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2 LEVEL QR CODE FOR SECRET MESSAGE

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Abstract - *The QR code was designed for storage information and high-speed reading applications. QR codes are made to create a link between important world products (tagged with the QR code) and Internet. A new QR code is proposed to have two storage levels: a public level and a private level. The public level are often read by any QR code reading application, while the private level is made by replacing the black modules by specific textured patterns. These patterns do not introduce disruption in the standard reading process and are always perceived as black modules by any QR code reader. Thus the private level is invisible normal QR code readers. It can also be used for document authentication. It consists of information encoded using q-array code with error correction capacity which helps to improve the storage capacity of the QR code and to determine the original document from a copy. The sensitivity of the used textured patterns to the print-and-scan process represents this authentication. The pattern recognition method are often used both during a private message sharing and in an authentication scenario. The storage capacity are often notably improved by increasing the code alphabet q or by increasing the pattern size (2 level qr code for secret message)*

Key Words: (QR code, 2 level qr code, reed solomon, private level, public level, EEC encoding)

1. INTRODUCTION

The popularity of QR codes is due to the following features- they are easy for copying process, easy to read by any device, they have a high encoding capacity enhanced by error correction features, they have a small size and are robust to geometric distortions. However, those undeniable advantages also have their counterparts: 1) Message encoded in a QR code is always accessible to everyone, even if it is ciphered and therefore is only eligible to authorized users. 2) It is impossible to determine an originally printed QR code from its copy due to its insensitivity to the Print-and-Scan process. In this paper, we propose to overcome these shortcomings by enriching the standard QR code encoding capacity. This enrichment is obtained by replacing its black modules with specific textured patterns. Besides the gain in storage capacity, these patterns can be designed to be sensitive to distortions due to the print and scan process. These patterns do not disrupt the standard reading process, Therefore, even when the private information is degraded or lost in the copy, the public information is always accessible. The proposed two-level QR code contains a first level accessible for any normal QR code reader, therefore it keeps the characteristics of the normal QR code, and the second level which improves the capacities and characteristics of the normal QR code. The information in the second level is encoded using q−array code with an error correction capacities. This information is hidden to the normal QR code reader because it perceives the textured patterns as black modules. Therefore, the second level can be used for secret message sharing. the private level needs a specific application. This 2LQR code can be used for private message sharing and for authentication scenarios. The private level is created by replacing black modules with specific textured patterns and adding private messages into it. The qr code consist of version information, format information, data and error correction keys, patterns

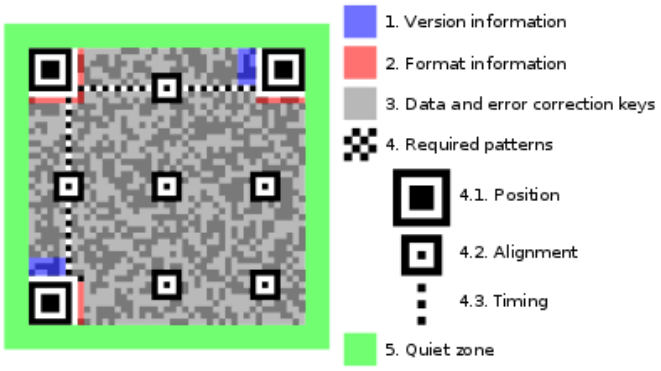

Fig-1 : QR code structure

2. RELATED WORK

Based on Zachi Baharav and Kakarala in “Visual Qr Codes: Image merging And Statistical Analysis”, QR codes are used as a way of conveying text information, like emails, phone numbers, through images that are interpreted using a camera. This paper indicates how the visually massive QR codes could also be gained by image merging. This procedure allows images as diverse as corporate logos and family photographs to be embedded within the code in full color. The purpose of this paper is to describe a statistically analyzed method for blending color images into a QR code to enhance its visual significance. Cleo Baras and Franc¸ois Cayre in “2d Bar-Codes for Authentication: A Security Approach'' investigates the authentication of real world goods on which 2nd bar-codes (2D-BC) were printed and takes the opponent’s factor of view. The opponent is assumed to possess access to Nc noisy copies of a real 2D-BC. A simple estimator of

the 2D-BC based copies averages is proposed, allowing the opponent to print a fake 2DBC which aims at being declared as genuine by the system detector. It is proven that the opponent can produce fake copies that successfully fools the detector with an inexpensive number of genuine goods. In this context, an opponent aims at producing fake 2D-BCs declared as genuine by the detector, whereas the aim of the merchandise manufacturer is to form such a reproduction difficult or impossible. This problem is tackled with a security approach inspired by works in digital watermarking. Anh Thu Phan Ho, Bao An Mai Hoang, Wadih Sawaya and Patrick Bas proposes "Document authentication using graphical codes: reliable performance analysis and channel optimization" to investigate the impact of the channel model for authentication systems supported codes that are corrupted by a physically unclonable noise like the one emitted by a printing. The goal of this paper is twofold, firstly, it provides reliable performance measurements of the authentication system that is based on a Neyman-Pearson hypothesis test. Secondly, the computation of type I and type II errors are used to derive the foremost favorable channels for authentication. According to Thach V. Bui, Nguyen K. Vu, Thong T.P. Nguyen, Isao and Thuc in paper "Robust Message Hiding for QR Code" To hold the actual content of QR code and encode private information into it are the two main challenges. Hiding secret information based on its technique is so fragile to modification attack. If an attacker changes any bit of hidden bits, it becomes very difficult or impossible to recover the secret information. This paper proposes a scheme to overcome this problem. The main objective is to propose algorithms that hide a secret message into QR code. The private message is invisible to attackers and secure against modification or damage attack

3. PROPOSED SYSTEM

The Proposed system uses two level QR for hiding data. This 2 level qr code has following levels

3.1 Public message

The public message is stored within the standard QR code. The standard QR code generation algorithm includes following steps. First of all, the foremost optimal mode (numeric, alphanumeric, byte or Kanji) is chosen by analyzing the message content. The public message is encoded using the shortest possible string of bits. This string of bits is break up into 8 bit long data codewords.

