

# QR-Code & its Benefits in Industry

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**Abstract**— QR Code (Quick Response Code) is a trademark for a matrix barcode, matrix barcode is a two dimensional barcode. It was first established in 1994 for automotive industry in Japan. After that it will become popular outside the automotive industry. A QR code build-up of four institutionalized encoding modes (numeric, alphanumeric, byte/ binary, and kanji) to efficiently store data. Kanji are the logographic Chinese characters that are utilized as a part of the Japanese written framework. A barcode is a machine-coherent optical mark that contains data about the thing to which it is joined. Matrix barcode: Data Matrix is a two-dimensional matrix barcode, which encodes content or crude information in an example of high contrast square modules. Common information measure in couple of bytes up to 2 kilobytes. By including error correction codes, the images can be perused regardless of whether they are in part hurt. QR codes are easy to utilize and adaptable. The code itself stores gigantic measures of data that is effortlessly examined and stored onto a mobile device. Numerous organizations are now adopting this code as a methods for promoting and as another approach to attract customers to the internet for more data. There is no need to have a notebook or pen to write down URL, It can be scanned anytime, anyplace utilizing cell phones. QR codes are very easy to create with the help of free software's.

**Key words:** QR Code

## I. INTRODUCTION

Quick Response Codes (QR codes) are essentially a sort of two-dimensional barcode that can only be read using smartphones and different gadgets that are dedicated to QR reading. The gadgets that can read a QR code interface specifically to texts, emails, websites, phone numbers and many more! You may have access few websites by scanning a QR code! Despite the fact that QR codes are extremely well known in Japan and over the East, they are gradually getting to be famous in the West.

We will begin to see the codes on shop displays, product packaging, printed and bulletin ads, in emails as well as on websites. The likelihood of QR Codes can have a huge impact on the society, particularly in the marketing and promotion of products, brands, services as well as any other thing is very high. On prior days barcode are used to distinguish the items yet in standardized identification, if any harmed will happened them then it won't examined in any case. In a QR code if any harmed will happened to code then additionally another part will get filtered any how this is the primary impact and preferred standpoint of the QR code.

## II. UNDERSTANDING QR CODE & ITS CHARACTERISTICS

QR codes has just overwhelmed the ubiquity of customary scanner tag in various districts as a result of a few advantages like increment in limit, reduced size, etc. Combined with the

assorted variety and extendibility offered, it influences the utilization of QR to code more engaging than that of the scanner tags. Measurably, QR codes are equipped for symbolizing same measure of information in around one tenth the space of a traditional barcode. Data, for example, URL, SMS, contact data and plain content can be inserted into the two dimensional framework. Besides, with the hazardous augmentation of the pattern to utilize smartphones has also played an imperative part in the popularity of QR codes. It is also take a small space and encode the data in such a manner that no any person will decide that data.

### A. Architecture & Encoding

QR code is a two dimensional i.e. framework compose image with a cell diagram implemented in a square. Figure below shown the QR Code Architecture QR codes comprise of various zones that are held for particular purposes. Finder, separator, timing patterns and alignment patterns comprised function patterns. Function patterns shall not be used for the encoding data. The finder patterns located at three corners of the symbol planned to aid simple area of its position, size and tendency. The encode system of QR Code include following steps. Firstly input information is encoded as per most productive mode and framed piece stream. The bit streams are divided into code words.

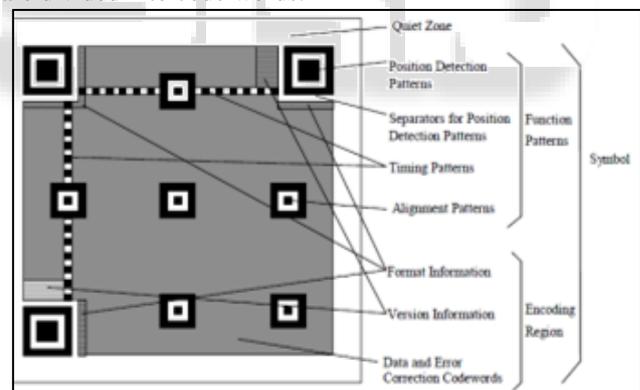


Fig. 1: Architecture & Encoding

Then code word are divided into blocks, and add error correction code words to each block. All these code words are put into a matrix and are masked with mask pattern. Finally function patterns are added into the QR symbol. A QR Code symbol is formed.

### B. Basic Characteristics

#### 1) Encodable character set:

- 1) Numeric data (Digits 0-9)
- 2) Alphanumeric data (Digits 0 - 9; upper case letters A-Z; nine other characters: space, \$ % \* + - . / :)
- 3) 8-bit byte data
- 4) Kanji characters

#### 2) Representation of Data

A dark module is a binary one and a light module is a binary zero.

3) *Symbol Size*

21 x 21 modules to 177 x 177 modules. Versions 1 to 40, increasing in steps of 4 modules per side.

