

# 2LQR: A Way to Secure Private Information

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**Abstract :** Now a days, most of peoples are working with smart devices with the digital data for their regular survive in the world. The QR codes are use to store the digital data in form of black and white modules. QR codes are use in many applications related to security, academics, marketing etc. Now, peoples are well aware with this technology and they are use QR codes for various purpose. The QR codes are known at worldwide and getting popularity to use smart phones by the peoples. These are type of optics labels and only read by machines. The human-being can not access the data from QR code without using smart applications for scanning the code. There are static and dynamic QR codes and create by using code generators. The QR codes are gives the link to get information about particular subject. If data is important then user can use QR code to store that data with various other techniques. Hence another user cannot access data without having authority. There is a new system of QR code use for data security purpose. That is called two level QR code, because it is having two parts to store data. One part is for public data and it is generated by standard process. It can be reads by any application which is standard QR code reader. The second part of QR code is for private data and it will generates using Reed-Solomon algorithm and visual cryptography. Using these methodologies time requirement of process is become less, because it is automates the combination of textured patterns. These patterns are replaces the black modules of the QR code. Because of using texture patterns, there will be increase storage capacity of the QR code. Data security is main focusing concept for our proposed approach and for that key is used with private QR code to decode the data.

**IndexTerms - Data security, Quick response code, Reed-Solomon algorithm, Scrambling, Visual Cryptography**

## I. INTRODUCTION

QR code is the Quick Response code, is nothing but the barcode having two-dimensions. A QR code can be store and transfer the data by including contact number, link of the web, webs URLs, it can be plain text, email address can be as QR code. At first time these codes are designed to track parts of the vehicles at the time of manufacturing in industry. Now a days anybody can be able to generate his or her own QR code by providing data to some softwares or websites which are going to be encode the code. There is also using some applications use to generate the QR code for particular information. When the process of encoding the data into QR code in finished. That generated code can be extracted by using decoder or also by using the scanners. For scanning the code some of a device and an applications are to be used for the purpose to decode that QR code and obtains the data which is stored into that code. The figure 1 shows the symbol of QR code having various patterns placed in specific area. QR code is having property that, they can only read by the machines. The human can not get direct access over the code, for that he should use the particular device or a application which is scanning and decoding the encoded data in QR code. In our system use the Reed-Solomon's encoding and decoding algorithm or Golay's algorithm [1]. Using QR codes methodology can be opens both positive and negative possibilities of using QR code for data security. One is that to need of particular and specific terminal for scan or decodes the data. Because of that important data is not expose everywhere in the plaintext. The second possibility is that, the attacker has to be use the unread ability of the humans about code. They can be take this as advantage to access the important data. Hence for to manipulate the important data using any point which is can be exploit, for example, encodes information which is malicious, into a particular code and users can be tricked at when they are decodes that encoded data.

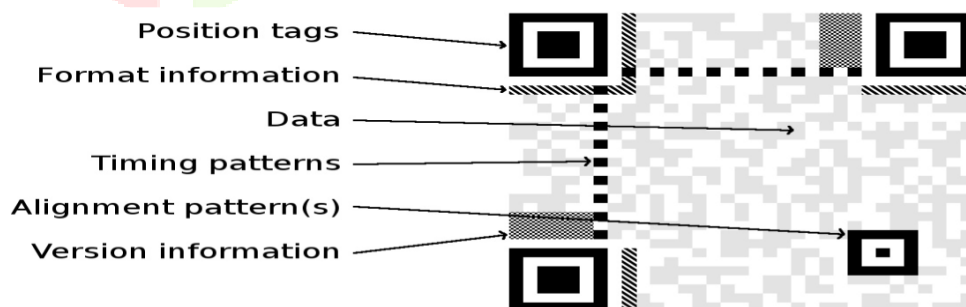


Fig. 1. A symbol of QR code

The QR Code symbol is built in square form. It consists of function patterns and encoding parts. The whole symbol is surrounded by a quiet zone. Function patterns of QR code are placed in specific areas. For decoding the code, scanners detect the function patterns of the code. In QR code, there are 4 types of function patterns: separator, timing patterns, finder pattern, and alignment patterns. The encoding part of QR code contains the data, in which comes version information, format information, and error correction codewords.