Then, the choice of error correction level is performed and the error correction codewords using the Reed-Solomon code are generated.

3.2 Private message

The proposed two level QR code contains of: a first level accessible for any normal QR code reader, therefore it keeps the strong characteristics of the QR code; and a second level that improves the capacities and characteristics of the initial QR code. For Private message encoding, the private row-bit string is encoded using error correction code (ECC) to ensure the message error correction after the P&S operation. It uses the block codes, for message encoding. Various shortcomings can be overcome by enriching the standard QR code encoding capacity. This enrichment is obtained by replacing its black modules by patterns.by the gain of storage capacity, these patterns can be designed to be sensitive to distortions due to the print and scan process. That do not introduce disruption in the standard reading process, are always recognized as black modules by any QR code reader. Therefore, even when the private information is degraded or lost within the copy, public information is usually accessible for reading

4 .TWO LEVEL QR (2LQR) CODE GENERATION

as the standard QR code, the 2 level qr code has the same structure, which consists of position tags, alignment patterns, timing patterns, version and format patterns. However, the normal QR code has white and black modules and the 2 level qr code have white modules and textured modules over the black module. This replacement of black modules by textured modules doesn't disrupt the normal QR code reading process. But it helps to have a second storage level, which is invisible to the normal QR code reader. This second level contains the private message that has been encoded with q-array ($q \geq 2$) code with error correction capacity.. This replacement of black modules by textured modules doesn't affect the normal QR code reading process. But it allows us to have a second storage level, which is invisible to the normal QR code reader. These textured patterns have specific features and are used for private message storage in the new 2LQR code. In private message sharing method, the black modules of the qr code are also replaced by patterns. The below image show the basic structure of 2lqr generation process

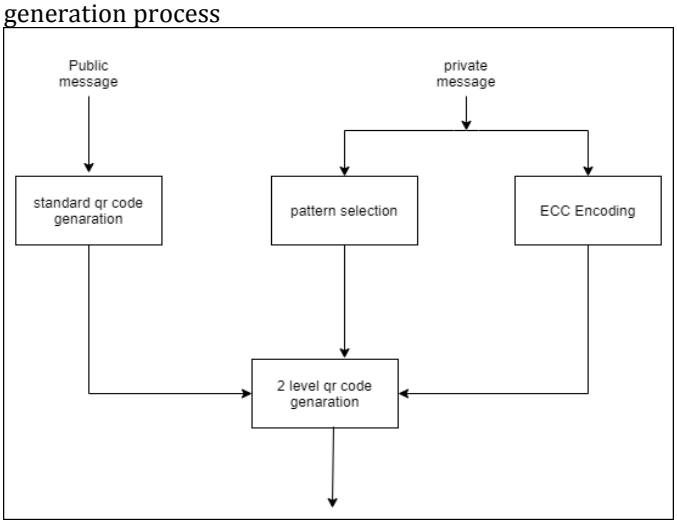

Fig-2: 2lqr generation process

5. APPLICATIONS OF 2LQR

The QR code was designed for storage information and fast reading applications. QR codes have come a long way since creation. It has many purposes like, commercial tracking, product labeling or marketing, movie tickets. QR codes getting used to sending audiences to a website for browsing, to bookmark a webpage, send mails, to make phone calls, send messages, produce links to web URLs, hook up with WI-FI networks, access information, get coupons, view videos, purchase items, process orders, advertise products, etc. Application scenarios for 2LQR code are mainly focused on: a secret message sharing scenario and an authentication scenario. The main purpose of a secret message sharing scenario is the invisible storage and transmission of private information into QR code.

6. EXPERIMENTAL STUDY

In the first experiment the storage level of private message was low so i increased the storage capacity by adding a pattern into it. Before adding pattern the storage capacity was low. After adding pattern the qr code have a capacity of 272 bits. While coming to decoding side the message was decoded successfully without any problem in every try and the pattern size is varying based on the qr code size, but it didn't affected the scanning process of the normal public message. and the private message was secured and did not exposed in normal scanning process since it can only readable by the specific application. And i tried copying and mailing the 2lqr code to check if there any problem with private information after transferring it still safe without damaging the secrete message

7. CONCLUSION

In this paper, a new QR code called two-level QR code is proposed. This 2 level qr code has two levels- public level and private level. The public level can be read by any application, the private level needs a specific application. This 2LQR code can be used for private message sharing and authentication. The second(private) level is made by replacing black modules with textured patterns. These textured patterns are considered as black modules by standard QR code readers. The private level is invisible to normal QR code readers. In addition, the private level does not affect the reading process of the public level. The proposed 2LQR code increases the storage capacity of a normal QR code. Experiment results show that the storage capacity is improved by up to 272 bits to a message length of 380 bits. The storage capacity of the two level qr code can be improved by increasing the number of textured patterns used or by reducing the textured pattern size. In my future work, I'll add cryptographic algorithms to encrypt the data so it will be more secure while it requires a secret key for decrypting the Code and real-time online authentication for advanced security

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