www.ierjournal.org International Engineering Research Journal (IERJ), Volume 2 Issue 9 Page 3534-3535, 2017 ISSN 2395-1621

Two Level QR Code using Steganography

[#1] Prof. M. R. Mahajan, [#2] Karteek Gole, [#3] Mohan Deshpande, [#4] Rushikesh Lanke, [#5] Aditya Deshpande

[#1] *mrm_it@pvgcoet.ac.in*, [#2]*kartikgole77@gmail.com*, [#3]*mohandeshpande@hotmail.com*, [#4]*rushikeshlanke@gmail.com*, [#5]*addsh10@gmail.com*

[#12345]Department of Information Technology,

PVG's College of Engineering and Technology, Pune, Maharashtra, India

ABSTRACT

The QR Code was invented by Denso Wave Corporation in 1994. It was designed for storage information and high speed reading applications. In this paper, we will be presenting a new rich QR code, that is enriched with pixels from an entirely different 'key' image. This new QR code, dubbed as the "Two Level QR Code" or "2LQR Code" will be unreadable to standard QR Code scanners, thus ensuring the full confidentiality of the message encoded in it. In the standard QR code there are basically two different types of modules, the black and white modules. In this 2LQR code, using steganography, we will be replacing the white modules with patches from a different image. The decoding process is then carried out using reverse texture synthesis. These 'patches', taken from the key image are selected randomly. Replacement of white modules disrupts the standard QR code reading process completely and ensures the full confidentiality of the data stored in the initial QR code.

ARTICLE INFO

Article History

Received: 27th May 2017

Received in revised form : 27th May 2017

Accepted: 29th May 2017

Published online : 30th May 2017

Keywords: Quick Response Codes, Two Level QR Codes, Steganography, Reverse Texture Synthesis.

I. INTRODUCTION

Lately, graphical codes like Barcodes and QR codes have become increasingly popular because of their compact size, robustness, ease of use, high encoding capacity enhanced by error correction facilities and many other major factors. Despite being as advantageous as they are, these graphical codes have many flaws and one of the major flaws of these graphical codes is their lack of security provisions. Anyone can read encoded data from the QR code or Barcode and therefore major overhaul in this tech was necessary. The modified QR code or the Two Level-QR code as we've named it, tries to address exactly this necessity. Like the standard QR code, this 2LQR code has the same specific structure, which consists of position tags, alignment patterns, timing patterns, version and format patterns. However, this 2LQR code will have patches of a different 'key image' which will make it unreadable to standard QR code readers.

II. SYSTEM OVERVIEW

The QR (Quick Response) Code was firstly designed for the Japanese automotive industry by Denso Wave Corporation in 1994. Perhaps the most important of its characteristics are small size and high-speed reading and writing process.

III.LITERATURE SURVEY

The concept of 2LQR Code was put forth by Dr William Peuch and Iullia Tchkachenko of the University of Montpellier in a 2015 blog titled "The 2LQR Code". They followed it up with a full IEEE publication in the year of 2016 titled "2LQR code for private message sharing and document authentication", thus giving an application perspective to the concept as a whole. That publication happens to be the pillar of our project and initial inspiration.

The 2LQR Codes introduced by aforementioned scientists are comprised of Black and White modules like standard QR Codes except the Black modules here are further embedded with Special Textured Patterns thus giving an additional security edge to the graphical code. Secret messages are encrypted using these textured patterns inside the black modules which are invisible to standard QR Code Readers without tampering the primary functionality of QR Codes. The Key used during encryption is then used for Decryption of the secret message.

Steganography is one of the most widely used methods of information hiding. Basically, in Steganography, messages are embedded in a host medium so as to conceal the secret message such that a potential attacker will not be able to read them. Typically, steganographic applications include secret communication between sender and receiver parties whose existence the possible attacker is unaware of. In a way, the success of the attacker depends on knowing the existence of the sender and receiver.

Texture Synthesis is widely used for security purposes mainly in the field of computer graphics. It uses a source image and alters that image with either pixel based or patch based algorithms to produce similar but secure image which can transmit confidential data.

We propose to use reverse texture synthesis to recover cover image which is subsequently used to recover the original QR code which contains the original message.

