

Information Security by Embedding Of QR Code into Color Image

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Abstract: — nowadays, the information processing system plays crucial part in the internet. Online information security has become the top priority in all sectors. The use of 2D Barcode or QR code with a digital watermark usage is interesting research work in the field of security. The semi visible watermarking of QR code with color image can prevent information from being disclose that is encoded in the form of QR code image. This paper proposes embedding of QR code into color image using Discrete-Wavelet-Transform (DWT) watermarking technique. This technique includes encoding and decoding operation in frequency domain. The text message is hidden in the QR-code image. The QR code image is hidden into the Discrete Wavelet Transform. This technique performed well and additional security given to the information. The DWT uses Haar Wavelet Transform method hierarchically decompose a QR Code as well as the color image into a series of successively lower frequency Approximation sub band and their associated detail sub bands.

Keywords: DWT, QR code, information, security

I. INTRODUCTION

High QR code (abbreviated from Quick Response Code) is a type of 2-dimensional bar code developed by DensoWave. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR ("Quick response") code is a machine-readable code consisting of an array of black and white used for data for reading by the camera on a reader. Its 2-dimensional barcode. Data is accessed by capturing a photograph of the code using a camera and processing the image with a QR reader.

A QR code uses four standardized encoding modes (numeric, alphanumeric, byte / binary, and kanji) to efficiently store data. QR code can store. The maximum capacity of a QR Code varies according to the content encoded and the error recovery level. The higher the error correction level, the less storage capacity. The maximum capacity is 2,953 bytes, 4,296 alphanumeric characters, and 7,089 numeric digits. QR Code, also known as "Quick Response" code, is a two dimensional matrix barcode that can store over 1800 characters of text information. QR Barcodes contain PDF 417 for its high data capacity, Data Matrix for its high density printing and MAXI Code for its high speed reading as shown in fig 1. QR Codes are capable of handling of data such as numbers, alphanumeric characters, Kanji, Kana, binary and control codes. A QR code can store information such as:

- ❖ Website URL
- ❖ SMS
- ❖ Text message
- ❖ Calendar event
- ❖ Contact Information
- ❖ Phone number
- ❖ Geographic location

In this paper, we focus on frequency domain technique. The DWT has received Considerable attention in various signal processing applications, including image Watermarking. The QR code gets secured by embedding it into color image using DWT watermarking technique.

II. DETAILS EXPERIMENTAL

2.1. Information security

Due to tremendous growth in communication technology, sharing the information through the communication network has never been so convenient. Nowadays information is processed electronically and conveyed through public networks. Such networks are unsecured and hence sensitive information needs to be protected by some means.

Security attacks are classified as passive attacks and active attacks. In passive attacks, attacker monitors network traffic and looks for sensitive information but does

not affect system resources. Passive attacks include traffic analysis, eavesdropping, Release of message contents. In active attack, attacker breaks protection features to gain unauthorized access to steal or modify information. Active attacks include masquerade, replay, modification of messages, and denial of service. Therefore, security threats (such as eavesdropping, data modification, phishing, website leaks etc.) force us to develop new methods to counter them. Considering QR barcodes as effective media of sharing information, many researchers have proposed information/data hiding method as well as online transaction systems using QR barcode.

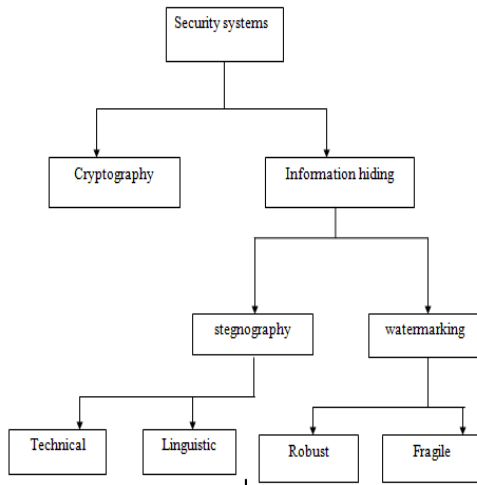


Figure 2.1: Block diagram of security system

2.2. QR code

QR Code is a matrix symbol that consists of an array of nominally square modules arranged in an overall square pattern. QR Code includes unique finder pattern located at three corners of the symbol and intended to assist in easy location of its position, size and inclination. A wide range of sizes of symbol is provided for together with four levels of error correction. Symbol structure of QR Code is as follow.

