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PICODE: PICTURE EMBEDDED 2D BARCODES

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ABSTRACT

Qrcodes which is called as quick response code is a 2D barcodes. Qrcodes contain the information about the item in which it is attached. Qrcode consist of black squares arranged in a square grid in which information's are present in both horizontal and vertical components of the image. This paper introduces the concept of QR codes, an automatic method to hide information using QR codes and to embed QR codes into colour images with bounded probability of detection error. The embedding methods are designed to be compatible with standard with full area coverage. The decoding process will first extract the QR code from the color image and then decoding is applied to the QR code to get the information which is embedded inside the QR code.

***Keywords*: Quick Response (QR) Codes, Half Toning, Ordered Dithering, Gray Scale Image, Binary Image**

I INTRODUCTION

A QR code is a 2D barcode that can encode information like numbers, letters and binary codes. QR code holds a considerably greater volume of information than a 1D barcode. QR code contains information both in vertical and horizontal direction. Maximum storage capacity of QR code is 4296 characters. There are 40 versions of QR codes and are used in a variety of applications, such as post information to social networks, accessing websites, download personal card information. This versatility makes them a valuable technique in any

Industry that seeks to engage mobile users from printed materials. The customised barcodes typically contain hyperlinks to direct to a webpage containing further information about the products to be promoted, and can also be used as a convenient electronic replacement of conventional coupons and membership cards. An important issue in QR codes is the square shapes and limited colour tolerance. This challenge has generated great interest for algorithms capable of hiding information in QR codes and embedding QR codes into images without loosing decoding robustness.

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PiCode is a new form of the 2D barcodes. It aims to show not only machine-readable data, but also show human-recognisable visual information or a picture, such as a company logo, a cartoon, a low resolution photo, etc. Since anyone scanning a barcode with his/her mobile phone must also look at it for seconds during the camera focusing process, it is a perfect opportunity to advertise the brand logo of a company or show a picture related to the promoted product. The existing 2D barcodes, such as Quick Response (QR) codes, is being used for this purpose by overwriting a central region of the barcode by a small picture. However, since the size of the overwritten region is limited by the error correlation capability and the size of the barcode in use, the embedded picture is typically too small to preserve the (brand) image quality of the (company logo) picture. The Pi Code technology improves the aesthetic value of the picture embedded barcode by allowing the picture to be overlaid on almost the whole barcode area.

II QR CODE STRUCTURE

The patterns and structures inside a QR code have well defined functions which include error correction, sampling grid determination, and symbol alignment. These patterns are used in the decoding process, to extract the QR code image. The information is encoded in square black and white modules of several pixels. Finder patterns play a central role in the speed and success of decoding and are located in three corners of the symbol as shown in figure 1. QR readers use binary images resulting from thresholding the captured gray scale image with local or global thresholds. This particular feature simplifies the computations and reduces the processing requirements for QR decoding. Function pattern shows the main regions in the QR symbol and their patterns. The modules in a QR code can be classified in two main categories: function pattern region and encoding region. The function pattern region includes the finder and alignment patterns as well as the timing patterns. The encoding region contains the information code words, the error correction code words and the modules used for the determination of the version and type of encoded data.

2.1 Function Pattern Region

This region contains all the necessary information to successfully detect and sample the information bits of the code. Finder and alignment patterns are the most essential modules in the region and are key to locate, rotate and align the QR code as well as to correct for deformations in the printing surface. In addition to finder and alignment patterns, timing patterns also aid in the determination of the sampling grid especially for large code sizes.

2.1.1 Finder Pattern

Finder patterns are easily identifiable as 3 concentric square structures in the corners of the code. They are designed to have the same ratio of black and white pixels when intersected by a line at any angle, allowing determining its centre even if the code is scanned at arbitrary angles. Finder patterns are surrounded by two guard zones of one QR 10 module wide called the separators. These zones aid in the separation of finder

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patterns from the encoding region and in the identification of the proper sequence of black and white pixels further improving the location accuracy.

