

# Increase of QR Code Usage over Other Codes Having Better Features

Heena Patel<sup>1</sup>, Dipal Modi<sup>2</sup>, Pooja Thakar<sup>3</sup>

<sup>1</sup>SAL Institute of Technology and Engineering Research,  
Oop. Science City, Sola-Bhadaj Road, Ahmedabad, Gujarat, India

<sup>2</sup>Hasmukh Goswami College of Engineering,  
Naroda - Dehgam Road, Vahelal – Dascroi, Ahmedabad-380025, Gujarat, India

<sup>3</sup>Asst. professor, SAL Institute of Technology and Engineering Research,  
Oop. Science City, Sola-Bhadaj Road, Ahmedabad, Gujarat, India

**Abstract:** *There are many codes used for different application. The most common code we see on the product is one dimensional barcode which stores only digits. Nowadays, there are many types of two-dimensional codes are available. They have their different features. Here we compare the different codes. And we conclude that the QR code is better among the all codes. From all the two-dimensional code the QR code, having more advantages over the other codes.*

**Keywords:** barcode, QR code.

## 1. Introduction

There are many types of codes available in the market. Generally the one dimensional barcode is used on the product to read its price or to identify the product. And the capacity of the one dimensional barcode has very low capacity to contain the data. So to overcome this problem the two dimensional codes are introduced. In two dimensional codes, there are also different types of codes. They are on the base of the data storage capacity, error correction capacity, data reading speed, code compression capacity, etc. The two dimensional code is allow to encode the information of item. The two dimensional code has two axes to carry the data. The size of one dimensional barcode is reduced as compare to one dimensional barcode. From all the two dimensional code the QR (Quick Response) code is better and become famous due to its features. Section 2 gives brief introduction of one dimensional barcode. Section 3 gives an overview of two dimensional barcodes. Section 4 compares one dimensional and two dimensional barcodes. Finally section 5 describes QR Code and its features.

## 2. One Dimensional Barcode

The one dimensional barcodes are designed for computer recognition which consist the thick and thick lines [1]. In the one dimensional barcode, the data is represented systematically by varying the widths and spacing of the parallel lines [2]. The barcode is used to identify the item or product. It can carry tens of data. The barcodes are read by optical scanning, and it is decoded by computer program. In the barcode, code itself does not contain any information, but it represents the string of identifying numbers or letters [1]. The optical scanner is linked to the computerized device. This device provides and records the data or information about the item or product. The barcode can carry limited data such as tens of alphanumeric. And it covers the wide space area as it contains the data in only one dimension. To read the barcode special scanner is required. If the barcode is damaged then it cannot be read correctly. To overcome these

problems the two dimensional code is invented. Example of one dimensional code are code 39, code 128, EAN-13, ISBN, EAN-8, etc [3].

## 3. Two Dimensional Codes

The two dimensional codes contain the data in two axes. So they increase the data carrying capacity. In two dimensional codes the available space for data is increases. The two dimensional code is one of the simpler and cheap method to store the data, using some encoding methods. The two dimensional code can compress the data like digits, texts and small images in some geometric shapes, the decoder convert it to the original data. The two dimensional code has features such as high information capacity, high reliability, small storage space, etc. There are different types of two-dimensional code such as Data matrix, PDF417, Maxi code, QR code, etc, are shown in the table 1. We can conclude that the QR code is better than all other codes. The four widely used two-dimensional codes are described in following:

**QR code:** It is a two-dimensional code which contains the data in matrix type. It can read by smart phone, no any special scanning device is necessary to read it. So it becomes popular. It has small print size, so it can be printed on visiting card.

**PDF417:** In this code PDF stands for portable data file and 417 signifies that 17 modules of 4 bars and spaces for each code. This code is vertically stacked linear barcode. This code contains the 3 to 90 rows. This code is used for identification card, transportation, etc. [8]

**Data Matrix:** The data matrix is square or rectangular shaped matrix type code which consist the black and white cell or module. It can carry the up to 2335 alphanumeric. It is used to label the small components.

**Maxi code:** It is small sized and square shaped code. It has dot arrangement in the hexagonal grid, not in the bars. This

code has bullseye in the centre, which is surrounded by the pattern of the hexagonal dots.