## II. PROBLEM DEFINITION

There are many types of graphical codes for data storage because of their easy handling feature. But then also they are accessible by anyone, hence there is a need to generate a code that will not be accessed by an unauthorized person. The proposed method is useful for that.

### III. REVIEW OF LITERATURE

There are many systems that has been developed over the past few years to deal with the security related problems of the important data. The QR codes was invented in 1994 for the Japanese automotive industry by Denso Wave corporation. These QR codes are used for data storage in small area, also having high speed reading ability. By using these QR codes there was many systems designed for prevent security to the important data. Every system that has been developed has many different technologies that can be used to encode data into QR code and also gives the security for that data using many other technologies.

#### A .Replacement of textured patterns with black modules of QR code.

This system was invented by Iuliia Tkachenko, et al. In that used the textured pattern, which are stored into database. For creating the QR code black modules are replaced by textured patterns. Reed-Solomon algorithm is used for creating the QR code. For authentication for private QR key is used. Textured patterns having important feature, that is sensitivity for print and scan process. To take advantage of that, used pattern recognition method which based on maximization of correlation values among the print and scan degraded version and generalization version. Because of using database for stored the textured patterns, time required more to access that patterns. Hence there is need to automate the process combination of textured patterns with QR code [1].

#### B. Distributed Secret Sharing Approach

This system invented by Pei-Yu Lin. In that data is distributed into two parts. First is non-secure data is converted into QR code and second is for secret data generates one key for particular user. Then this secret data is hide into QR code using Wet paper code algorithm. It is like steganography techniques for data hiding. But many modifications required for this method. Need Reed-Solomon algorithm which will decrease the modifications [2].

#### C. Encryption of patient's private information based on QR code

This was designed by Narendra Panwar et al. Patients data is important hence to security for that used encryption algorithm. DES algorithm is used for data encryption. Generated cipher text is encoded into QR code. For decryption also used DES algorithm. Hence using steganography and cryptography important data in embed into QR code for better secrete message sharing. Attacker can not decrypt data from QR code without having the cryptographic key [4].

#### D. Reversible Data Hiding with Histogram

This is invented by Hsiang-Cheh Huang, et al. In this paper, They was described the use of QR codes. They are proposed a algorithm in reversible data hiding. It has characteristics about to capacity of storage and hide data. In that codes conceals more data of images. By proposed algorithm the QR codes can be removed from corners of images and from that original images can be recovered. The QR code are stored the URLs , which gives the information about the image for the user [5].

#### E. Data security through steganography and encryption using QR code

This system was invented byM. Mary Shanthi Rani , et al. By using QR code generator encrypts the impotent message into code, which is not read or not understood by the human. QR codes are read by using the smart phones with camera.By considering these things authors proposed the method for secure secret data from unauthorised users. In that method steganography with QR codes for data hiding. There is encryption process at the side of sender and the decryption process at the side of receiver [6].

#### F. Visual cryptography based scheme using QR code

This technology was invented by Xiaohe Cao, et al. The authors was proposed the scheme to secure the important data of the user by using visual cryptography with QR codes. They were applied pseudo-random matrix in visual cryptography.By combining pseudo-random matrix with visual cryptography, there is possible to detect the attacker. It is give the security to data. But by using mathematical analysis attacker can access the data [7].

### IV. EXISTING SYSTEM

Existing system first consider the features of QR code and another graphical codes. Then consider the print and scan process of the QR codes to calculate pearson correlation values between that two codes for giving the data authentication to user .In that generated textured patterns and store that into database. For QR creation that patterns are access from database. But for this process time requirement is more, there is not happens the automate combination of the textured patterns with the QR code.

