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# Image Steganography in QR Codes Using Secure Techniques with Two-Level Discrete Wavelet Transform and DES Encryption

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***Abstract*—**Steganography was the art & science of writing secret messages(SM) in a way which no one else is, separately from sender and the intended recipient, it knows there is hidden message. Propose Algorithm are hybrid S system that relies on Discrete Wavelet Transform (DWT) and Quick Response (QR-code) .This method involves decoding encoding operations in case of domain. Text message are hidden in QR code image where the QR code image are hidden in DWT. It method has been well performed & additional security is provided to information. This paper focuses the concept of an image stenographic approach capable of embedding encrypted secret messages using the Quick Response Code (QRC) code for the image data The 2-level DWT domain & LSB is used to embed QR code while embedding method is protected by the DES Algorithm. In addition, the standard features of QRC have been overcome by encryption (E), making the technique more secure. The goal of such a paper is to develop the image S approach with a high level of security & high level of non-perceptibility. The relationship among security & method capacity was strengthened special encoding of the QRC prior to the embedding method. The effectiveness of A proposed approach are evaluated by (PSNR) Peak Signal-to-Noise Ratio & Mean Square Error (MSE) & results achieved were compared with other S tools. It work has been compared to other methods. A proposed method has achieved a high level of safety & more imperceptibility.

**Keywords—Image steganography,*DES, LSB, MSB, QRC 2level DWT.***

## I. INTRODUCTION

A advent of Internet technology, a need to hide information, has expanded. People around the Net would like to send & receive private information. This confidential information must also be secured against unauthorized attacks is a way of covering private information below the wrap. The cover can be a picture, audio & photo. Private information within the QRC is entered in the sent to the recipient and cover image. At the end of receiver, the decoding (Dc) Algorithm was used to retrieve Privacy details Steganography from a cover image. That QRC would insert data for both horizontal and vertical directions so the information could be encoded (E). QRC is used for the correction of high error capability. The correction of the QRC error is based on the Reed-Salomon Manual.QRC is easy to set up or enforce. QRC can store a large amount of information and it can be read in any way. Various methods have been suggested for the integration of private information in to the cover image. [1]

Thousands of software can read & encode messages into digital records. E messages clearly able to be seen, no matter how powerful we can give rise to suspicion, which can in themselves be incriminating in countries where E are unlawful. We're focused on the methodology of the frequency domain. DWT also provided significant attention in various applications for signal processing or including the Watermarking Image. A main idea of DWT was the outcome of a multi-resolution analysis It includes the decay for an image in constant frequency bandwidth channels on a logarithmic level. With a number of useful tools for statistics & signal processing QRC are trademark for the kind of matrix barcode QRC is a focus of marketing strategy, easy access to the brand's website & quick delivery. Common approaches include processing of URLs, various forms &addresses of poster information posters, business cards, cars, public transport, etc. The approach has a wide range for possible applications. [2]

Steganography was the art & science of hiding the presence of touch, i.e. hiding a secret message in other media, audio, such as video images, text, etc. This is described like process of Write messages in the way nobody but the sender & recipient knows continuation of a secret message. The article shows how the QRC (commonly known as the QRC) was used in the Cryptography(C) field. QRC is mainly used for conveying and storing messages as they have a higher & larger storage capacity than any standard barcode. This paper describes how the QRC is used for photo steganography. While QRC has a fast response time and a large storage capacity, QRC can be used to send encrypted (E) data (messages) to a recipient. The DWT Algorithm block is used for additional security by applying DES cryptography to the QRC until it is embedding in the cover image. [3]

This paper uses QRC& S that provide security for important information.


