

# Review: Quick Response (QR) Code types and its Characteristics

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**Abstract**— QR code is in the form of matrix barcode which was introduced by Denso Wave for the automotive industry. Due to the automotive industries fast readability and more storage capacity, the QR Code system has become admired outside as compare to standard UPC barcodes. This paper take account of QR codes basics, its real time application in day to day life and research areas associated. With the technology of mobile phones constantly emerging, especially in the area of mobile internet access, QR codes seem to be an adequate tool to quickly and efficiently converse URLs to users. QR code permits offline media such as newspapers, business cards, public transport vehicles, magazines, signs and any other medium that can embrace the print of a QR code to be used as carriers for advertisements for online products. Due to QR code structural flexibility, it being so versatile that it leads to so many different fields for research such as increasing data capacity and also security applications. For better recognition of the QR code image, several experiments have been done which includes scratch removal techniques. This paper is an attempt to highlight QR codes and its characteristics.

**Key words:** Quick Response Code, UPC Barcode, Kanji & Kana Capacity

## I. INTRODUCTION

Even if you don't know what a "QR code" is, you've probably seen them. They may become visible everywhere like in any ads, catalogs, any products, business cards or any brochures. They mostly appear in black and white color. [2] QR code stands for Quick response code and they look like UPC barcodes usually seen on product packaging. QR codes is superior than UPC barcodes because it stores only about 12 numbers or letters while QR code stores about 4,000 numbers or letters. Now-a-days mobile phone became the most important and most useful product for everyone and its affordable to almost everyone. Before mobile phones only some people or business person were able use the technologies for reading and processing the code. Now most of the mobile phones provides the by default facility of scanning codes. Scanning the code became very easy for everyone as it is made in user friendly format.

QR code is also in user readable format as it stores the letters or number. It accepts any kind of information. The text does not need to be a website address. For example, it can also be a representation of the information on your business card which may be a personal data. When phone scans the code, the software on the phone interprets the text and decides what to do. If it is personal information from a business card, it may ask you if you for confirmation weather you want to add it to your address book. If it is a website address, the software on your phone will usually open the address on your phone's web browser. QR code is very popular now-a-days for its greater storage than

standard UPC barcodes. This code consists of white background with black module set in a square structure. The information which is encoded using this method may use different types of data which can be in the form numeric, alphanumeric, byte or bits or kanji.

## II. CHARACTERISTICS OF QR CODE

### A. High Ability Encoding Data

QR Code is able to handle several hundred times more information than the bar codes which are capable of storing nearly 20 digit. QR code provides better storage area. A single symbol of QR code includes up to 7089 characters which encodes the original data and that data can be in the form numeric and alphabetic characters, Kanji, Kana, symbols, binary.[3]

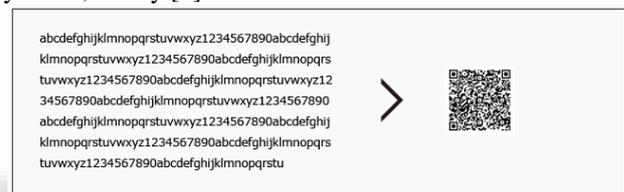


Fig. 1: Example of high capacity encoding data in QR code

### B. Small Print out Size:

QR code consists of information stored in both vertical and horizontal format. QR code is able to encode same amount data almost one-tenth the space of conventional barcode. so QR codes very less amount of space to store data. For example –Micro QR code [3]



Fig. 2: Example of small print out size of QR code

### C. Kanji & Kana Capacity:

QR codes are developed in Japan so QR code is capable of storing a data which consist of kanji character set. And one character of kanji and kana is encoded in 13 bits which stores more than 20% data compared to other symbologies.



Fig. 3: Example of kanji and kana capacity in QR code

### D. Dirt & Damage Resistant:

QR Code has error correction skill. If the symbol or any data is dirty or damaged then that data can be restored up to 30% of code word. So there is no complete loss of data. In QR

code one code word is equivalent to 8 bits that code word is a unit which build data area. The amount of restoring the data is depends upon the amount of damage. [3]

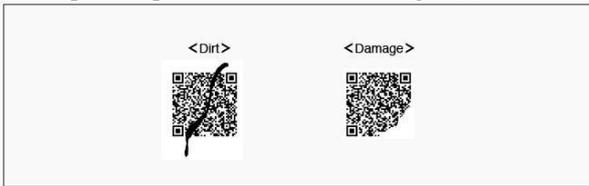


Fig. 4: Example of dirt and damage resistant in QR code

**E. Readable from any Direction of 360**

QR code is able to read 360 degree with high speed. QR Code completes reading task from the located three corners by position detection patterns with guarantee of stable high-speed reading and also avoiding the negative effects of background intrusion. [3]



Fig. 5: Example of readable from any direction of 360 in QR Code

**F. Structure Appending Features**

The information within a QR code can be divided into specific area in the code. On the other hand, data stored in multiple QR Code symbols can be regained in a single data symbol. [3]

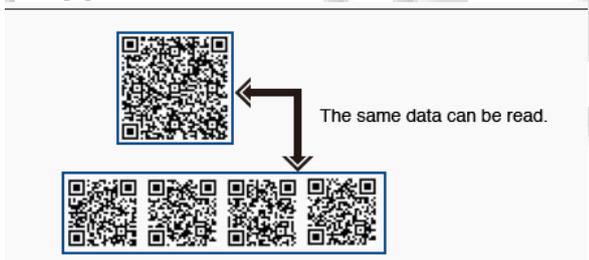


Fig. 6: Example of structure appending features in QR Code.