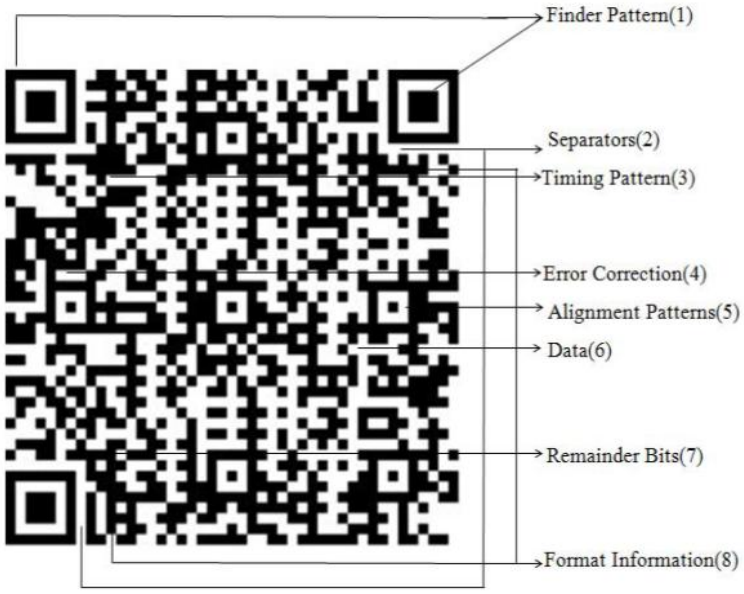

Fig 1. Structure of QR code

2.1.2 Separators

The white separators have a width of one pixel and improve the recognisability of the finder patters as they separate them from the actual data.

2.1.3 Error Correction

Similar to the data section, error correction codes are stored in 8 bits long code words in the error correction section.

2.1.4 Alignment Patterns

Alignment patterns on the other hand are used to determine the sampling grids from which code words are extracted and to correct for possible deformation of the printing surface.

2.1.5 Timing Patterns

The standard also defines two zones consisting on one row and one column of alternating black and white QR modules, denoted as the timing zones and located between finder patterns.

2.2 Encoding Region

The code area delimited by finder patterns is denoted as the encoding region, where data, parity modules and decoding information is stored. This area is divided into code words consisting of blocks of 8 QR modules. Two dimensional shapes of these code words depend on the version of the code and are designed to optimize area coverage.

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INFORMATION HIDING USING QR CODE

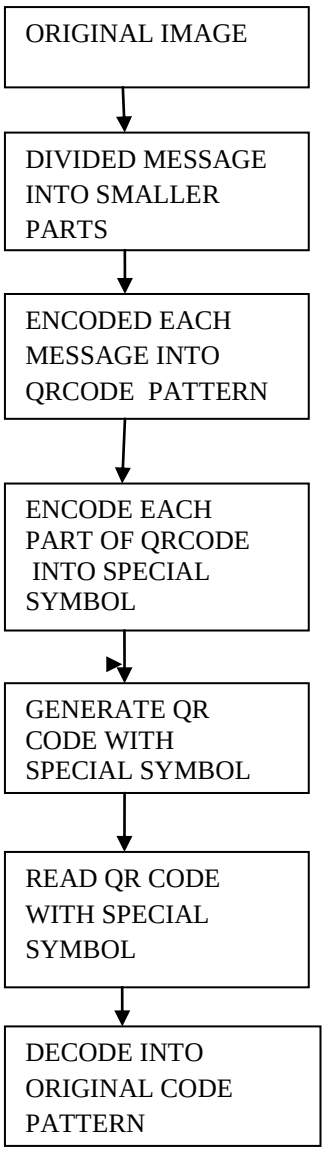

Fig 2. Architecture of information hiding using QR codes

The original message is divided, to form a string of characters, into smaller parts, where smaller part is the number of QR code pattern that can be formed by a string of characters. The data in each is part is encoded into ordinary QR code corresponding to that part of data. The architecture of information hiding using QR code is shown in Fig 2.

At the receiving end, this QR code with special symbols is decoded to give back the number of QR code patterns that was encoded. After that, when this QR code with special symbols is scanned or read by optical device such as a scanner or a camera phone, the picture image can be analyzed. Using this picture image original information can be read and the decode the information from single QR code with special symbols and split the

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data back to their QR code pattern where these QR code pattern can be read by ordinary QR code reader. The data in each QR code pattern were recognized and concatenated back to form its original information.

III QR CODE EMBEDDING IN COLOR IMAGES

QR embedding method will encode the information bits of the input QR code image into the color image. The information which is to be hiding is in central portion of the QR code. There are different techniques used for embeddings the QR code into the color image. We use the technique of Halftoning method to embed the QR code inside the color image.