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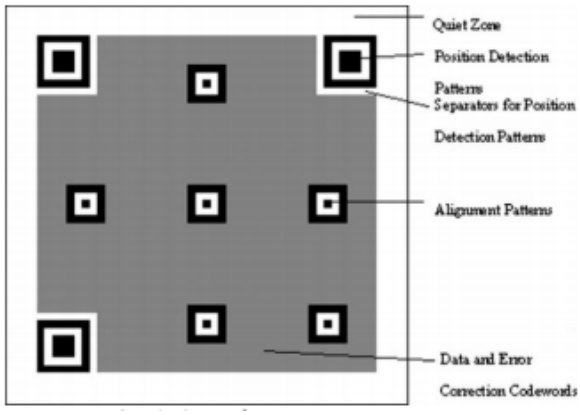
### 1.1 QRC *(Quick Response Code)*

QRC is a 2D matrix. This requires large volume of specific information to be stored. The bar codes are a 1D vector. As a result, QRC had more storage capacity compared to bar codes. QRC can carry 7,089 numerical letters and up to 4,296 alphanumeric letters info. The following picture. Shows a QR code structure.




### 1.2 Steganography

S is embedding method used conceal information of image & text. The modern meaning of words also applies to details or files that are contained in digital image or video & audio file. In reality, S manipulates human opinion; Human perceptions have not been trained to look at the files of knowledge hidden within them. Usually, in S, specific information was not stored in the actual format & converted to an alternative corresponding transmission file, such as video & audio, image. It's hidden successively among objects. This obvious message (recognized to cover text in the usual terms) will be sent to the recipient through network, wherever actual message are separated from the recipients can be used to information of privacy confidentiality [4]

## II. LITERATURE REVIEW

Abhijeet Mendhe, et al. (2018) Several C methods is essential for the purposes of web server & local information security. Nonetheless, there is always a need for more protection that, due to known security attacks & mathematical complexity, could not be fulfilled by such C Algorithm alone. Visualizing a strategic S strategies & combination of The QRC is commonly utilized due to its advantageous features. It includes readability, error correction capabilities, robustness, large data capacity than conventional barcodes, etc. As a result, it project proposes 3-layer structure to protect the mechanism for sharing messages use a single-layer QRC picture. The architecture uses S & cryptography techniques for empirical & strategic use. The proposed system provides for a high level of security on a basis of quantitative and qualitative results our approach is to be evaluated against the performance evaluation criteria set out in the paper [5]

Ryan A. Subong, et al. (2018) This paper proposes an image steganographic where in the bit data of the SM swap the LSBs of the RGB bytes of the CI simply like a considerable lot of the LSB S of image strategies, then again, actually the bits of the SM experience a progression of assessed and scored bit revolution and reversal activities earlier substitution. Utilizing MSE and PSNR as a proportion of picture quality, the SI created by this proposed methodology delivered lesser bending than the current four bits for each byte substitution approach of LSB alternate and Adaptive LSB Embedding Algorithms. The proposed methodology anyway doesn't present critical enhancement of heartiness regarding security. [6]

Muhammad ArslanUsman1, et al. (2018) this article proposes another approach to picture stenography for the verification of therapeutic information. Swapped (HTC) Huffman tree coding Used to add lossless compression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(LC)& complex E The payload before introduction CI. Moreover, simply edge locale of the CI is used to introduce protected data that provides high impalpability. Consequences show that a proposed plan guarantees a security and privacy of patient data thus maintaining imperceptibility.[7]

Shivam Bansal et.al. [2018] this article proposes another approach to picture S for the verification of therapeutic information. Swap(HTC) Huffman tree coding use to add lossless compression (LC) & complex E The payload before introduction CI. Moreover, simply edge locale of the CI is used to introduce protected data that provides high impalpability. Consequences show that proposed plan guarantees security & privacy of patient data thus maintaining imperceptibility [8]

D Jude Hemanth, et al. (2017) —Transform derived picture S approaches is commonly used for safety applications. Nevertheless, use of other existing transformations in picture S continues unexplored. This paper describes a bit plane dependent S approach utilizing special transformations. In this function, a bit-plane of transform coefficients are chosen by encode secret message. A characteristics of the 4 transformations for use in S are evaluated and the effects of a four transformations contrasted. It was shown in the findings result. [9]

V.Hajduk,(2016)This there is picture S approach that is capable of embed encoded mystery message the use of QR code into photograph data. The DWT area is hired to embed a QRC, at the same time as embedding approach is in addition secured by means of the usage of AES cipher Algorithmic law. In moreover, common traits of QRC were damaged by the E, and then it creates the technique extra comfy. The relation among protection and functionality of the approach became improved through particular density of QRC earlier than the embedding approach. [10].