4) *Data Characters per Symbol*

Maximum allowable data capacity for maximum symbol size version 40 and minimum error correcting level L:

- 1) Numeric data 7,089 characters
- 2) Alphanumeric data 4,296 characters
- 3) 8-bit byte data 2,953 characters
- 4) Kanji data 1,817 characters

5) *Selectable Error Correction Level*

Four levels of error correction allowing recovery of:

- 1) L 7%
- 2) M 15%
- 3) Q 25%
- 4) H 30%

III. 1D V/S 2D BARCODES

Feature of QR	QR code	Barcode
High capacity	Upto 7089 numeric digits 	10-20 digits 
Durability against soil and damage	Reading is possible (Upto 30% damaged) 	Reading impossible 
360° reading	Support 360° reading 	Horizontal Reading 
Reduced Space	40 digits Numeric approx. 5mm x 5mm tag. 	10 digits numeric approx. 50mm x 50mm tag 
Language Supported	Numeric, alphanumeric, kanji, kanji, kana.	Numeric alphanumeric.

Table 1:

IV. WHERE THEY ARE USED

Without a machine, it's impossible for human to physically interpret QR Codes yet they are effortlessly handled by smart phones. Clients take a photo QR Codes and the product introduced into their phones decodes the messages and appears, controls, or stores the information on their cell phones. Depending on type of data and nature of the application, different actions can be taken at decoding stage: a phone number can be consequently dialed, a short text can be sent, particular webpage can be display on browser by decoding the URL(Uniform Resource Locator) of that

particular site or a particular application can be installed or open. QR Codes are now part of daily life in most of the Countries because of their security level and scanned style. The website will look more effective if you are using QR-code. You can easily generate QR Code by using various free websites. QR Code is more essential to advertisement and marketing.

A. *Few Top Companies Using QR-Code*

- McDonalds utilizes QR codes to its packages. By scanning which it advise clients about the nutritious estimation of its burger or might be in some case, recipe of food also.



Fig. 2: Ex. of McDonald Barcode

- 1) Apple advertised the new i-Pod on bulletins with QR codes. QR Codes utilized as a part of a Nike advertising campaign allows direct access to a dedicated mobile site.

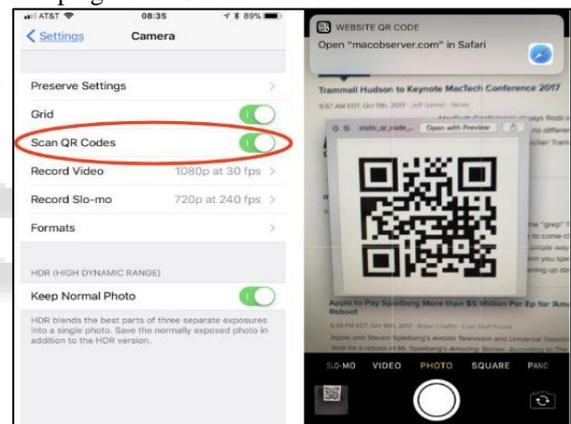


Fig. 3: Ex. of Apple Barcode

- Paytm is an Indian e-commerce payment system and digital wallet company who business very well during demonetization, they also used a QR-code to store the bank account details.



Fig. 4: Ex. of Paytm Barcode

- Turkish Airlines amid the London Olympics, Turkish Airlines used QR codes to make a scrounger pursue around the city's transport stops.



Fig. 5: Ex. of Turkish Airlines Barcode

- QR Code share your life in a single graphics.
- QR codes presently show up in magazines, ads, item wrappings, T-shirts, international IDs, business cards.

## V. DIVERSITY IN RESEARCH AREAS WHILE CONSIDERING QR CODE

### A. Improving Data Capacity

Data is independently encoded in three monochrome standardized identifications which are then consolidated as the cyan (C), magenta (M), and yellow (Y) colorant channels within a single print prompting a three-fold increase in data rate compared with the corresponding monochrome barcode. In figure encoding part is shown. Color QR code constructions offer three times the data rates of their monochrome partners with low bit error rates that are readily promptly taken care of by the error correction coding choices available in the QR code.

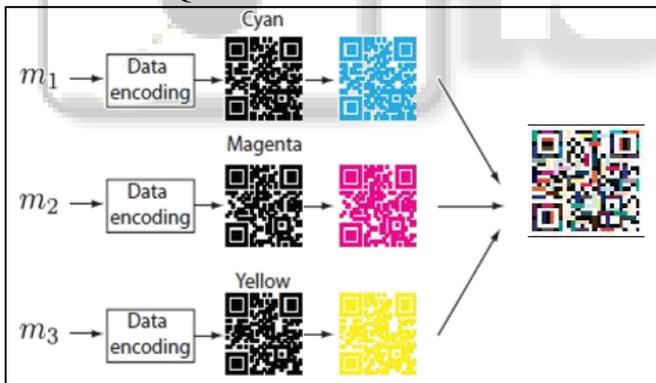


Fig. 6: Channel based Data Encoding

### B. Use of Multiplexing to Increase Information

The technique presented by to increase the amount of data, as the original data in QR Code, keeping secret data as well

The original information that is should have been encoded is isolated into smaller parts. A QR Code design is generated for each part in its standard shape. Each pattern multiplexed and spoke to each module in QR Code with black and white color or some with special symbols. At the receiving end, this QR Code with extraordinary symbols (multiplexed ones) is decoded to give back the similar number of QR Code designs that was multiplexed. These decoded QR Code pattern can be read by the general QR Code reader of the smart phones and the data can be concatenated back to form its original information.

