QR Code based Stock Management System

Milind Amrutkar[1], Dr. Anup Palsokar[2] , Ass. Prof. Pankaj Raibagkar[3]

[1]Student, Department of Computer Applications, SIES College of Management Studies, Maharashtra, India
[2]Associate Professor, Department of Computer Applications, SIES College of Management Studies, Maharashtra, India
[3]Assistant Professor, Department of Computer Applications, SIES College of Management Studies, Maharashtra, India

---

Abstract - *Stock management system which is a QR based system, plays a significant role in the management of stocks for any organization.*

The project which is implemented has helped the shop keepers to avoid the maintenance of stock record book. This project is targeted for a shop which maintains records of gold items in a register, and maintenance of such important information in a register is very crucial for any organization as the register may get into bad condition as and when the time passes. Also sometimes to find out the information related to any item the worker has to ask it to the owner, which becomes time consuming; and to find and calculate the item rate again they have to do a manual process. So this project simplifies all the problems mentioned above and helps them to carry out their task at a far greater speed. Now the workers can directly scan the QR code which is attached to the item and then can find out all the necessary information related to the item.

Key Words: Barcode scanner, Stock management system, QR Code, ZXing library

1. INTRODUCTION

QR based stock management system is an android application which utilizes the barcode scanner in the mobile to record and maintain the stock details. Generation of barcode for any item and scanning of the barcode are the two main features in the android app.
To carry out this project it was subdivided into several topics:

- Working of barcode system
- Types of barcodes
- Information that a QR code contains
- Actual implementation of the selected type of barcode

1.1 Working of barcode system

Computers understand 1 and 0, so if while scanning it reflects no light then it is considered as 1 & if light reflects then it is considered as 0. These are then grouped into 15 different sections out of 12 are used for numbers which are shown at the top in the above image. As you can see there are guards in the barcode image above(Left guard, Center guard & Right guard). Guards let the computer know where the barcode begins & ends.

Fig. 1 Barcode Image

Left side codes	Left side codes
0001101 = 0	1110010 = 0
0011001 = 1	1100110 = 1
0010011 = 2	1101100 = 2
0111101 = 3	1000010 = 3
0100011 = 4	1011100 = 4
0110001 = 5	1001110 = 5
0101111 = 6	1010000 = 6
0111011 = 7	1000100 = 7
0110111 = 8	1001000 = 8
0001011 = 9	1110100 = 9
Error checks	Error checks
Odd number of 1's	Even number of 1s
Begins 0	Begins 1
Ends 1	Ends 0

So if computer reads even number of 1's on the left hand side it knows that the barcode is flipped upside down and once it reads it, it can just flip the numbers while processing. Also as an error check all the codes on the left side begin with a 0 and end with a 1 and all the codes on Right side begin with a 1 and end with a 0.

Let's take an example, as shown in the image the numbers shown are as 0, 5, 1, 0, 0, 0, 0, 1, 2, 5, 1, 7. First number is 0 which is outside of barcode. It tells us what type of barcode this is.

0 = Standard barcode

2 = Weight item like fruit or meat

3 = Pharmacy item

5 = Coupon

The next set of 5 numbers tells us who the manufacturer of the product : 51000 is manufacturer code for Campbell soup company. The next set of 5 numbers tells us product code 012517 which is 10 ¾ ounce can of chicken noodle soup.

Finally, the last number on the right hand side is Modulo check character. This is another form of error checking.

When the computer scans the barcode and processes the numbers it means a final way to know that it read & processed everything correctly so it performs a calculation and comes up with a modulo check character.

Modulo check character formula is based upon the positions of each of the numbers at the bottom of the barcode it first adds up the digit and the odd-numbered positions and the adds up the digits and the even – numbered positions.

It then multiplies the odd-numbered digits the 3 and adds that amount to the sum of the even-numbered digits.

So the calculation goes like

3 X (0 + 1 + 0 + 0 + 2 + 1) + (5 + 0 + 0 + 1 + 5) = 23

We then subtract the result of this formula from the next highest multiple of 10 to get modulo check character. So the next highest multiple of 10 after 23 is 30 and 30 – 23 = 7 so we know we read the barcode correctly.[2]

UPC – Universal Product Code, black lines of the barcode absorb light which is read & translated into bits of information. Thickness & order of these lines represent a number. A UPC is a barcode symbology that maps a products information to its visual manifestation in the form of a barcode. UPC's are not unique because there is no centralized database to store all UPCs and check against.[7]

How barcodes represent numbers 0 – 9 [4]

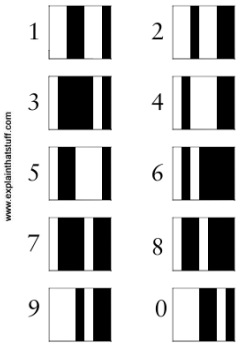


Fig.2 Barcode representation of numbers

Give every item that you want to classify its own, unique number and then simply print the number on the item.