**Problem Formulation:-**

The previous work of RSA is Algorithm which uses modern computers to encrypt messages & decode .If that's the asymmetric C Algorithm. In comparison of base and propose, two Algorithm are used for different propose RSA is really helpful for key exchange but it is slow to use. AES is really fast, but suffers from the security risk if key exchange.

## III. USING TECHNIQUES ARE LSBAND QR CODE STEGANOGRAPHY

### (A).QR Code :-

The cause why they're more effective than a standard bar code is they can keep a lot more statistics, including URL hyperlinks, geo coordinates, and textual content. The other capabilities of QRC is in place of requiring a corpulent handheld scanner to experiment them, many cutting-edge mobile smart phone scan them.

### *(B). Discrete wavelet transforms (DWT):*

DWT is image Transformation & frequency domain technique used to separate data from some digital media in a sub signal use to display pixel value and a complete sub signal horizontal & diagonal data, use to display vertical. For each of these techniques (DWT & DCT), a encoding machine & the compression interpreting device are allowed to transfer the specific image to a compressed photograph. In a the encoding system take original photograph with input and the compressed image for output at the same time as in the interpreting machine take compressed image as output or take unique photograph as input. [11]

### *(C). LSB:-*

It is one of most important procedures in spatial domain stenography picture. LSB is the bottom giant bit at a byte value of image pixel. LSB focused photo stenography embeds name of game in LSB of pixel values of quilt image. It abuses truth that level of exactness in numerous photograph code's is a long way extra than that perceivable with the aid of common human imaginative and prescient. Therefore, An modified image to mild shades It may be indistinguishable from true of human beings, simply by looking at it.[12]

### *(D). most significant bit (MSB):-*


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In computing, the MSB is the most significant bit in a large multibit binary object. Most of the MSB remained. Since binary numbers are frequently used in calculations and other operations, MSB is thought to be especially important in the transmission of binary numbers.
Numeric data, like numeric characters, is in binary format; The leftmost number is considered the best number, and th e rightmost number is considered the lowest number. Because of the notes, the most important one is called the one on the left. In most binary numbers, the value of the segment increases as it contains the MSB. Since it is binary, MSB c an be 1 or 0.

***(E).*DES:-**
The data E standard Algorithm works on 64 bit block of data. It uses 64 bit key. The key is then again converted to 56 bit. The plain text is divided into two equal halves/blocks and key is used for E. Initial permutation is applied on plain text and then each half goes through 16 rounds of E. After E each half is combined and a final cipher text is formed. An E Algorithm that E 56-bit, randomly generated symmetric key data. DES is not a secure E Algorithm, and has been cracked several times. [13]

**F. *JPEG Compression:-***

Data plotting during JPEG density processing affects the visbility of the stenographic image because the plot area is in TD. At first, you start to think that the shortcut for JPEG snapshots is no longer used, but that they use lossy pressure, resulting in correction of the composition of image objects. JPEG images are the product of a virtual printer, camera, or other imaging device. Why is ambiguity hidden better in JPEG images? [14]

## IV. PROPOSED METHODOLOGY

### 3.1Problem statement:-

There are some problems with DWT as follows, Depending on number of decomposition levels. Computational complexity and time (especially for wavelet tree or several decomposition).Suitable mother wavelet (according to your application).Choosing suitable detail or approximation sub bands.

