

2LQR Code for Private Message Sharing and Document Authentication

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Abstract— Quick response codes are machine readable optical label which was first created in the automated industry of Japan. Quick response codes are capable enough to store vital information in it by converting into various black and white patterns. QR codes have many applications especially in the field of message sharing and document authentication. We must lay our emphasis on the security and privacy of the QR code as there are chances of it getting into wrong hands. In this paper we have proposed a technique known as 2 level QR code which consists of two layers of security provided to the QR code. The first level is known as public level and the second level is known as private level. We will be using Reed Solomon algorithm. Our 2 level design is capable enough to supply ample security and privacy as way as personal message sharing and document authentication are involved. During this paper we've got studied numerous state of the art existing techniques of planning QR code at the side of their comparison with the our projected two level QR code technique. In this paper we've got studied numerous state of the art existing techniques of coming up with QR code in conjunction with their comparison with the our planned two level QR code technique.

Keywords- QR Code; Reed solomon.

I. INTRODUCTION

Quick response codes or QR codes are basically a two dimensional bar codes which are used day by day due to the technological advancements [1]. These codes have plenty of applications. To name a few, these QR codes can be used for storing information, web site redirecting, tracking and tracing, Entity identification, Uniform resource locator, Code payments, Virtual stores, Website login, Message sharing and document authentication. QR code is also known as matrix barcode. QR code was invented by Denso Wave in Japan while working for automotive industry. Due to the technological advancements there are plenty of QR codes which are being used in the market. As a result of which the demand for QR code scanners has also increased proportionally. The popularity of QR code is due to its robustness, easy to read feature, higher encoding capacity and small size. Although it has many advantages but still has many downsides to be improved upon most common disadvantages are: It is easily accessible to anyone even if it is ciphered and it is very difficult to distinguish between the originally generated QR code with its photocopy. So, in order to intrude the QR code, any third person can retrieve the information with the help of a standard QR code scanner. As far as message sharing and document authentication are concerned the security of the QR code is our highest priority. In order to overcome these shortcomings we have proposed a Two level QR code with

enhanced encoding technique. This enhancement is achieved by using textures patterns in place of black modules. These patterns are sensitive to the distortions created while printing and scanning process. Our proposed technique also lays emphasis on storage capacity apart from security and privacy. Our proposed system consists of a public level QR code and a private level QR code. The public level QR code can be accesses with the help of any standard QR code scanner whereas the public level QR code cannot be accessed from any standard QR scanner. Hence it provides a level of security against any possible intrusion to greater extent. The first level keeps the strong characteristics of the QR code whereas the second level improves the storage capacity of the QR code. This paper is as follows: we start with the overview of QR codes and in the subsequent sections we will be mainly exploring the state of the art existing techniques along with the proposed technique. And at the end we will compare our technique with the existing techniques.

II. EXISTING TECHNIQUES

We start with an introduction of QR code features and existing rich graphical codes. Addition to this, the distortion added during the Print & Scan process will be there. The proposed two level QR code as well as the proposed recognition method are presented in this. The experimental

results show the efficiency of the proposed recognition methods and analyze the capacities of the proposed code

III. PROPOSED SYSTEM

The two level QR code which is the proposed technique provides a two level security to the QR code which is mainly focusing on message sharing and document authentication [6]. The first level is known as public level and the second level is known as private level. The public level QR code will store the information which can be shown publicly. The private level QR code will store the information which is secret and private. When this two level QR code is scanned from any standard QR scanner, only the public message will be shown from the scanner whereas the private message will be safe, secured and hidden.

A: INPUT MESSAGE.

This is our first module. In this module we will be giving the public and private messages as an input.

B: STANDARD QR CODE GENERATION.

In this module we will generate a standard QR code which will be created by encoding the public message. This QR code can be scanned by any standard QR code scanner. As far as standard QR is concerned, there is a pre defined library “Zxing” which has to be directly imported. That Library has got all the predefined methods in order to create a QR code. We just have to import a jar file known as Zxing’s core.jar file from Maven repository.

