

SPACE REDUCTION AND STORAGE INCREMENT IN BARCODES USING COLOURS

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ABSTRACT

Code 39 is one of the most widely and commonly used barcode type, Wide use of this barcode type makes it portable. This barcode can be encoded and decoded by almost every barcode encoding/decoding equipment. Code 39 can encode all 26 Alphabets of the English language and the numerals which was not possible with the previous barcodes. It is much more secure and is not prone to faulty encoding and decoding, but the disadvantage is its too lengthy strip, needs more space and has less storage capacity. To reduce this a novelistic idea of using multicolour barcodes can be developed so that large amount of data can be stored within a small space.

Keywords: Multicolour barcodes, RGB colours, infrared scanner.

1. Introduction

Barcode is a method of automatic identification and data collection. It has series of bars and spaces representing alphanumerical information. It uses binary system for coding and decoding. A bar code is optional machine codable representation of data, which shows data about the object to which it attaches.

1.1 Barcode symbology

Structured to contain a specific piece of information. It allows real time data to be collected accurately and rapidly. Combination of barcode technology with computer and application software improves performance, productivity and profitability.

Two symbologies are used :

- Discrete symbology
- Continuous symbology

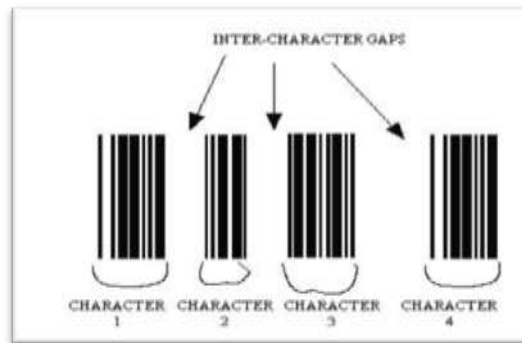


Fig 1.1a Discrete symbol

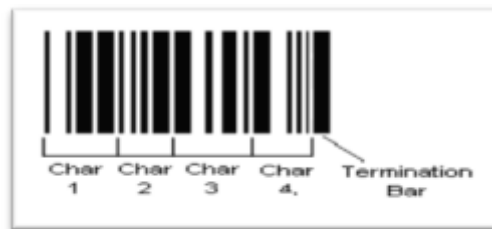


Fig 1.1b Continuous symbol

1.2 TYPES OF BARCODES:

There are two types of barcodes

- Linear barcodes
- 2-dimensional barcodes

1.2.1 Linear barcodes:

Linear barcodes are also known as One dimensional barcodes. A barcode that encodes data only in one dimension. Data is encoded in the widths of the bars and spaces and no data is encoded in the lengths of the bars. The UPC or EAN barcode symbol found on many retail products is a linear barcode. The different types of linear **barcodes** are

- Code 128
- Code 39
- Interleaved 2of 5

CODE 39

The Code 39 specification defines 43 characters, consisting of uppercase letters (A through Z), numeric digits (0 through 9) and a number of special characters (-, ., \$, /, +, %, and space). An additional character (denoted '*') is used for both start and stop delimiters. Each character is composed of nine elements: five bars and four spaces. Three of the nine elements in each character are wide (binary value 1), and six elements are narrow (binary value 0). The width ratio between narrow and wide is not critical, and may be chosen between 1:2 and 1:3. The barcode itself does not contain a check digit (in contrast to—for instance—Code 128), but it can be considered self-checking on the grounds that a single erroneously interpreted bar cannot generate another valid character. Possibly the most serious drawback of Code 39 is its low data density: It requires more space to encode data in Code 39 than, for example, in Code 128. This means that very small goods cannot be labeled with a Code 39 based barcode. However, Code 39 is still widely used and can be decoded with virtually any barcode reader. One advantage of Code 39 is that since there is no need to generate a check digit, it can easily be integrated into existing printing system by adding a barcode font to the system or printer and then printing the raw data in that font.



Fig 1.2.1a Example for code 39

The table for code 39 is given below. This table includes all the possible alphabets and its barcode representation.