### 3.2 Propose Work:-

For 2D applications, they first conduct the DWT in vertical direction for each degree of decomposition; it was accompanied by DWT in horizontal direction. After first decay level there will be 4 sub-bands: LL1, LH1, HL1, and HH1. The LL sub bands of the previous level are used as input of each subsequent decay level. In order to conduct second-level decay, DWT is added to LL1 In order to conduct third-level decay; DWT has been added to a LL2 band that decomposes the band through four sub-bands – LL3, LH3, HL3, and HH3. The result is a total of ten sub bands per element. LH1, HL1, HH1 include the high frequency bands in the picture tile so LL3 comprises the approximate image and the low frequency band.

The DWT provides Frequency Domain Data & Simultaneous Spatial Image. DWT Operation, A picture could be evaluated by a combination of analysis & decimation of the bank filter. The research bank filter contains of pairs for low & high-pass filters to all decay rates. The A low pass filter extracts estimated image data because high pass filter extracts specifics like edges. 2D transformation is the result of 2 separate 1D transformations. With 1D DWT, approximate correlations provide low frequency data because exact correlations contain information of high frequency. 2D DWT software decomposes a input image through 4 separate low frequency sub band modules in vertical (cA) & horizontal directions. Low frequency component in low frequency horizontal and high frequency horizontal, high-frequency vertical direction (cV) components; high-frequency components & Vertical direction (cH) in horizontal direction & vertical direction (cD). CA, cV, cH & cD could also be described by LL, LH, HL & HH. Representing a 1-level picture of DWT in its sub-band.


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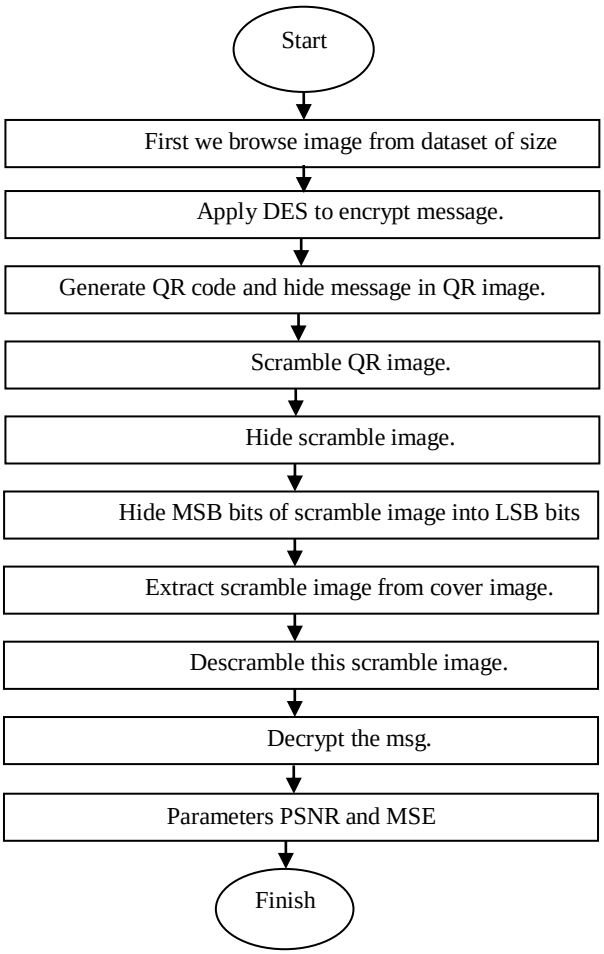


**Fig 1: Flow chart of propose work**

## Proposed Algorithm

1. First we browse image from dataset of size 256*256.
2. Apply DES to encrypt message.
3. Generate QR code and hide message in QR image.
4. Scramble QR image.
5. Hide scramble image.
6. Hide the MSB bits of the scramble image to the LSB bits of the cover image using the 2-level DWT.
7. Extract scramble image from cover image using 2 level DWT.
8. Descramble this scramble image.
9. Decrypt the msg.
10. Calculate parameter PSNR and MSE.
11. Exit


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## V. RESULT ANALYSIS

The proposed scheme will be applied on Matlab platform using standard LSB using cover image and MSB using secret message. Algorithm and using JPEG compression. Matlab is an excessive largely presentation language for specialized PC, incorporates calculation, representation &programming in a smooth to utilize environment. The pursuits for choosing to estimate the overall performance of proposed procedure, they enforced proposed approach with the aid of the usage of Matlab R2013b. MATLAB is to suit flawlessly in the requirements of a photograph processing studies because of the inherent traits and helpful in solving matrix & vector formulation issues.