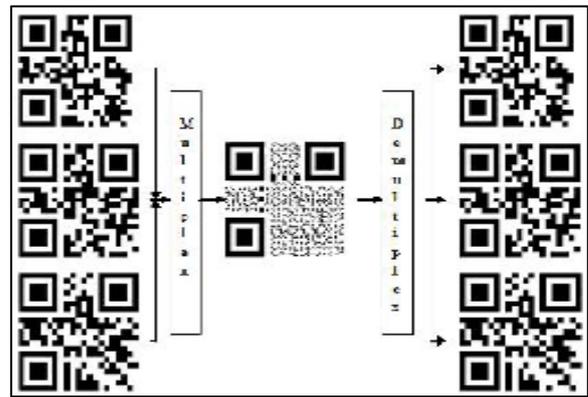


Fig. 7: Multiplexing & DE multiplexing Method

### C. Scratch Removal Technique

In barcode if any harmed happen to code they won't get read by the machine but in QR-Code if any damaged happen to code then also they will get scanned with the help of few techniques, technique on removing scratch or damage that exists on QR-code. The harm applies on some curtain area, which consider as data zone of the QR code. The scratch removal technique comprises of several processes. With a specific end goal to expel scratch from hurt QR-code, mimic HSV (Hue, Saturation and Value) is connected and scratch on harm QR-code turns out to be more unmistakable. Next, Morphological Image handling technique is apply by start with Dilation process that change the image structure and allow scratch turn out to be significantly more obvious. At this point scratch should be obvious enough and able to remove. To increase efficiency of decoding, Median filter is applied by transform image to Binary image to removing noise. image that been optimizing with the image handling technique is able to be decode with standard cell phone QR code programming with no data lost

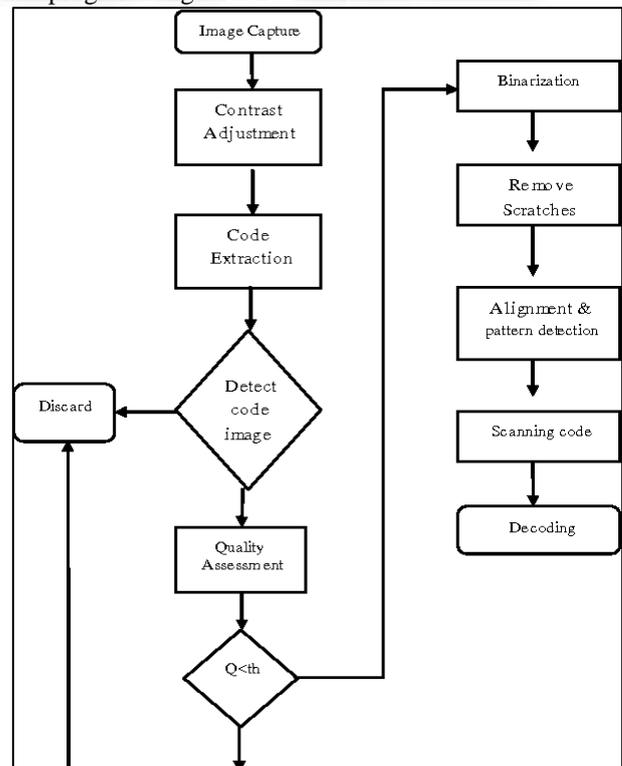


Fig. 4: Scratch Removal Technique

#### D. Data Hiding Techniques

Nowadays, business activities on web and media are incredibly exploding. The 2D Barcode with a computerized watermark is a broadly interesting exploration in security field. Numerous methodologies towards data hiding have been proposed for various attributes, such as imperceptibility, power, capacity and reversibility. These are utilized for different applications like secret communication, copyright protection, picture altering identification and other human-focused approaches. Even though conventional data hiding techniques have been capable to make secret information impalpable to attackers, alterations of cover media, caused by the hiding process have regularly been unavoidable and irreversible. As indicated by created reversible information concealing techniques, four primary advances have been broadly connected: the pressure based innovation, the distinction development based innovation, the histogram-based innovation and unmistakable watermarking

#### VI. CONCLUSION

This paper infers that there are such huge numbers of conceivable outcomes for QR code's utilization in various territories that is yet to be investigated. The innovation has a firm ground for examine viewpoints. An ever increasing number of investigations are finished with QR codes in various angles like improving the security, better acknowledgment, diminishing excess keeping in mind the end goal to spare space, probability of encoding distinctive sort of information like audio, and etc. As QR code gives the basic adaptability, it opens up the gigantic stage for scientists to investigate the conceivable outcomes to improve the execution of QR code or to blend QR code with various innovations, like

- Tests should be possible to enhance data capacity of QR codes.
- To discover the possibility of the utilization of coding systems other than RS coding.
- Utilize encryption to encode information, and after that encode it to QR code for better security arrangements

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