Any QR code generated using the Zxing library can be easily scanned by a standard QR scanner.

C: 2LQR CODE GENERATION.

For creating private QR code, we will be using Reed solomons algorithm. Reed solomons algorithm is also known as Golay’s algorithm.

For creating the 2LQR code we will be performing the following two steps.

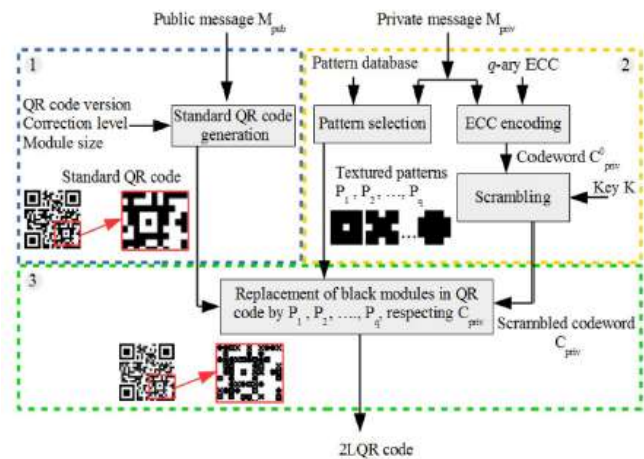
1. Pattern generation.
2. Replacement of black modules of the standard QR code with the generated patterns.

We will be selecting patterns from the database. We will create the patterns of all the alphanumeric characters along with the special symbols. And then we will store those patterns in a database.

For example: Consider my message to be “A”. First we will consider the ASCII value of A.

That ASCII value is in decimal. We will convert that decimal value into binary. Afterwards, we will take a 3x3 Matrix comprising of the binary ASCII of A. The elements of the matrix will be either 1 or 0. So, the 1 will correspond to a black spot and 0 will correspond to a white spot. Similar process will be performed on all the characters. Finally we will get a pattern.

IV. SYSTEM ARCHITECTURE



For generating standard QR code we need to insert M_{PUB} which is public message key determined by admin. After generation of standard QR code replacement of black module (2LQR code) takes place. For private message input M_{PRIV} is given to pattern selection. These patterns are textured patterns viz P_1, P_2, \dots, P_n which are obtained from pattern database and this is further used for replacement of black module. Then codeword is encoded with the help of M_{PRIV} and key K is used for scrambling which is also used to replace black module.

V. COMPARATIVE STUDY

Code name	Storage capacity ($bits/inch^2$)			Color printing	Copy sensitivity
	public	private	total		
HCC2D code [2]	15048	0	15048	Yes	No
Multilevel 2D barcode [5]	11224	0	11224	No	No
Graphical code for authentication	0	0	0	No	Yes
QR code with hidden message [3]	7548	3102	10650	No	No
Proposed 2LQR code [6]	7548	6386	13934	No	Yes

VI. FUTURE RESEARCH DIRECTION

In QR code system, the size of QR code will not increase and storage capacity will increase but for scanning this code we need high resolution camera so that QR code will read the information and can provide better accuracy but if we use less resolution camera QR code will not provide accuracy so for future work we can implement code such that it can be read by less resolution camera.

VII. CONCLUSION

The private level is created by replacing black modules with specific textured patterns. These textured patterns are considered as black modules by standard QR code reader. Thus the private level is invisible to standard QR code readers.

In addition, the private level does not affect in anyway the reading process of the public level. The proposed 2LQR code increases the storage capacity of the classical QR code due to its supplementary reading level. The storage capacity of the 2LQR code can be improved by increasing the number of textured patterns used or by decreasing the textured pattern size. It is possible to obtain good pattern recognition results, and therefore a successful private message extraction. However, we are facing a trade-off between the pattern size, the alphabet dimensions and the quantity of stored information during the 2LQR code generation.

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