4.1 Imperceptibility

The most important criteria which must be met by any data embedding Algorithm is imperceptibility. [9] It is evaluate PSNR. High value for PSNR indicates high degree of imperceptibility.

**Peak Signal to Noise Ratio (PSNR)**

Their decibel PSNR are determined among cover image & secret message this ratio will be used as a performance measure among original and the hidden message .The higher the PSNR, the less difference between cover image & secret message.

$$PSNR = 20log_{10}\left(\frac{MAX_f}{\sqrt{MSE}}\right)$$

MAXf is the maximum signal value that exists in the cover image. The PSNR and MSE are calculated for the proposed Algorithm after hiding the QRC generated with secret messages of different sizes in the same image.

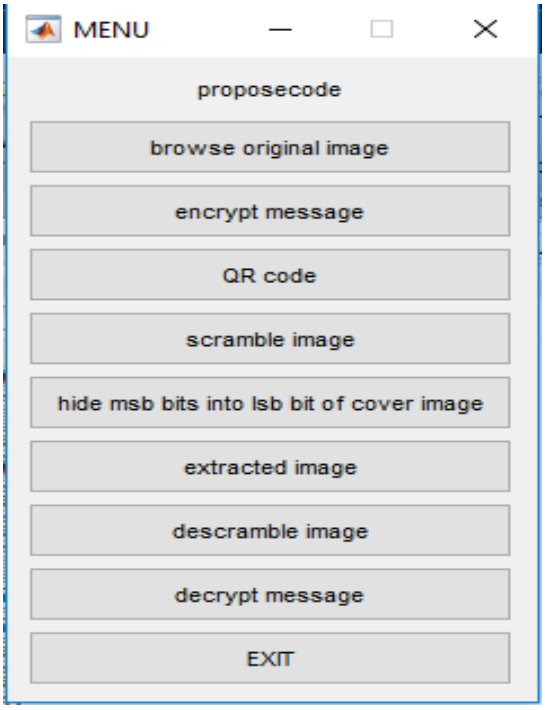


**Fig.2.First run the code we obtain the menu bar.**


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**Fig.3.First we browse image from dataset.**

1. Encrypt message.

```
Enter the message: rajkumar
Cipher Text of the entered Message:
   249    28   166    23   213   139    28   24
```

**Fig.4 Generate QR code.**

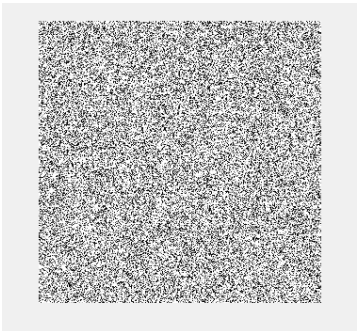

**Fig.5. Scramble QR image.**

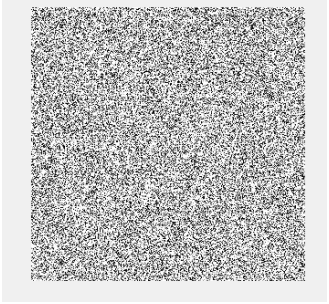

**Fig.6.Embedding scramble image into cover image**

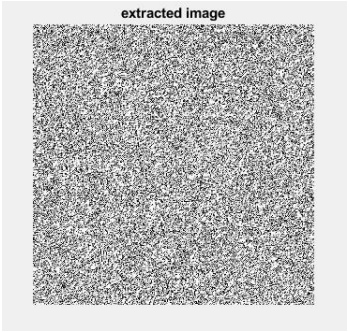


**Fig.7. Extract scramble image from cover image.**


**Fig.8. Descramble this scramble image.**

2. Decrypt the msg.

```
Decrypted Message is: rajkumar
```


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**Table.1. Comparison table on Base PSNR & Propose PSNR**

| Image name | Base PSNR | Propose PSNR |
|---|---|---|
| **Cameraman** | 75.9247 | 88.8333 |
| **Lena** | 74.2938 | 85.9304 |

