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Color QR Code

Sakshi Bhagwatkar[1], Mayuri Raut[2], Payal Bhawarkar[3], Prerna Ghare[4], Rutuja Tipramwar[5]

[1,2,3,4,5]Student, Dept. of Computer Science & Engineering, Datta Meghe Institute of Engineering, Technology & Research, Wardha, Maharashtra, India

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Abstract - *A 2D color barcode will hold rather more data than a binary barcode. The variable light condition, different cameras, webcam and poor quality of pictures along with capricious rotation of barcode creates difficulty in getting good results. They're often used in advertising to supply customers with scannable URLs to product websites. In pursuit of magnified barcode capability, novel schemes victimization color is planned. Encoding information severally in cyan, magenta, and yellow (CMY) print colorant channels with detection in complementary Red, green, and blue (RGB) image capture channels offers a lovely framework for extending monochrome barcodes to paint with magnified information rates. The unsought absorption of colorants in regions of spectral sensitivity of the no complementary capture channels, however, offers rise to cross-channel color interference that considerably deteriorates the performance of the color barcode system. This provides a much better coding together with higher data rates. The paper provides associate overall look on QR codes.*

Key Words: Barcode, Encoding, Color, Data Rate.

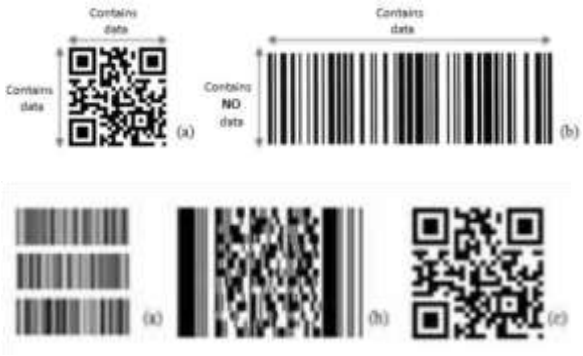
1. INTRODUCTION

As Barcodes measure optical machine-readable representations of information, capable of storing digital data regarding the object to which they're attached. Thanks to their reading speed, accuracy, and practical characteristics, barcodes became omnipresent in several applications, together with their usage in shops and retail chains to cost merchandise. Also to trace things and to spot customers through membership cards; in following item cargo and movement, like mail, rental cars, airline luggage; in patient identification in hospitals; in document management systems. The stock of digital data kept in 1D barcodes is proscribed and will be merely enlarged by increasing the quantity of barcode digits or by birthing out multiple barcodes. This approach has several negative effects, however, like enlarged barcode areas, additional advanced reading operations, and enlarged printing prices.

Once more if one or bars within the code is lost whole barcode becomes indecipherable.

For this reason, the barcode technology has been deploying geometric patterns in 2 dimensions: such barcodes square measure noted as bi-dimensional (2D) codes. Note that 2D codes increase the data space available by storing information in 2 dimensions, whereas 1D code contains knowledge in one dimension solely. Figure 1.1 shows samples of 1D and 2D barcodes.

Obtainable 2D codes span from repeating one 1D barcode over multiple rows to exploiting bi- dimensional shapes so as to represent information. Figure 1.2 illustrates the evolution of 2D barcode technology. Specifically, Figure 1.2 (a) shows a multiple barcode layout: the disadvantage associated with this straightforward 2D layout is the need of multiple scans in order to get all the data contained in the barcode. Figure 1.2 (b) illustrates a stacked barcode layout: during this case one single scan is enough to get data but the scanning equipment must be carefully aligned with the barcode orientation. Finally, in Figure 1.2 (c) a matrix barcode layout is presented: this layout enables to acquire information with one single scan and does not require the accurate alignment of the scanning equipment.



This completes a brief introduction about barcodes. Now we will have a look on details about 2D barcodes.