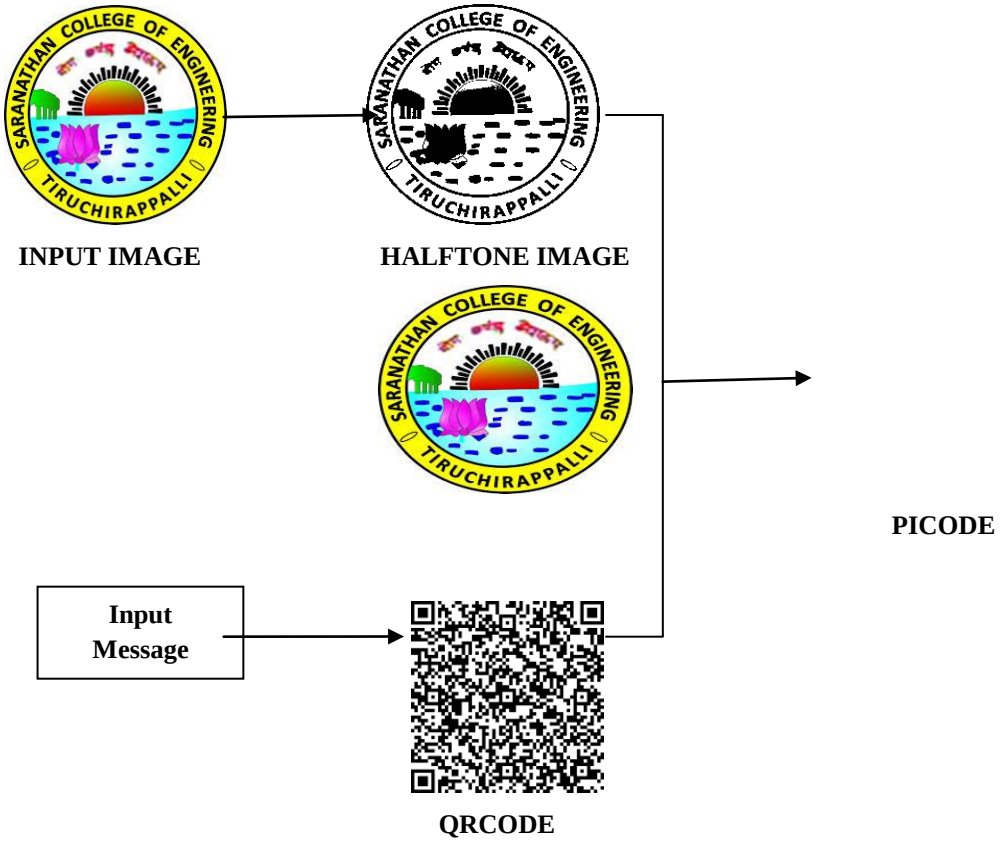

Fig3- Embedding Procedure

The inputs are the original image and the QR code. The encoding process of the QR code and the colour image is given below.

3.1 Input Image

The input images are color image and the QR codes. The information is present at the central portion of the QR code.

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3.2 Embedding Procedure

The Color image can be converted into gray scale image. The gray scale image and QR code can be embedded using the technique called Halftoning.

3.3 Halftone Technique

Halftoning is a technique for changing multi-tone images into two-tone binary images. We are using the process of ordered dithering technique. Ordered dithering is process of thresholding of the multi-tone image with a spatially periodic pattern. To dither an image, each pixel value is scaled and compared to a threshold in the corresponding element of the pattern, and if the pixel value is greater than the threshold, draw the pixel white otherwise, draw it black. After the Halftone process the halftone image and the QR code is embedded into color image by its luminance level modification.

3.4 Final Image

The final output of the encoding process is the color image which contains the QR code inside of it.

IV DECODING PROCESS

Decoding process include the process of extract the QR code from the color image and decode the information which is present inside of the QR code. First step is to get the QR code which is embedded inside the color image at the encoding process. after fetching the QR code we have to decode the information which is embedded inside the QR code.

V .APPLICATION

QR code is scannable by using the mobile phones. If we take any product it should have the QR code. If we scan the QR code we can get the details of the product, use of the product. We can also give the URL link inside the QR code when we scan the QR code it will automatically redirect to that particular webpage. Using Pi Code in advertisement business is to link customers in a more interactive, interesting, and unique way. So the Pi Code enables pictures/logo to be integrated with a 2D barcode to achieve enhanced visual appearance and high decoding reliability. It is not necessary to allocate extra space to print the QR code in the products we can embed QR code within the company logo.

VI. FUTURE ENHANCEMENT

This project can be further enhanced by designing the barcode scanner for scanning the picode (picture embedded 2d barcodes).QR code scanner only recognize the structure of QR code which contain the squarish pattern to scan the information. The squarish pattern is present at the three corners of the QR codes. Picode contain the QR code inside the image so we have to design the scanner in such a way that it can recognize the picode (picture embedded 2d barcode) structure and decode the information successfully.

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