## V. PROPOSED SYSTEM

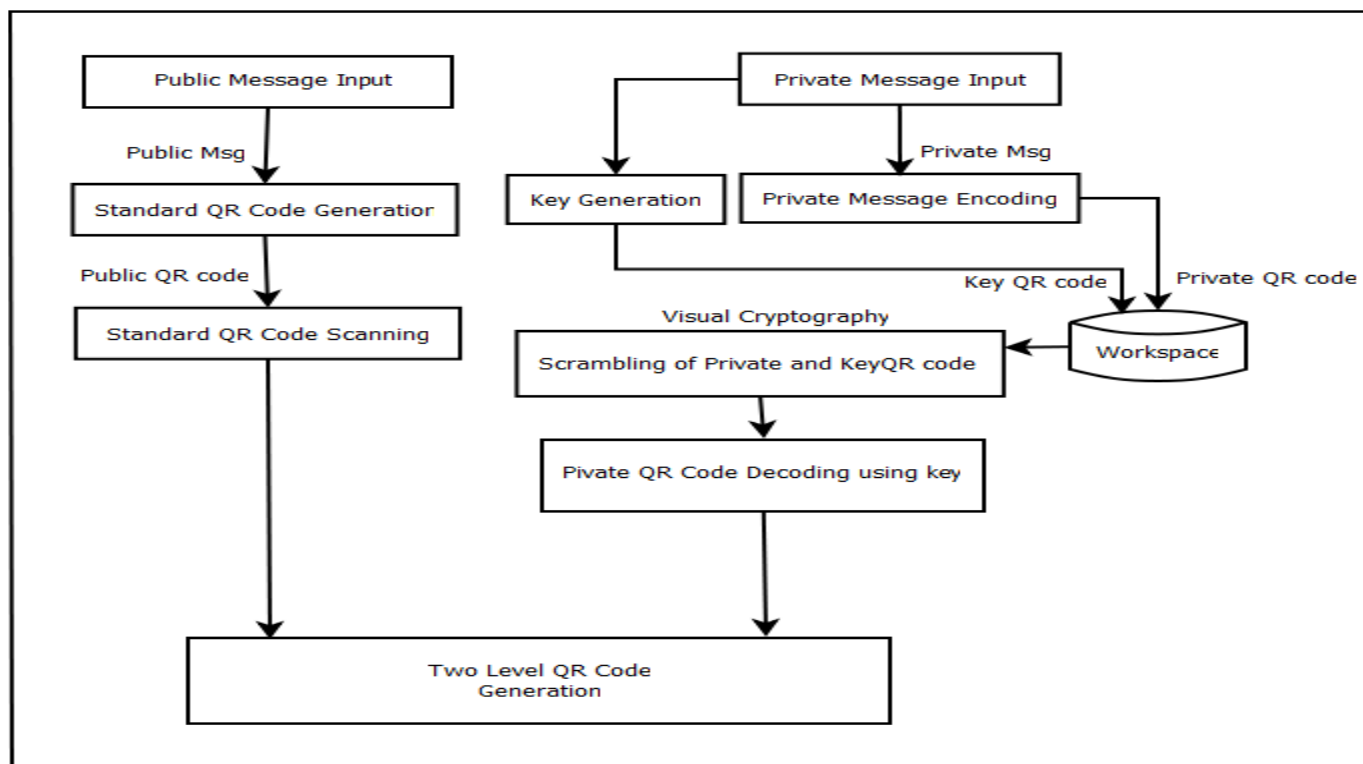


Fig. 2. Proposed System Architecture

Our proposed system shows that it is consider in two parts. First is for public data and second is for private data. There are some phases to design the system.

- **Phase 1 : Input Messages.**
- **Phase 2 : Generation of public QR code.**
- **Phase 3 : Generation of two level QR code.**

## A. Phase 1 : Input Messages

In this phase inputs are given to system in form of public and private. After that inputs are going for processing of encoding of ata to store into QR code.

## B. Phase 2 : Generation of public QR code

The public QR code can be generate by using any standard method. It can be generate using any application of smart phones or can use "ZXing" library for that.

## C. Phase 3 : Generation of two level QR code

This is main part of our system. In that use Reed-Solomon algorithm for QR code generation. For providing security to encoded data visual cryptography is use. Key is generated in form of QR code. For QR code decoding that key is scramble with Private QR code. If key is not with private QR code, then it is impossible to access the data from QR code. Hence by this we can secure our important data. e.g. Bank account related information.

