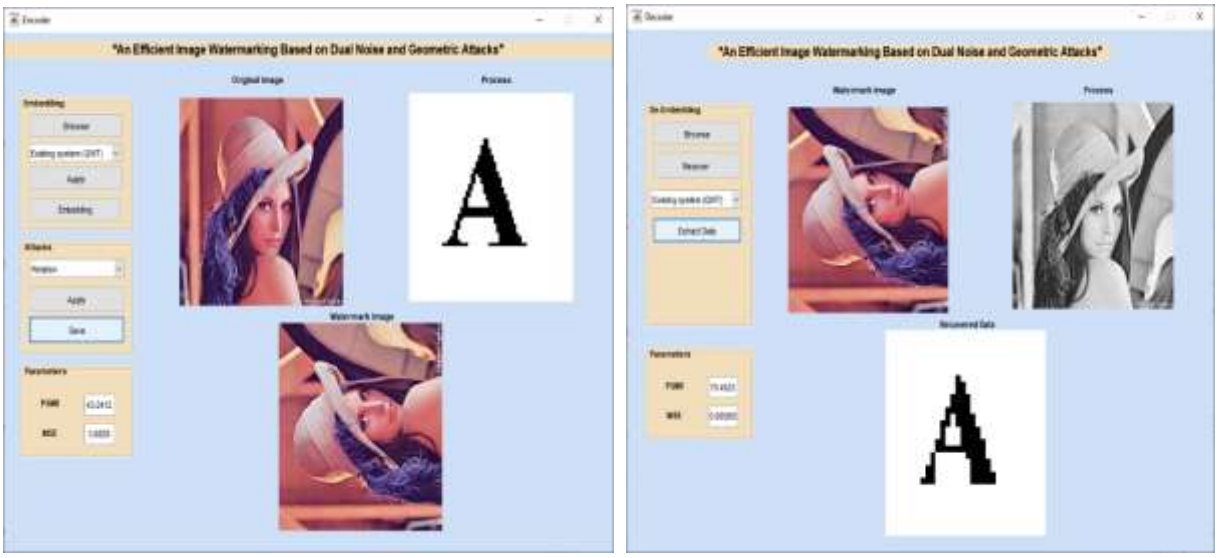

Figure 5.1: QWT with Rotation Attacks

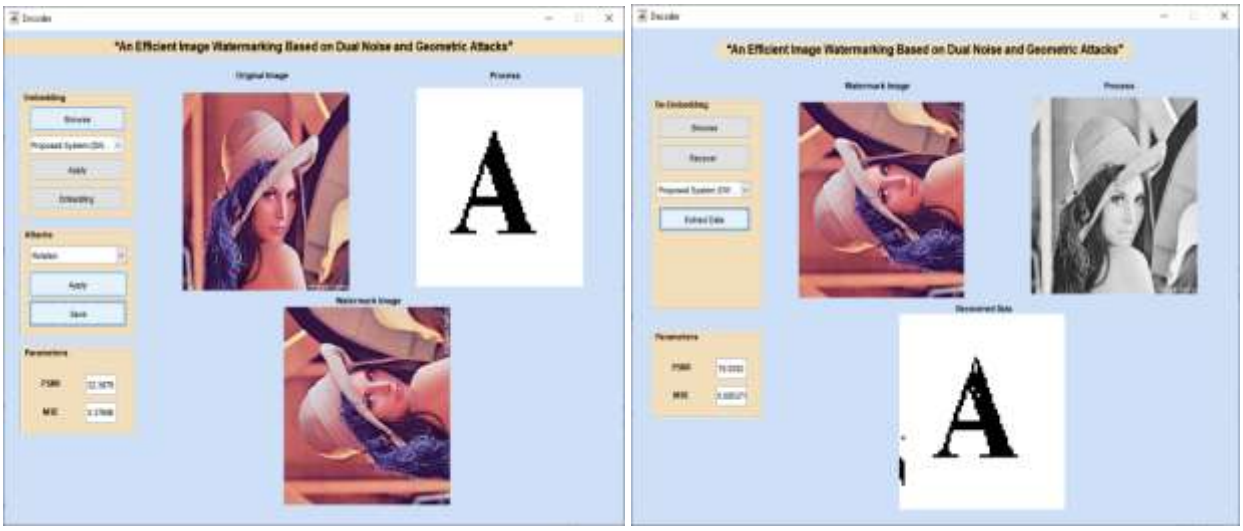

Figure 5.2: DWT+DCT+SVT with Rotation Attacks

Table 5.1 Cover Image Analysis

Attack	QWT_PSNR	QWT_MSE	Proposed_PSNR	Proposed_MSE
0° Rotation	43.21	3.08	52.36	0.37
45° Rotation	43.24	3.08	52.36	0.37
90° Rotation	43.24	3.08	52.36	0.37
135° Rotation	43.24	3.08	52.36	0.37
180 ° Rotation	43.24	3.08	54.60	0.22
Salt-Papper Noise	43.24	3.08	54.60	0.22