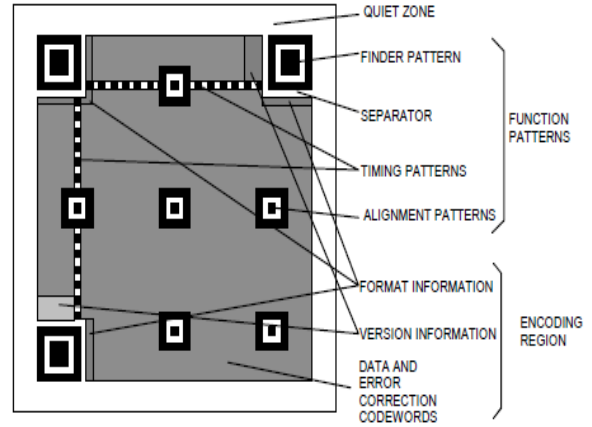


Fig.1 Symbol structure of QR Code

In version 1 measures 21 modules × 21 modules, Version 2 measures 25 modules × 25 modules and so on increasing in steps of 4 modules per side up to Version 40 which measures 177 modules × 177 modules. Four levels of Reed-Solomon error correction (referred to as L, M, Q and H in increasing order of capacity) allowing recovery the codeword's in 7%, 15%, 25% or 30% respectively. QR Barcode is capable of handling hundred times more data than conventional barcode. Conventional barcode has capacity to store maximum 20 digits. While for QR code, up to 7,089 (Numeric), 4,296 (Alphanumeric), 2,953 (Binary/byte), 1,817 (kanji/kana) characters can be encoded in one symbol. QR Barcode stores information in both horizontal and vertical fashion. QR Code is capable of storing the same amount of information in one-tenth the space of a conventional barcode.

2.3. Discrete Wavelet Transform (DWT) based Watermarking

Discrete Wavelet transform (DWT) is a mathematical tool for hierarchically decomposing an image. It is useful for processing of non-stationary signals. The transform is based on small waves, called wavelets, of varying frequency and limited duration. Wavelet transform provides both frequency and spatial description of an image. For watermark embedding Discrete Wavelet Transform (DWT) has used, DWT is a Wavelet Transform which use Dyadic Filters to decompose M×N Image into N-Levels, we can embed watermark into one of the sub band, For Extraction of Watermark Inverse Discrete Wavelet Transform (IDWT) is used. Commonly used frequency-domain transforms include Unlike conventional Fourier transform, temporal information is retained in this transformation process. Wavelets are created by translations and dilations of a fixed function called mother wavelet. This section analyses suitability of DWT for image watermarking and gives Advantages of using DWT as against other transforms.



Fig 2.3.1 Single level decomposition.

III. RESULTS AND DISCUSSION

During the embedding process first we read generate the QR code using zing library file. Further we the color mage and then perform the embedding process using DWT watermarking technique as shown in fig.

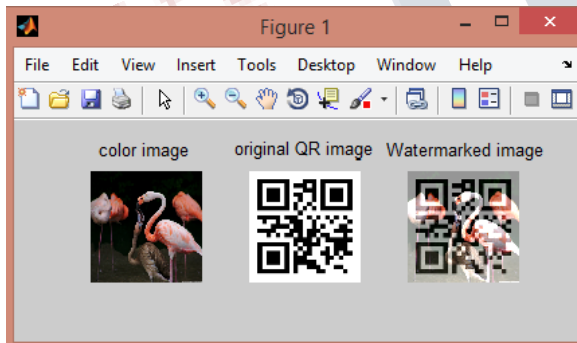


Figure3.1 embedding process

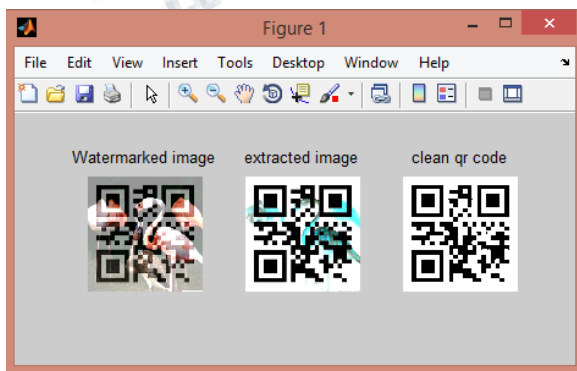


Figure 3.2 extraction process

Table1: The experimental results such as PSNR, MSE and Distortion rate of the images has been has tabulated.

IMAGES	PSNR	MSE	MAX ERR
Fruit.jpg	40.21	0.049	0.2249
mandril.jpg	43.187	0.0232	0.2232
baby_flamingo.jpg	44.3638	0.0225	0.2225
lion.jpg	45.8913	0.0218	0.2218

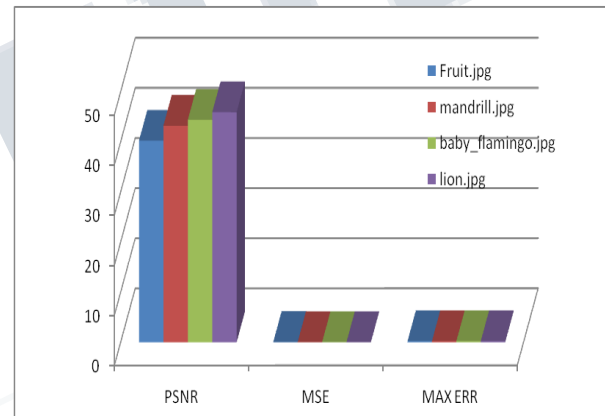


Chart 1.Graphically PSNR, MSE and Distortion rate of Images has been shown.

IV. CONCLUSIONS

In this paper, we have proposed security of data by embedding of QR code image using the DWT watermarking technique. All the Simulations are carried out using differentcolor images of different formats viz. JPEG and BMP using MATLAB. The embedding and extraction operation in the frequency domain is proposed. The text message is hidden in the QR-code image. The QR-code image is hidden into the Discrete Wavelet Transform. This technique performed well and additional security given to the information. Performance analysis of these two transforms is done based on parameters such as PSNR and MSE and maximum distortion.

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