A	B	C	D	E	F	G
H	I	J	K	L	M	N
O	P	Q	R	S	T	U
V	W	X	Y	Z		
0	1	2	3	4		*
5	6	7	8	9		
(SPACE)	-	\$	%	.	/	+

Table 1.2.1a code39 characters

2. Need for barcodes :

The Price Bar codes are more frequently used by stores and supermarkets. Every product in the store would have a bar code, which would be scanned at the till or register to quickly access a database - which stores and retrieves the following data;

1. The Product Name

2.Type of Product

3.The Price (not actually stored on the bar code, as this is always changing, but can be altered on the database).



Fig 2.1a Anatomy of barcode

Once scanned, the information will be added to the customers receipt. Some stores may also keep records of the bar codes scanned, so they can see what products sell well, and other details like that. Barcodes are also used in industry. Steelmaking plants that make sheet steel first mill steel slabs out into a few kilometres of sheet - this is woundup into a 40-tonne coil for ease of handling. Each coil gets a barcode which can easily be read when coils are pulled from the warehouse for processing. Barcodes give rapid and accurate identification of any coded item. The advantages of barcodes are

- Represent unique identity of a product
- Accuracy of data input
- Real time data collection
- More accurate dispatch



Fig 2.1b Barcode in a cheetos packet



Fig 2.1c Barcode in pens

3. Colour barcodes

It is based on RGB colours, its more efficient than normal barcodes. Large amount of data can be stored. Different colours can be formed just by varying the intensities of RGB colours. The colours and type of ink chosen for the barcodes are important. As a scanner reads a barcode using an infrared light source it sees the symbol differently to the human eye. A barcode with dark bars on a solid light background is essential for successful scanning. The most suitable and reliable colour combination is black bars on a white background. The colour used as background should be light and reflective for example white, yellow, etc. and the colours used for bars should be darker for example black, blue, green, etc.

3.1 Combination of colours

Dark solid areas should use dark colours (black, blue, or colours that contain a very high proportion of black). Light areas should use bright and reflective colours (white, yellow or red (note some scanners use a red-light therefore red appears 'white' to the scanner)). Use of gold or silver should be avoided as the reflectance can 'blind' the scanner.

Optimal combination

Bars	Background
Black	White
Blue	Pink
Brown	Yellow
Green	Orange

3.1.1 Acceptable colours

- Black on White
- Blue on White
- Black on Orange
- Blue on Orange
- Green on White
- Dark Brown on White
- Black on Yellow
- Blue on Yellow
- Green on Yellow
- Green on Red



Fig 3.1.1 chart of some acceptable colours

4.Multicolour barcodes:

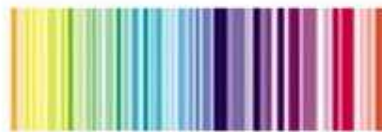


Fig 4.1 Model of multicolour barcodes

Code39 uses 9 elements per character (5 bars and 4 spaces), that are only wide or narrow while code128 uses 6 elements per character (3 bars and 3 spaces), that have 4 variations of width. This makes “39” barcodes easier to be produced and read but they can be substantial in size. The difference in the dimensions, when one and the same information is encoded, whereas “128” standard is more concise and space-efficient. It also provides its users with higher degrees of data security. The last one makes your barcode more error-proof during the process of scanning. Of course drawbacks are present too– the printing tolerance is rather low because of the four different element widths and more sensible printer has to be used. When compared to code 128 and code 39 the maximum elements per character in multicolour barcodes is two (ie., 2or 1 bar and 2or 1 space) with variations of width. code 39 is too long and code 128 is too dense and it is used to store only heavy datas, but multicolour barcodes can store even heavy datas concisely. The printing tolerance of multicolour barcode is high when compared to code 128 because in code 128 the bars are very dense so sensible printer has to be used whereas in multicolour barcodes the bars and spaces are not dense hence printing tolerance is high.