IV. PROPOSED SYSTEM

In the proposed system, Initially, a standard QR Code will be generated with a secret message that is to be sent to the receiver. Most QR Codes have no security and can be read using any standard QR Code readers. If an attacker somehow intercepts this QR code in the communication channel between the sender and receiver, the confidential data being transmitted becomes vulnerable. So, after the standard QR code is generated we will follow the following steps:

1. Index table generation
2. Patch processing
3. Message embedded texture synthesis.

Before describing the process, we will firstly describe some terminologies used in this paper. Patch is a part of the source texture image. The size of the patch is defined by its height and width. The central part of the patch is called as kernel with size defined by height and width. We'll use the cover image which is also called as source texture image.

1. Index table generation

   In the first step, we will generate the index table which will allow us to trace the patches in the synthetic texture. Synthetic texture is the one which we intend to produce. The capacity of the index table is determined by the size of synthetic texture, its size can be divide into number of patches it can accommodate. The positions in which we will paste the patches will result in their entry in the index table with corresponding patch id and for every blank position in the synthesized texture, '-1' will be written in index table.

2. Patch processing

   In this step, we'll paste the selected patches in the workbench, which will contain the initially generated QR Code. These patches will be pasted in the white modules of the initial QR Code situated in the workbench. We will paste the patches by referring to source patch IDs stored in the index table.

3. Message Embedding

   After the first two steps, we have an index table as well as a patch pasted texture. If the number of patches is more and the dimensions of the texture to be synthesized is small then the patch pasting process can result in overlapping of certain patches. Such overlapping must be avoided whenever possible. Thus, the message which we embedded in the initial QR Code is now secure because the code is disrupted due to patch replacement and is unreadable to the standard QR code reader.

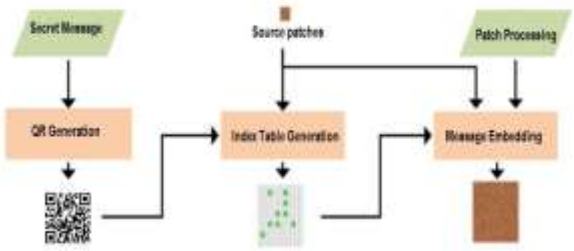

Fig 1. Message Embedding

Message Extraction

In the final step source texture is recovered and the secret message is extracted from that source texture. By using the secret key the index table is built at the receiver end.

In source texture recovery, by using the index table the source patches are recovered from the given texture and it is arranged according to its position by referring to the index table. In the next step, we paste the source patches into a workbench to produce a composition image by referring to the index table. This generates a cover image that is identical to the one produced during initial steps. This composition image consists of the initially generated QR code which will be read using any standard QR code reader and the secret message will be extracted.

V. CONCLUSION

This paper proposes a two level QR code created using steganography and reverse texture synthesis. Using a source key image, a QR code is tampered and made unreadable in order to secure the message encrypted in it. Our idea is novel and allows us to retrieve the original QR code using patches from the key image and the index table. This method can provide a possibility of future study into exploring various data encryption techniques using image processing.

REFRENCES

[1] Iullia Tchkachenko 1, William Puech 2, Christophe Destruel 3, Olivier Strauss 4, Jean-Marc Gaudin 5 and Christian Guichard 6, "Two level QR code for private message sharing and Document authentication", IEEE Transactions on Information Forensics and Security Year: 2016, Volume: 11, Issue: 3

[2] Kuo-Chen Wu 1 and Chung-Ming Wang 2, "Steganography Using Reversible Texture Synthesis". IEEE Transactions on Image Processing, Volume: 24, Year: 2015

[3] N. F. Johnson 1 and S. Jajodia 2, "Exploring steganography: Seeing the unseen," Computer, Volume: 31, pp. 26-34, 1998.

[4] Ying Zhao 1 and George KarypisC 2, "Comparison of Agglomerative and Partitional Document Clustering Algorithms " In Multimedia and Expo (ICME), 2013 IEEE International Conference on, pages 1–6. IEEE, 2013.

[5] A. A. Efros and W. T. Freeman, "Image quilting for texture synthesis and transfer," in Proc. of the 28th Annual Conference on Computer Graphics and Interactive Techniques, 2001, pp. 341-346.