**Table 1:** Types of two dimensional code [4]

Symbology	QR code	PDF417	Data Matrix	Maxi code
Example				
Type	Matrix	Stacked	Matrix	Maxi code
Data Capacity-Numeric	7089	2710	3116	138
Data Capacity-Alphanumeric	4296	1850	2355	93
Main Features	Large capacity, small print size, high scan speed	Large capacity	Small print size	High scan speed

#### 4. Comparison of One Dimensional Barcode and Two-Dimensional Code

The one dimensional code contains data in only one axis and two-dimensional code contains data in two-dimensions (axis) as shown in figure. The two dimensional QR code has 360 degree high speed reading and one dimensional barcode has only horizontal reading. The two dimensional QR code can recover 30% of damage, and one dimensional barcode cannot recover the damage [1].



**Figure 1(a):** The data contained in one and two dimensional codes [4]



**Figure 1(b):** Code reading in one and two dimensional codes [4]



**Figure 1(c):** The data recovery for damaged code in one and two dimensional codes [4]

The one dimensional code require special scanner to read it, two-dimensional code does not required the scanner. The one dimensional barcode can contain tens of alphanumeric; two-dimensional code can contain hundreds of alphanumeric. The two dimensional code require less space as compare to the one dimensional barcode. So, two-dimensional code has become more famous than one dimensional code because of their features and usability.

#### 5. The QR code

The QR code is designed for automotive company in Japan first time. The QR code is basically the square shaped matrix type code, which contain the data in black and white modules. The black module represents the binary 1 value and the White value represents the binary 0 value.

##### 5.1 The structure of QR code

The structure of QR code is as shown in figure 2. The QR code symbol is nominally square and it is consist of encoding region and function patterns, such as finder, separator, timing patterns, alignment, etc. The QR code symbol should be surrounded by quit zone border.

**Separators:** A one-module wide separator of light modules is placed between position detection and encoding region to differentiate.

**Timing pattern:** The horizontal and vertical timing patterns consist of one module wide row or column which is dark and light module alternatively. Both timing patterns runs 6of the symbol between the separators for the upper and left-hand position detection patterns. The enable the symbol version and density.

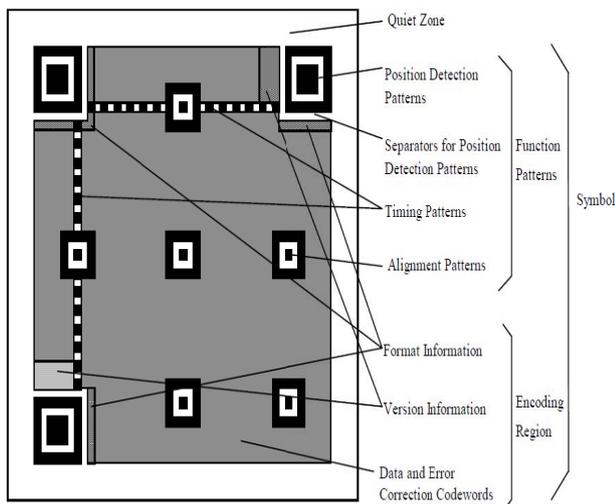


Figure 2: The structure of QR code [5]

**Alignment patterns:** The alignment pattern may be viewed as three superimposed squares of dark and light module. The numbers of alignment patterns are depend on the version of the symbol.

**Encoding region:** The area contain the symbol characters representing data, error correction code words, the version and format information is called encoding region.

**Quiet zone:** The light module surrounding the symbol on all four sides which shall be free of all other markings is known as quiet zone.

## 5.2 Basic characteristics of QR code [6]

### (a) Encodable character set:

- (1) **Numerical data :** digits 0-9
- (2) **Alphanumerical data:** digits 0-9, upper case letters A-Z, special characters space, \$%\*+ \_ . / : )
- (3) **8-bit byte data:** JIS 8-bit character set (Latin and Kana) in accordance with JIS X 0201

