

# A Survey on: HC2D Barcode Modulation Technique

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**Abstract--** Bar-coding, since its evolution has emerged as a very secure and quick way to identify the data or things uniquely, but the other major use of the bar-coding is to secure the data using barcodes. The concept of 2-D barcodes is of great relevance for use in wireless data transmission between handheld electronic devices. In a general setup of barcode standalone systems, any file on a cell phone, for example, can be transferred to a second cell phone through a series of images on the LCD which are then captured and decoded through the barcode scanner of the second cell phone. In the proposed system, a new approach for data modulation in high capacity 2-D barcodes is introduced, where in the High capacity 2 D barcode of 448\*63 pixels is used to barcode the data and thereby transmitted through any wireless or wired medium. The proposed barcode has a high capacity of encoding the large amount of data by making use of MD5 secure hashing algorithm for uniquely identifying the data. The data is hashed using MD5 algorithm and thereby retrieved by cross hashing the values decoded from the barcode. The proposed bar-coding and barcode modulation technique makes use of the latest technology for generating and reading the barcodes and thereby avail users to securely transmit the data. In this paper we have propose the survey of barcode types and compare this with high capacity 2D barcode.

**Keywords--** Barcode, HC2D, High Capacity, 2 D barcode, MD5 algorithm.

## I. INTRODUCTION

In today's business environment, staying competitive is critical to your success. Bar code data-collection technology is an effective way to improve the bottom line and meet the competitive challenges your organization faces every day .Combined with data-collection technology, bar codes provide a rapid, accurate, and efficient means to collect, process, transmit, record, and manage data in a variety of industries. Retail, package delivery, warehousing and distribution, manufacturing, healthcare, and point-of-service applications can all benefit from the use of bar codes. Bar code is a fundamentally simple technology. But like the chain - or the wheel - simplicity of concept relies heavily on excellence of total execution.

Data ID takes full responsibility to provide you, our customer, with every link in the chain primitively barcodes represented data by varying the widths and spacing of parallel lines, and may be referred to as linear or one-dimensional. Later they evolved into rectangles, dots, hexagons and other geometric patterns in two dimensions. The HC2D barcode is a highest capacity of 2D barcode while it occupies a small area. The size of the HC2Dbarcode is suitable for displaying on print media such as paper and poster. But, for reading the HC2D barcode, the bit representation of the barcode is obtained by scanning the image of the barcode with scanner machine only.

This paper includes the basic understanding of HC2D barcode in the next section. Section III. Shows the comparison between one dimensional and two dimensional barcodes. Section IV. includes the comparisons of HC2D Barcode with other barcode in different factors. In section V. Application of HC2D barcode. Section VI. is the conclusion.

## II. UNDERSTANDING OF HC2D BAR CODE

Nowadays, almost of mobile phones have embedded camera devices, and some of those have more than over megapixel range image sensor cameras. Also, the embedded camera devices can be used as new input interfaces such as for symbol recognition. In the recent, most mobile phones, with camera Devices support symbol recognition, such as 1D barcode and 2D barcode [1] (PDF417 barcode [2], data-matrix barcode [3] and QR code [4]) and these code symbols are used for reading URLs or plaintext. HC2D barcode [5] is largest capacity of 2D barcode for communication, public relations, and data Transport. However, in general, the HC2D barcode can recognition only in scanner machine

### A. Architecture

HC2D barcode is a 2D barcode which consists of a black square pattern on white background. The HC2D barcode contains information in the vertical direction as well as thehorizontal direction.

The data capacity can be the maximum of 7,250 numeric characters, 10,100 ASCII characters. HC2D barcode use the Reed-Solomon [6] error correction which can detect and correct multiple errors and HC2D barcode have an option to compression data it's powerful for a large of data. HC2D barcode can be read by standard scanners machine. The HC2D barcode is a greater capacity than other 2D barcodes. Shape of HC2D barcode is suitable for use with paper documents or print media. The HC2D barcode are shown in fig I.



Figure I: HC2D Barcode [3]

The HC2D barcode consists of a vertical line on the left of the barcode and a horizontal line on the bottom. The top of the vertical line is a detection point. Another detection point is where the vertical line and horizontal line meet. The dash line on the top is used for sampling column widths. The vertical line on the right is the stop indicator. Finally, the data area is configured as a 63x448 matrix which can store black and white pixels up to 28,224 pixels. The characteristics of the HC2D barcode are shown in Fig. II.

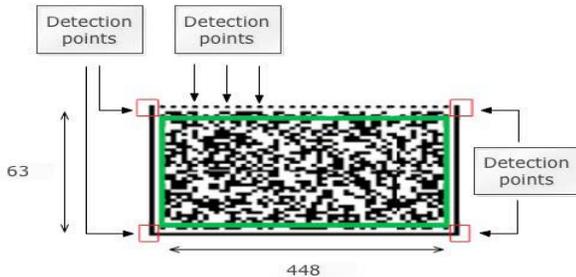
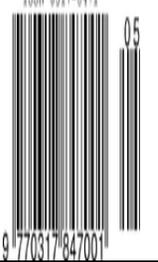


Figure II: Characteristics of HC2D Barcode [2]

### III. 1D V/S 2D BARCODES

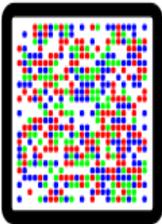
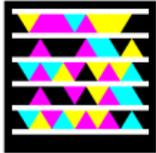
**1D Barcode:** If you are looking to read "conventional" 1D barcodes (these are the ones commonly found on most supermarket products you would purchase) then all you need is a 1D barcode scanner. 1D barcode scanners are capable of reading 1D barcodes ONLY. 1D barcodes typically hold a single line of information, such as a part number.