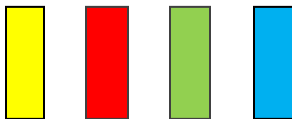
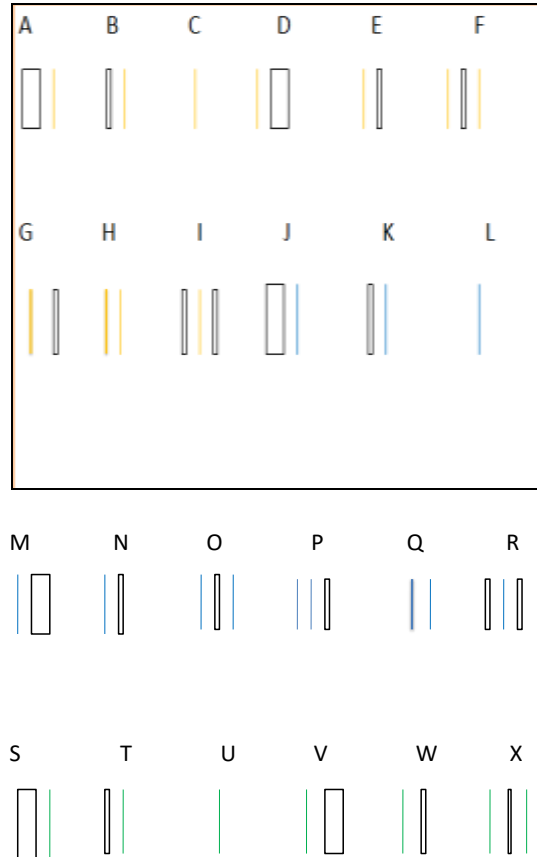


Fig 4.2 Colours used in multicolour barcodes

Still now the use of single colour bars on a single background is only available but the main idea of this paper is to use multicolour bars to store large amount of data.

5. Process of multicolour barcode

There are different methods of developing barcodes but the method discussed here using the colours red, blue, green and yellow are more efficient when compared to others. As a first step to multicolour barcode character chart should be designed, it can be designed by using the binary values (any colour can be used except red) but we need many colours for this, thus to reduce the colours a single colour can be written in 9 different ways so for double colour we can write 18 characters and for tripple colour 36 characters can be written, but the disadvantage of this concept is it causes confusion while scanning so error occurs. To overcome this error black lines can be used after each character for perfect and accurate scanning. There is one more concept ie., the probability of colours that are used. For example if we are using 3 colours, the reader should be assigned to read only three colours. When we are using infrared scanner red lines can be used instead of spaces because red appears white to infrared scanner.



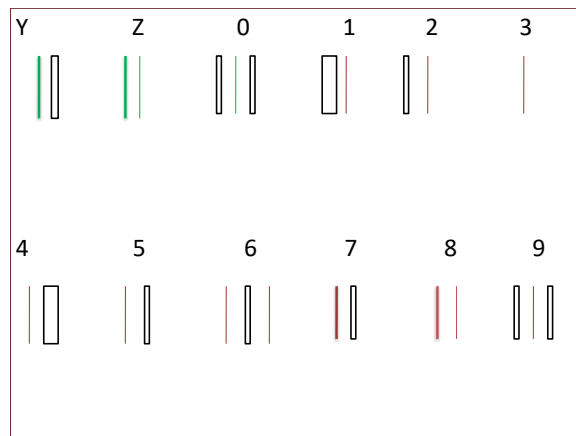


Fig 5.1 Chart for multicolour barcodes

EXAMPLE



Fig 5.2 An example generated using multicolour barcode chart

6.Conclusion and future work

Thus by using two colours we are capable of storing only the product code and manufacture code but many datas such as size ,quantity,ingredients ,etc can be stored by using multicolour barcodes.The maximum number of bars used for each character is two whereas for code 39 nine bars are used for each character out of which two bars are wider.As the length of the code39 bar is more, the multicolour barcodes can be used to store datas.Multicolour barcodes are short in length and more datas can be stored in it.The total number of bars for **code 39** (ie;bars present in each and every character is **324** ie.,for A to Z and 0 to 9) whereas **for multicolour barcodes** total number of bars used is **46** (ie; for A to Z and 0 to 9).The total number of spaces in code 39 for 36 character is **144** whereas for multicolour barcode the total number of spaces for 36 characters is **39**.Therefore the characteristic chart of multicolour barcodes discussed here is more efficient when compared normal barcodes such as code39 or interleaved 2of 5.

<u>Characteristics</u>	<u>Code39</u>	<u>Multicolour barcodes</u>
Total no.of bars(for 36 alphanumeric characters)	324	46
Total no. of spaces(for36 alphanumeric characters)	144	39
No of colours used for bars	1	4
Storage capacity length	less	More
	9 bars for a single character.	Maximum two bars for single character.

References

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- en.wikipedia.org/wiki/High_Capacity_Color_Barcode