## VI. MATHEMATICAL MODEL

Let  $S$  be the solution perspective of the 2LQR System:

$S = I, O, F, DD, NDD, Success, Failure$

$I = Name, Contact, Message$

$O = QR\ code\ generation$

$F = getInfo(), publicEncode(), publicQR(), convertToBinary(), privateEncode(), privateQR(), generate(), decoding()$

$DD = int, char, String$

$NDD = Data\ types-int, char, String\ if\ out\ of\ QR\ Code\ Version.$

$Success = QR\ code\ is\ generated\ along\ with\ the\ display\ of\ only\ the\ public\ message.$

$Failure = QR\ code\ is\ not\ generated\ or\ public\ and\ private\ both\ the\ messages\ are\ in\ display.$

## VII. ALGORITHM / METHODOLOGY

## Reed-Solomon Algorithm:

Step 1: Take private message as input for encoding that into QR code.

Step 2: That input message converted into binary form and generate polynomial.

Step 3: According to binary form set 1 to black module means data is present in that portion and set 0 to white module means data is not present in that portion.

Step 4: QR code is generated.

Let, consider  $k$  for digits of message information that is to be represented by a polynomial. i.e.  $m(x)$ , upto degree,  $k-1$  at most and the  $g(x)$  is generator polynomial, it is a factor of polynomial,

$$x^n - 1. \quad (1)$$

Then codeword  $c(x)$  is,

$$c(x) = c_0 + c_1x + \dots + c_{n-1}x^{n-1} \quad (2)$$

Therefore, the encoded information digits of message are shown by  $(c_0, c_1, \dots, c_{n-1})$ .

### Visual Cryptography:

Visual cryptography is one of the cryptographic technique. This allows visual information such as pictures, text, etc. to be encrypted. To decrypt that data becomes the job of the person who wants to read that information. In that deciding number of users to provide key for them to access that. Another person can not access that data. In our proposed system this methodology will be using to encrypt QR code with the key, which is not known to any other person.

### VIII. SYSTEM ANALYSIS

In our proposed system we are not using server database to store the textured patterns or to store QR codes. We work with project workspace, database is used in existing system to store patterns onto that. Because in our proposed system automation of textured pattern replacement with QR code modules is taken into focus. Because of database is not required for the proposed system to store the patterns, because automate combination of the textured patterns with QR code, the time requirement is less.

Table . Various Graphical Barcode Comparison

Code name	Storage capacity(bits/inch <sup>2</sup> )			Color Printing	Copy Sensitivity
	public	Private	total		
HCC2D code	15048	0	15048	Yes	No
Multilevel 2D barcode	11224	0	11224	No	No
Graphical code for authentication	0	0	0	No	Yes
QR code with hidden message	7548	3102	10650	No	No
Proposed 2LQR code	7548	6386	13934	No	Yes

### IX. SOFTWARE REQUIREMENT AND SPECIFICATION

#### A. Hardware Resource Requirement:

- Hard Disk : 80 GB
- RAM : 512 MB
- Processor : Intel Pentium 4 and above

#### B. Software Resource Requirement:

- Operating System: Windows XP/Vista/7 and above.
- IDE: Eclipse or Netbeans
- Programming Language: Java

#### C. Non Functional Requirements:

##### Interface Requirements:

- Secure access of confidential data (user's details).
- Flexible service based architecture will be highly desirable for future extension.
- Better component design to get better performance at peak time.

### X. CONCLUSION

Considering this topic of the project, we concentrate towards the security problems of important data. For that we described one technique to protect data by using the QR codes. That is called as two level QR code system. In that distribute data into two parts, one is for public data and another is for private data. Public data converted into QR code using standard methods. But our focus is on private data encoding into QR code by using Reed-Solomon algorithm with visual cryptography. At first private is encoded in QR code and key is encoded into QR code. For decoding the QR code key code scramble with key then it is access by the user. Hence by this data is not accessing by any other person, who do not know the key or key is not with that person. The two level QR code is use the automate combination of textured patterns for the replacement of black modules of QR code. Textured patterns are used because they have a low density than black modules. Hence memory required to store this type of QR code is less than the QR codes on which black modules are used. In this way we understand the how can we give the security to our very important data by using QR code encoding technique with visual cryptography methodology. In future work we can consider the white modules of QR codes for data storage. That can replace with the textured patterns and that also having low density than black modules of the code.

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