1.1 2D BARCODES

There are various types of 2D barcodes available [1]. They can be widely divided into two: Database 2D Barcodes and Index-Based Barcodes. The Database 2D barcodes were initially fancied to enhance knowledge capability for industrial applications. QR Code, VSCode, and Data Matrix belonged to the present kind. The operating of those codes will be integrated into mobile phones with constitutional cameras which will scan and rewrite data, permitting these 2D barcodes to work as transportable databases, material possession users access info anytime, anywhere, notwithstanding network property. The VS code that uses encrypted format of knowledge makes the mobile applications secure and helpful in biometric applications.

However once more the absence or presence of a really tiny quiet zone makes the decipherment inefficient. Within the case of knowledge matrix this can be solved by the employment of 2 styles of border however once more distortions inside the image cannot be handled. The compression of knowledge for compaction makes its decipherment advanced.

The other kind index-based 2D barcodes take into consideration the reading limitations of those constitutional cameras. The Visual Code, Shot Code, and Colour code belonging to this take into consideration the reading limitations of those constitutional cameras. They have a far lower knowledge capability than database 2D barcodes, however they provide strong and reliable barcode reading.

Every barcode primarily works as associate degree index that links the digital world to the real world, thus these barcodes need network property. Getting to the case of Visual codes they need an honest detection capability with structure however the data capability is extremely less (max 83 bits). Colour Codes has associate degree aesthetic shape however this once more makes decipherment bit advanced and perceivable. Colour Codes use set of colour and work on that.

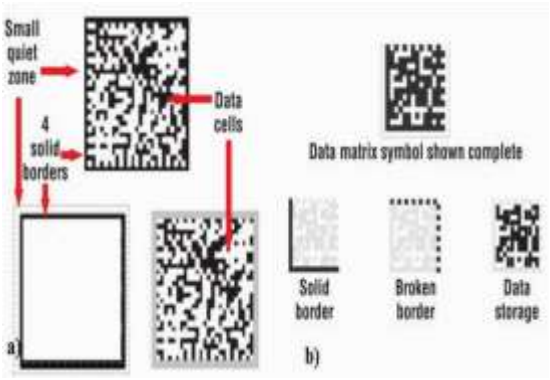


Fig – 1.1.1: Different types Of Database Barcodes- a)VS Code b) Data Matrix

The most distinguished and widespread 2D barcode is QR codes [1]. The "QR" stands for "quick response", a relevance to the speed at that the massive amounts of data they contain may be decoded by scanners.

They were fictional in 1994 in Japan by Denso-Wave and at the start used for chase shipping. Currently QR Code is seen and used everyday everyplace for the subsequent reasons: Many characteristics superior to linear bar codes: a lot of higher information density, support Kanji/Chinese character, etc. It may be employed by anybody freed from charge as Denso has discharged the patent into the general public domain.

System customary isn't necessity for current usages.

Most mobile phones in Japan equipped with cameras that change reading of QR Codes will access net addresses mechanically by merely reading a URL encoded within the QR Code.

QR codes adopt a rendezvous of black and white squares for all the desired functions. Especially, every module represents one bit following a simple rule: black squares store one and white squares store (fig). The options like high capability cryptography of knowledge, little output signal size, information linking practicality, information restoration practicality, readability from thirty-six zero degrees masking accessibility and confidentiality makes it additional powerful. The essential structure of QR code is already illustrious and standardized [1].

The finder patterns, alignment patterns and therefore the temporal order patterns build QR codes simply detectable similarly as decodable. The knowledge to be encoded is then enclosed in the opposite elements. The cryptography kind is initial known for the given information so cryptography is finished supported that. So as to be immune to errors and distortion up to an explicit level l, error correction code words equivalent to encoded words is formed supported Reed-Solomon error correction**.** Currently this code words and error correction code words square measure combined along and square measure placed at intervals QR code**.**

QR code thus created may be increased by the appliance of colour. The issues of that however colours ought to be selected and therefore the colour of border begin used is mentioned in [7]. Data secret writing is same as per the standards whereas rather than black and white we tend to choose exploitation the colours. This can be additionally handled in [9-12].

1.2 Motivation

Now a days rather than barcodes QR codes square measure wide used owing to their enhanced info storage capability compared to barcodes. Here the information is in horizontal and vertical format. Maximum storage capability of QR code exploitation solely 2 colours (black & white) is 4296 characters in version 40. This capacity can be further improved by considering more colors along with black and white i.e.; red, blue, green etc. or by using multiplexing technique.