Each and every number is given the same number of horizontal space which is 7 units. Then, to represent any number from 0 through 9 we simply color those seven units with a different pattern of black & white stripes.

Thus number 1 represented by coloring in 2 white stripes, 2 black stripes, 2 white stripes & 1 black stripe. [4]

1.2 Types of barcodes:

1.2.1 One Dimensional (1D) barcode types [4]

One-dimensional, or 1D barcodes, in a systematic manner represent data by varying the width and spacing of parallel lines, and refer to it as linear or one-dimensional. These include traditional, or most barcode types such as the UPC and EAN code types. [4]

➔ **UPC CODE(Universal Product Code)**

UPC barcodes are used to label and scan consumer goods at points-of-sale around the globe. The UPC-A type encodes 12 numbers while UPC-E encodes 6 numbers.

Industry: Retail

Fig. 3. UPC Barcode

Fig. 4. EAN Code

➔ **EAN CODE(European Article Number)**

EAN barcodes are used to label consumer goods for point-of-sale scanning.

Industry: Retail[4]

➔ **CODE 39**

Code39 barcode (or Code 3 of 9) are used to label goods across industries, and are mainly used in the automotive industry and in the Defense department of certain countries.

Industry: Automotive and Defense [4]

Fig. 4. CODE 39

Fig. 5. Code 128

➔ **CODE 128**

Code 128 barcodes are compact & high-density codes which are used in logistics and transportation industries for order & distribution. They're used in non-Point of sale products.

Industry: Supply Chain [4]

➔ **ITF (Interleaved 2 OF 5 / Interleaved Two of Five)**

ITF barcodes are used for the labeling of packaging materials.

Industry: Packaging [5]

Fig. 6 ITF

Fig. 7 CODE 93

➔ **CODE 93**

Code 93 barcodes are used in logistics for the identification of packages in retail inventory, label electronic components.

Industry: Retail, Manufacturing and Logistics[4]

➔ **CODABAR**

Codabar barcodes are used by logistics and healthcare professionals. Therefore, maker can make many codabar codes using successive numbers without the use of a computer.

Industry: Logistics, Healthcare and Education [4]

Fig. 8 CODABAR

Fig. 9 GS1 DATABAR

➔ **GS1 DATABAR**

GS1 DataBar barcodes are used by retail outlets for the identification of consumer coupons, produce, and perishables, also in the healthcare industry.

Industry: Retail and Healthcare [4]

➔ **MSI PLESSEY**

MSI Plessey (or Modified Plessey) barcodes are used for inventory management in retail environments, such as labeling supermarket shelves.

Industry: Retail [4]

Fig. 10 MSI PLESSEY

1.2.2 Two-Dimensional (2D) Barcode Types [4]

Two-dimensional barcode represent data using two-dimensional symbols & shapes. They are identical to a 1D barcode, but they can represent more information per unit area. [4]

➔ **QR CODE**

QR codes are 2D matrix barcodes are often used in tracking and marketing such as for the advertisements, magazines, and business cards. QR codes support four different types of data: numbers, alphanumeric characters, byte/binary information, and Kanji characters.

Industry: Retail, Entertainment and Advertisements[4]

Fig. 11 QR CODE

Fig. 12 DATAMATRIX CODE

➔ **DATAMATRIX CODE**

Datamatrix codes are used in labeling small items, goods, and documents. They are suitable for small products in logistics and operations.

Industry: Electronics, Retail and Government [4]

Fig. 12 DATAMATRIX CODE

Fig.13 PDF417

➔ **PDF417**

PDF417 codes are used in systems that require the storage of huge amounts of data, such as photographs, fingerprints, signatures, text, numbers, and graphics.

Industry: Logistics and Government [4]

➔ **AZTEC**

Aztec codes main use is in the transportation industry, viz. for tickets and airline boarding passes.