**TABLE I**  
**1D BARCODES TYPES**

Example	Name	Uses
	Coda bar	Old format used in libraries and blood banks and on air bills (out of date)
	Code 25 – Interleaved 2 of 5	Wholesale, libraries International standard ISO/IEC 16390
	Code 11	Telephones (out of date)
	Code 39	Various – international standard ISO/IEC 16388
	EAN 2	Addoncode (magazines), GS1-approved – not an own symbology – to be used only with an EAN/UPC according
	MSI	Used for warehouse shelves and inventory
	Pharmacode	Pharmaceutical packaging (no international standard available)

**2 D Barcode:** If you are looking to scan 2D barcodes (these are the ones found on advertisement boards or magazine articles for example and look like a square maze), then you will need to look at 2D barcode scanners. 2D barcode scanners are capable of reading both 1D AND 2D barcodes. 2D barcodes are capable of holding multiple lines of information, such as someone's name, address, and phone numbers.

**TABLE II**  
**1 D BARCODES TYPES**

Example	Name	Uses
	Aztec Code	Designed by Andrew Long acre at Welch Ally (now Honeywell Scanning and Mobility).
	CrontoSign	CrontoSign (also called photo TAN) is a visual cryptogram containing encrypted order data and a one-time-use TAN
	Data Matrix	Public domain. Increasingly used throughout the United States.
	High Capacity Color Barcode	Developed by Microsoft; licensed by ISAN-IA.
	QR Code	These codes are also the most frequently used type to scan with Smartphone's International Standard : ISO/IEC 18004

**TABLE III**  
**CAPACITY COMPARISON [10]**

	PDF417	QR Code	HC2D Barcode
<b>Numbers</b>	Max. 2,710	Max. 7,089	Min. 6,100-8,133
<b>ASCII Characters</b>	Max. 1,859	Max. 4,296	Min. 3,485
<b>Binary</b>	Max. 8,864 bits	Max. 23,624 bits	Min. 24,400 bits

For numeric data, PDF417 barcode and QR Code can store up to 2,710 and 7,089 characters, respectively. HC2D barcode encodes numeric data 0-5 using three bits

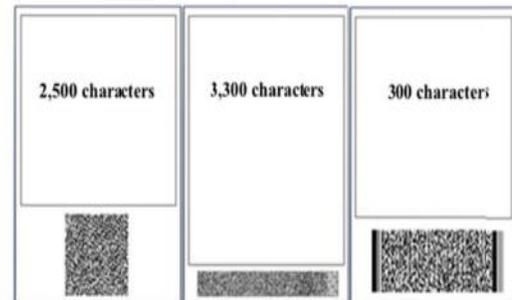
Each and 6-9 using four bits each. If the data contains only numbers 0-5, the barcode can store up to 8,138 characters. On the other hand, if the data contains only numbers 6-9, the barcode can store up to 6,103 characters. The given values are capacity for uncompressed data.

For alphanumeric data, PDF417 barcode can store up to 1,859 characters and QR Code can store up to 4,296 characters. QR Code only includes 45 characters, namely, 0-9, A-Z, nine special characters. HC2D barcode can store up to 3,488 characters which includes all ASCII characters.

For binary data, PDF417 barcode and QR Code can store up to 8,864 bits and 23,624 bits, respectively. HC2D barcode allows uncompressed binary data up to 24,400 bits.

#### B. Barcode size comparison

The size is very important for barcode the size of barcode is directly proportional to the amount of data store in to it. Figure shows the barcode size comparison and amount of the text that included. HC2D Barcode includes more text than other and still it's in smaller in size.



**Figure III: Barcode Size comparison between QR code, HC2D barcode, and PDF147 BARCODE [10]**

#### IV. HC2D BARCODE COMPARISON WITH OTHER 2 D BARCODE

##### A. Capacity comparison

Table III shows the capacity comparison between PDF417 barcode, QR Code and HC2D barcode. All types of barcodes are set at the minimum error correction level. Both PDF417 barcode and QR Code provide maximum capacity. However, HC2D barcode provides the minimum figures, which means that the HC2D could store more data if data compression is enabled.

#### V. APPLICATIONS OF HC2D BARCODE

The HC2D barcode can be used in applications used where the large amount of data gets used. Now days it gets used in paper based document authentication [4]. Both the paper based documentation and digital signature can be stored using HC2D barcode without reducing the data.

#### VI. CONCLUSION

A HC2D barcode has greater capacity than existing 2D barcode. In this paper we have done the survey on previous barcode types and newly introduced HC2D barcode. We have done survey by comparison of different 2D barcode with the HC2D barcode and finally we have proven that HC2D barcode is small in size but consists more text. The shape of HC2D barcode is suitable for use with the paper document or with media. With the use of data compression more data gets stored.

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