1.3 Objectives:

1. To improve storage capacity of QR code using color QR code.
2. To provide security by using encryption and decryption technique.
3. To generate mobile readable QR code.

2. MEHODOLOGY

2.1 Problem Definition

The Quick Response Code (QR code) is focused with the goal of high-speed reading and encoding capacity compared to traditional barcodes. QR code has gained popularity over classical barcode because of several advantages like high capacity, reduced size, 360 degree of reading etc. However, the data capacity of existing QR codes has severely hindered their applicability.

Black and QR code is unable to store more amount of data. As compared to black and white QR code, color QR code can hold more data in same amount of space.

To increase the data capacity of QR code, leveraging color is arguably the most direct and inexpensive approach. Unfortunately, it remains an open technical challenge to decode color QR code in a robust manner, especially for high density ones.

2.2 Proposed Approach

A color QR code generator encrypts the given message into color QR codes which couldn't be read or understood by citizenry. But the message hidden in these color QR codes are often easily decoded by any smart phone with inbuilt camera. So as to keep the message secret and to guard it from unauthorized access a replacement method is usually recommended by merging color QR codes with cryptography and Steganography technique. During this proposed method an encoding process at the sender and a decoding process at the receiver.

A. Encoding Process: The encoding process involves encryption of the key message into color QR codes followed by:

1) Select the key text or data.

2) Encode it into a color QR code using any color QR code generator

3) Read a color image and embed the quantized bits of the color QR codes within the pixels of the color image using DCT and DWT method.

4) Save the stego image.

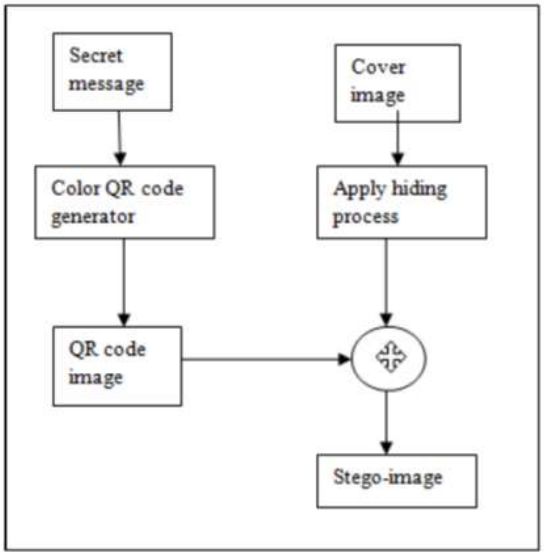


Fig - 2.2.1: Encoding Process

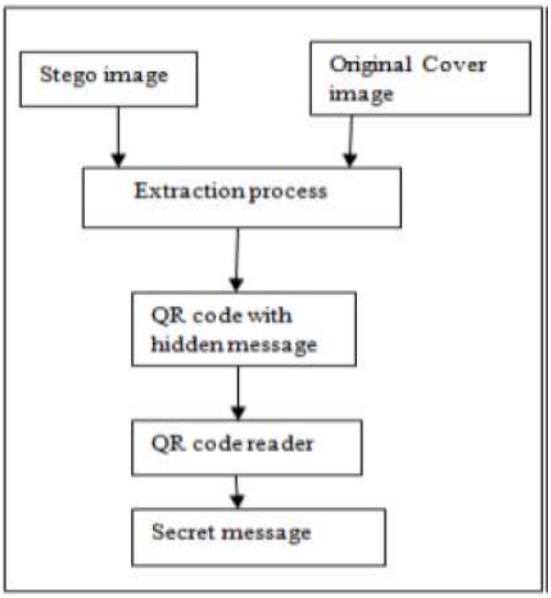


Fig - 2.2.2: Decoding Process

Algorithm:

Encoding Algorithm:

1. Enter the user's data to get the QR code.

2. Convert the entered data into its ASCII equivalent.

3. Using the ASCII equivalent Finite Fields Numbers are generated by using Primitive polynomial.

4. Codeword is generated for data.

5. The codeword is converted into its binary Equivalent.

6. These bits are placed consistent with the QR code pattern.

7. Each users QR code is taken into account as a color plane.

8. Combining the three-color planes, colored QR is generated.

Decoding Algorithm:

1. Read the color QR code.

2. Split it into RGB planes.

3. For every plane eliminate the QR patterns.

4. These bits are combined into 8-bit representation.

5. Convert the binary to decimal for every byte.

6. Apply to decoder as input.

7. The output of decoder are ASCII equivalents.

8. Converting them into characters that gives the first information.

3. IMPLEMENTATION DETAILS

3.1 Requirement Analysis

Tools and Technologies Used for Implementation. As of now, we are vigorously specializing in only software algorithms. We are using MATLAB 2017b tool for developing algorithms.

MATLAB: MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python. Though MATLAB is meant primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities.

3.2 System Requirements

Processor – i3
HDD – 160 GB
Ram – 2GB
Software: MATLAB R2015a

4. RESULT AND DISCUSSION

In figure 4.1 the GUI Main Window is shown with different buttons and text box. Insert the text in text box and click on INSERT TEXT button. To generate the color QR Code click on GENERATE QR CODE button, it generates the color QR Code as shown in figure 4.2.

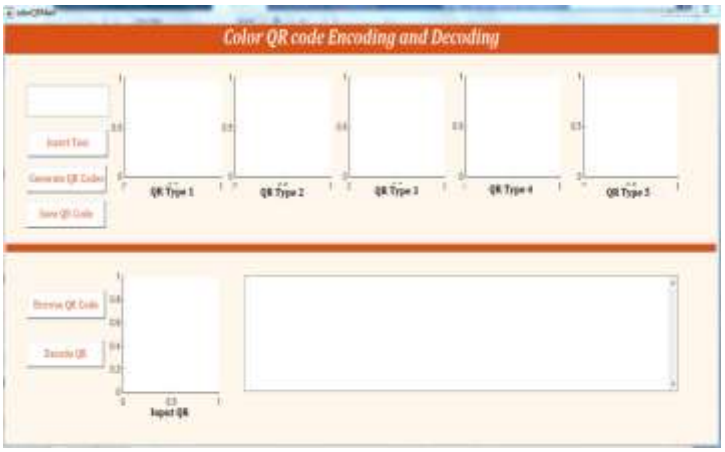


Fig - 4.1: GUI Main Window

Fig - 4.2: Generated QR Code

Click on BROWSE QR CODE button to scan it as shown in figure 4.3. To decode the browsed QR Code click on DECODE QR button and the text is decoded as shown in figure 4.4. Scan the QR Code with mobile phone and text is displayed as shown in figure 4.5 and 4.6.

Fig – 4.3: Browse the Generated QR Code

Fig - 4.4: Decoded QR Code by System

Fig – 4.5: QR Code Scan By Mobile Scanner

Fig – 4.6: Output of Mobile Scanner

Figure 4.7 displays GUI for Banking Application .Insert text in all text boxes and click on GENERATE COLOR QR CODE button ,color QR code is displayed as shown in figure 4.8. Scan the QR and text is displayed in figure 4.9.

Fig – 4.7: GUI for Banking Application

Fig – 4.8: Generated QR for Banking Application

Fig – 4.9: Output of Mobile Scanner

5. CONCLUSIONS

In this paper, we have proposed a method that jointly model different types of chromatic distortion together with newly discovered chromatic distortion, cross-module color interference, for high-density color QR codes.

QR codes are the foremost popular barcodes that are most useful. The paper has skilled different available two-dimensional barcodes and has seen that QR codes perform the simplest. Now the benefits of colors are incorporated with QR code to enhance its efficiency. Using colors will increase the data rate also as complexity in its decoding. Although, bit error rates and thus information capacities vary across the three resulting channels, the error rates are in ranges that are readily handled by the error correction coding options available for monochrome barcodes. Efficient methods can be adopted for its decoding. Using color QR we have generated high capacity QR that is accessible via Android as well.

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