**(b) Representation of data:** A dark module is represents binary one and a light module represents binary zero.

**(c) Symbol size:** 21 x 21 modules to 177 x 177 (versions 1 to 40)

**(d) Code type:** matrix type

### (e) Selectable error correction:

- L level 7%
- M level 15%
- Q level 25%
- H level 30%

## 5.3 The statistics for scanning of QR code from the different locations of the QR code

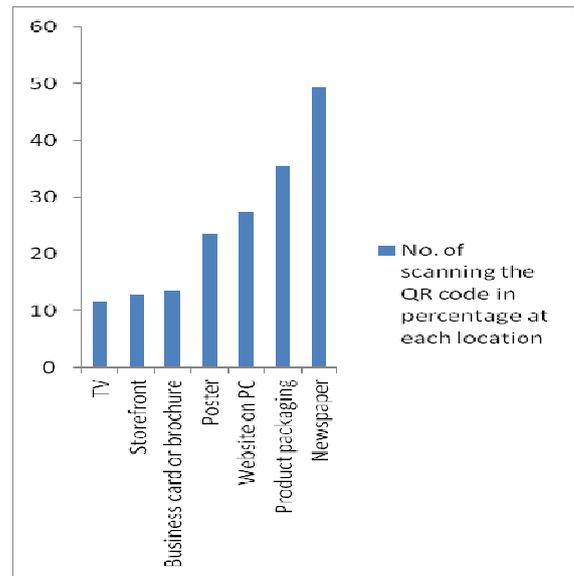


Figure 3: Statistics for scanning of QR code from the different locations of QR code

The QR code can locate at different places such as TV, newspaper, product packaging, storefront. The figure 3 shows the statistics for the scanning of QR code from where they located. The value of scanning the QR code is in percentage. From the newspaper the QR code is scanned greater times as compare to other locations.

## 6. Conclusion

Studying the one dimensional and two-dimensional code, can conclude that the two dimensional code is better. From all types of two-dimensional code, the QR code is better because it has features like high data capacity, supporting of 360 degree fast reading, recovery of 30% of damage, capacity of error correction code, and no special scanner is required to scan it.

## References

- [1] [http://www.encyclopedia.com/topic/bar\\_code.aspx#1](http://www.encyclopedia.com/topic/bar_code.aspx#1)
- [2] <http://en.wikipedia.org/wiki/Barcode>
- [3] <http://www.nationwidebarcode.com/1d-barcode-format/>
- [4] Uniquely Speaking, A technology e-newsletter from Unique Micro Design (Issue 10) Jin Soon
- [5] David Muñoz-Mejías, Iván González-Díaz, and Fernando Díaz-de-María, "A Low-Complexity Pre-Processing System for Restoring Low-Quality QR Code Images", IEEE Transactions on Consumer Electronics, Vol. 57, No. 3, August 2011
- [6] ISO/IEC 18004:2000(E), Information technology – Automatic identification and data capture techniques – Bar code symbology – QR Code
- [7] Hou A-Lin, FengYuan, Geng Ying, "QR code image detection using run-length coding", 2011 International Conference on Computer Science and Network Technology, 978-1-4577-1587-7/111©2011 IEEE
- [8] <http://en.wikipedia.org/wiki/PDF417>
- [9] David Muñoz-Mejías, Iván González-Díaz, Fernando Díaz-de-María, "A Low-Complexity Pre-Processing

System for Restoring Low-Quality QR Code Images”,  
IEEE Transactions on Consumer Electronics, Vol. 57,  
No. 3, August 2011

### **Author Profiles**

**Heena Patel** has completed B.E. in Electronics and Communication Engineering from Universal College of Engineering and Technology, Gandhinagar, Gujarat, India in 2012 which is under Gujarat Technological University. And now she is doing her M.E. in Electronics and Communication Engineering from SAL Institute of Technology and Engineering Research, Ahmedabad, Gujarat, India, which is under Gujarat Technological University.

**Dipal Modi** received the Diploma and B.E degrees in Electronics and Communication Engineering from Government Polytechnic for Girls, Ahmedabad, Gujarat, India in 2009 which is under technical examination board and Universal College of Engineering and Technology, Gandhinagar, Gujarat, India in 2012 which is under Gujarat Technological University, respectively. And now she is doing M.E. in Electronics and Communication from Hasmukh Goswami College of Engineering, Vahelal, Gujarat, India, which is under Gujarat Technological University.

**Pooja Thakar** has completed BE in Electronics and Communication Engineering from LCIT which is under North Gujarat University. She has completed her master from Charusat, Changa. I have done APGD in Geoinformatics and satellite communication from Gujarat University. I have taken training at SAC ISRO during my APGD study. And now she is working as Assistant professor in E.C. department at SAL Institute of Technology and Engineering Research, Ahmedabad, Gujarat, India.