**Table.2. Comparison Table on Base MSE& Propose MSE**

| Image name | Base MSE | Propose MSE |
|---|---|---|
| **Cameraman** | 0.8574 | 0.7384 |
| **Lena** | 0.7483 | 0.6875 |

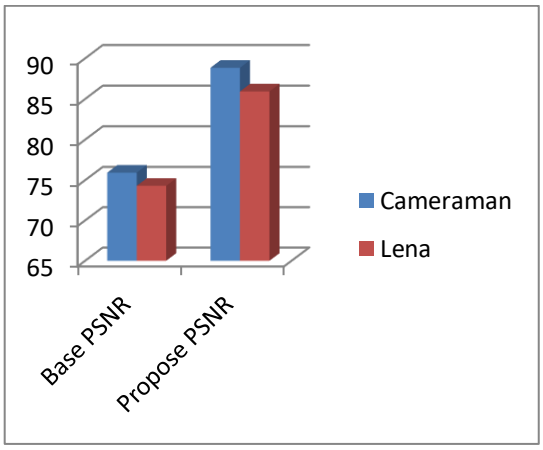


Fig.9 Comparison Graph on Base PSNR & Propose PSNR

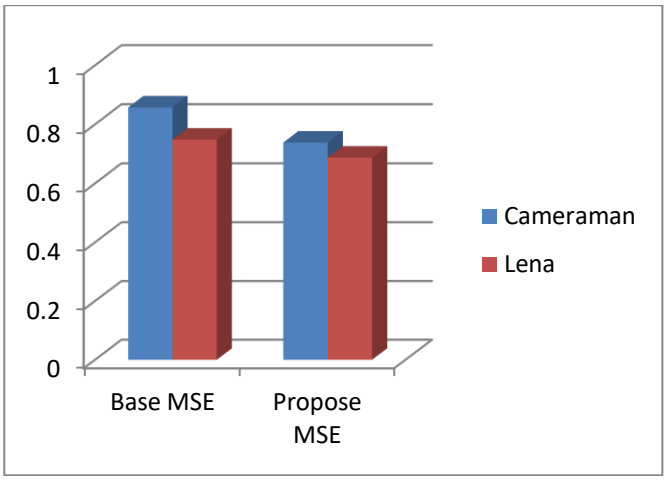


Fig. 10.Comparison Graph on Base PSNR and Propose PSNR

From results of the graph, they could say that proposed method works better than previous methodology. PSNR value of a proposal is 88.8333, that is greater than the PSNR value of the Base technique.

## VI CONCLUSION AND FUTURE WORK

This paper, we suggested image S using 2-DWT & DES, LSBQRC. Improvement of protection has been accomplished by ciphering a QRC DES. A benefit of a technique was the compression of a size of module in QR code until embedding method. A purpose of our study is to evaluate the approach with another stenographic picture in terms of Embedded Secret Message Imperceptibility or capacity for embedding. Results show that the PSNR of the proposed technique has reached higher values through comparing these approaches with very similar capacities.

Due to the rich selection and ability to protect against wide use of the Internet, malware developers sho uld target the largest volume in the S community. Ultimately, Destiny Map will enable deeper analysis to detect signatures of malware, obfuscators, and maskers. The research can be extended by examining Smethods for othe r means of audio and video recording. When the Special S tool is used, the highest performing data to be hidden i n the image must be determined and modeled. Experimental analysis shows that the proposed S is very good at c overing the size of the image, thus keeping PSNR high and MSE low.

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