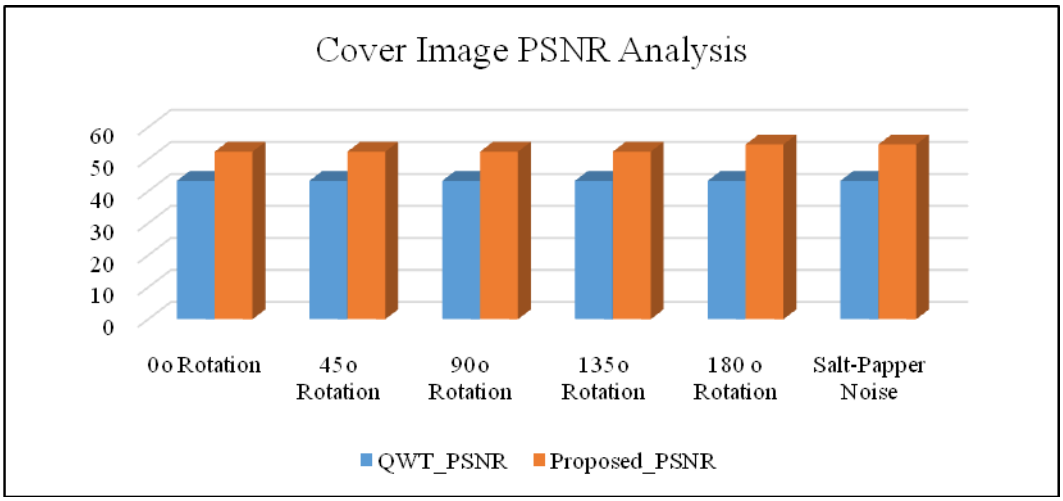

Figure 5.3: Cover Image PSNR Analysis

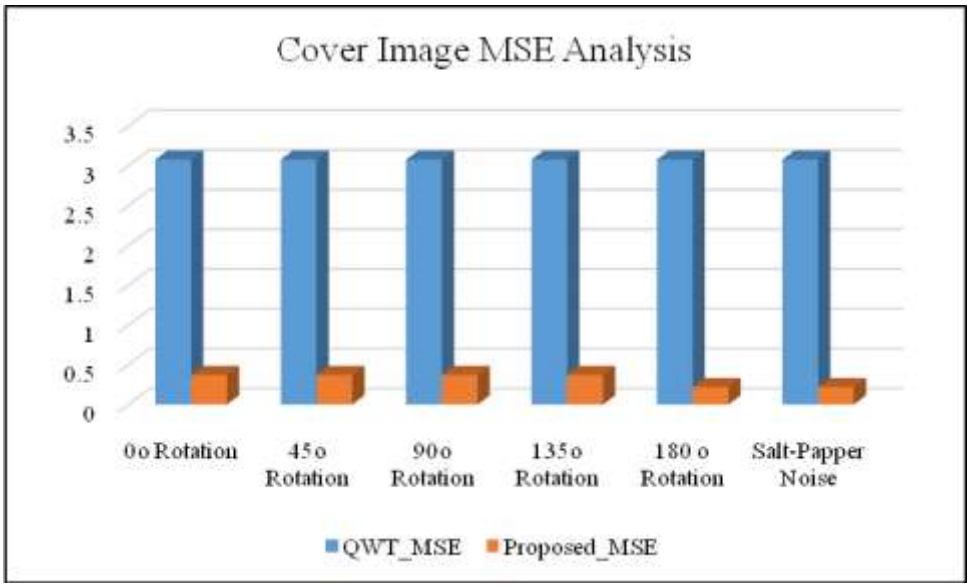

Figure 5.4: Cover Image MSE Analysis

Table 5.2 Watermark Data Image Analysis

Attack	QWT_PSNR	QWT_MSE	Proposed_PSNR	Proposed_MSE
0^o Rotation	70.45	0.0058	71.032	0.005
45^o Rotation	60.24	0.06	61.82	0.042
90^o Rotation	70.45	0.005	70.83	0.005
135^o Rotation	57.66	0.111	60.27	0.006
180^o Rotation	54.55	0.208	61.37	0.047
Salt-Papper Noise	54.54	0.22	62.32	0.038

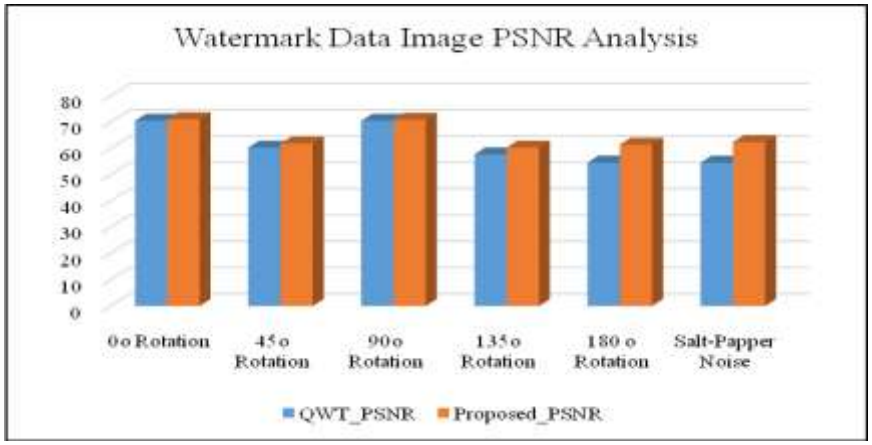

Figure 5.5: Watermark Data Image PSNR Analysis

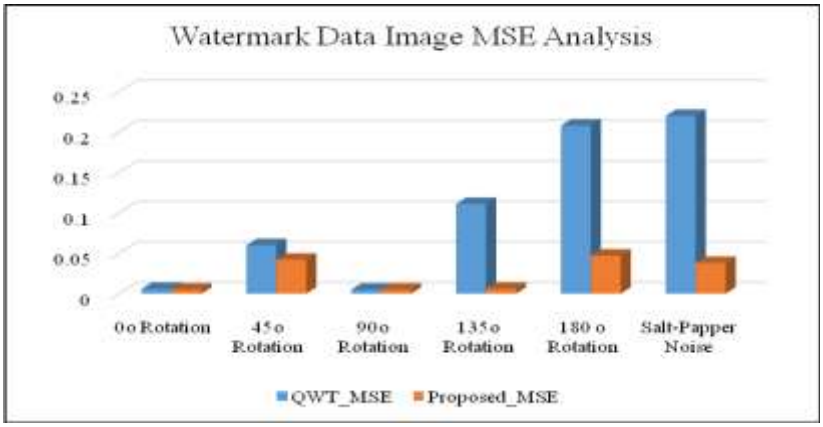

Figure 5.6: Watermark Data Image PSNR Analysis

VI. CONCLUSION

The paper studies different approaches, algorithms and attacks and gaining robustness against various attacks. The author's used the dual approach of "Block DWT-SVD-DCT" as well as "Modified Zernike Moment" for Recovery of Attacks which increases system privacy for recovered Image. The proposed system will provide efficient and Privacy Preserving Communication in the Traditional Systems. So in future the implementation of this system prevents from dual attacks.

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