**III. TYPES OF QR CODE**

**A. Micro QR Code:**

Micro QR codes is a smaller version of QR code which is use to store small amount of data, it is design to provide smaller surface area for storing small amount of numerical data. Their future use is on objects where physical surface area is a limiting factor. When micro QR code is compared with regular QR code, regular QR code uses definite amount of area as position detection patterns are situated at three different corners of a symbol where micro QR code uses only one position detection pattern. Also regular QR code needs minimum four-module wide margin around a symbol while Micro QR code needs only two-module wide margin. This way micro QR code is more efficient than regular QR code which allows Micro QR code to take even printing area smaller compared to regular QR code.[5]

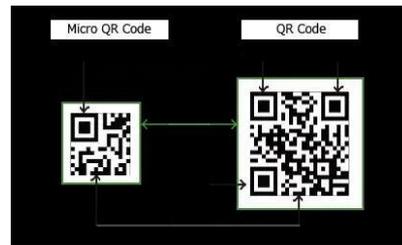


Fig. 1.1: Micro QR code.

**B. iQR Code:**

iQR codes store huge amount of data more efficiently because it uses the more number of rows and columns which is greater than standard QR code. iQR Codes also support rectangular modules in which black squares seen in QR Code, this allows for them to be printed direct onto some non-flat surfaces. It also encourages more error correction over the damage. [5]



Fig. III.2: iQR Code

**C. Frame QR Code:**

When Denso Wave identified the trends of people to insert their images into QR Codes that times he invent Frame QR codes which have a central area blank which is used as a canvas which helps the easier insertion of a any logo or other graphic structure within the code. It requires updates in order to generate and read because it is not compatible with QR Code scanners and generators. [5]



Fig. III.3: Frame QR code

**D. SQR Code:**

SQRC is one of the types of QR Code which enables the reading restricting function. This feature is more useful to accumulate personal data and to secure any organization's private information. SQRC is a registered trademark of DENSO WAVE INCORPORATED not only in Japan but also in many other countries. [5]

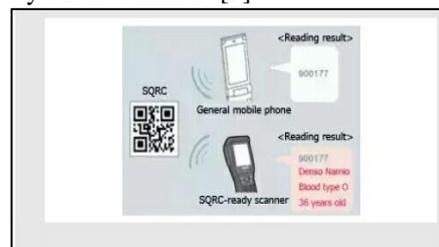


Fig. 1.4: SQR code

#### IV. STRUCTURE OF QR CODE:

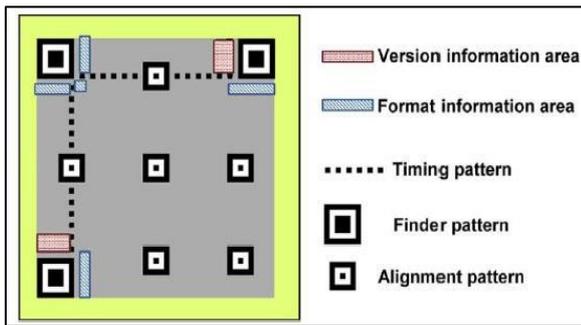


Fig. 1: Structure of QR Code

##### A. Finder Pattern:

Finder pattern can be seen at the edges in a QR code image. This pattern consists of black squares and also three types of finder patterns on every QR code image such as they are at the top left, top right, bottom left and not at bottom right. The main function of the finder pattern is to state a scanner or decoder that the image that has been encoded as a QR-code image. In finder pattern, data is not stored. [1]

##### B. Alignment Pattern:

The alignment pattern provides information scanner devices to properly position the data stored in the encoded data region. Like as finder pattern, there is no data stored in the alignment pattern also. The alignment pattern is positioned between encoded data and is usually in the center of the image. The structure of alignment pattern includes small square patterns with tiny dots. There exist different QR codes with different alignment patterns. [1]

##### C. Timing Pattern:

Timing patterns are arranged vertically as well as horizontally which lies between two finder patterns. A black dot is present in it. The main purpose of the timing pattern is to correct the central coordinate for each data cell when any distortion occurs during decoding of symbols or when an error is found in any cell pitch in the QR code. No data is stored in the timing pattern. [1]

##### D. Encoded Data:

This pattern is located at the center of the image. Data is stored within this pattern. In addition, when data is inserted, it is converted to binary data. This binary data is converted back to the normal text when the image is decoded by a scanner. [1]

#### V. ADVANTAGES

- Code can be scanned by any device which has ability to scan code like smart phones, barcode readers.
- All types of data such as numeric, alphabets, special character and binary can be encoded in QR codes.
- It provides the fast scanning of data.
- If some part of the code is damaged, information can still be recovered from the code since QR code has ability of good fault tolerance.
- QR code store huge amount of data than the 1-d barcodes

#### VI. DISADVANTAGES

- We need expensive smart phones for scanning QR codes as compare to simpler phone.
- People are not much familiar with new barcode types. So training is necessary for understanding advantages of using QR codes

#### VII. CONCLUSION

In this paper, QR codes are evaluated from the viewpoint of their importance and uses. QR code can store complex information within a small code. Once the importance of QR codes will be spread to everyone we can implement them for public use also. QR code can be work as media for using technologies in educational field.

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