Industry: Transportation[4]

Fig. 14 AZTEC

Advantages of 2D barcodes:

➔ More information:

A barcode is can't contain much information: typically just a dozen digits, but not much more. On the other hand, 2D barcode can pack more information into the same space. It can hold up to about 2000 characters of information. [2]

➔ Fewer errors:

Since barcodes hold little information there is very little redundancy. Apart from the length of the bars there is no duplication of information to guard against a code being misprinted or damaged. The advantage of 2D barcodes, the higher capacity means they can hold the same information in different ways with sophisticated, built-in error checking systems. If a code is damaged, that's easy to detect—and it may still be possible to read some or all of the code. [2]

➔ Easier to read:

2D barcodes can be read by smart phones and tablet computers using their built-in digital cameras. No special reading equipment is needed. Even though they contain more information, they can be read accurately at high speeds. [2]

➔ Easy to transmit:

2D barcodes can be sent as SMS text messages between cell phones. [2]

➔ More secure:

It's possible to encrypt the information in 2D barcodes to protect it. [2]

1.3 Information that a QR Code contains

➔ Quiet zone/Seperators:

It's a margin space necessary for reading the QR Code. This quiet zone makes it easier to have the symbol detected from among the image read by the CCD sensor. Four or more cells are necessary for the quiet zone. An empty white border makes it possible to isolate the code from among other printed information [2]

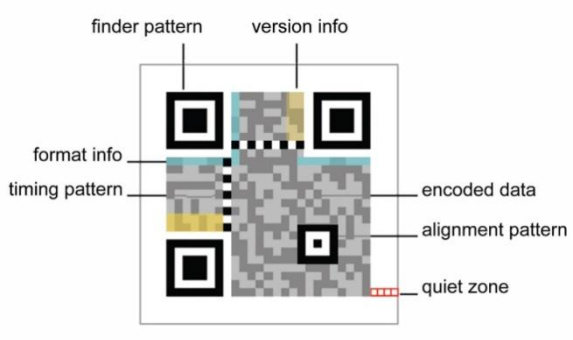


Fig. 15 Information a QR code contains

➔ Finder patterns:

A pattern for detecting the position of the QR Code. With the arrangement of this pattern at the three corners of a symbol, the position, the size, and the angle of the symbol is detected. This finder pattern has a structure which can be detected in all directions (360°). Large black and white squares in three of the corners make it easy to confirm that this is a QR code. Since there are only three of them, it's immediately obvious which way up the code is and which angle it's pointing at. [2]

➔ Alignment pattern:

A pattern for correcting the distortion of the QR Code. This ensures the code can be deciphered even if it's distorted(viewed at an angle, printed on a curved surface, and so on).

➔ Timing pattern:

This runs horizontally and vertically between the three finder patterns and consists of alternate black and white squares. The timing pattern makes it easy to identify the individual data cells within a QR code and is especially useful when the code is damaged or distorted. [2]

➔ Version information:

There are various different versions of the QR code standard; the version information simply identifies which one is being used in a particular code.

➔ Data cells / Date Area:

The QR Code data will be stored (encoded) into the data area. Each individual black or white square that's not part of one of the standard features(the timing, alignment, and other patterns) contains some of the actual data in the code. The grey part in represents the data area. The data will be encoded into the binary numbers of '0' and '1' based on the encoding rule. The binary numbers of '0' and '1' will be converted into black and white cells and then will be arranged.

2. NEED OF PROJECT

The purpose of this "QR Based Stock Management System" software project is same as it name, i.e. it is used for the recording or scanning the Stock related information. It is developed to manage the stock information, so that people who work in the organization can access accurate stock information quickly and easily as and when required, thereby improving its operational efficiency and effectiveness. Computerized software system help to fulfill these goals. Computerization of the official work will help in doing a lot of manual work quickly. It will help in easy storage and access of all information, in short period of time. The development of this software access facilitates accurate information correctly and easily which leads to increase efficiency & effectiveness of the organization too. This project reduces the amount of work the workers have to do. The works will not have to write item related information on a tag manually. The workers will not have to go to owner and ask information related to the item, and they also don't have to calculate the item price, as it will be automatically calculated. The entire process of stock keeping using our system reduces the probability of human error. The project reduces the time required for the entire process of stock maintenance as the worker can directly

scan the barcode and get the required information instead of going to the owner and ask him.

3. PROPOSED SYSTEM

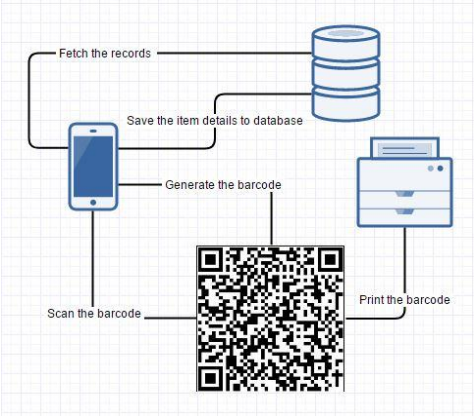


Fig. 16 Architecture of our system

Working:

Items related information is currently recorded in the register(book) which is very difficult to maintain and search for. Finding the stock related information consumes more time and sometimes becomes tedious. Currently the gold item details are maintained on a tag and are tied to the item. Since the tags are small and cannot store much information on it, so here QR code comes into the picture. Barcodes can store much more information then what a tag can. Also when the information related to any particular item needs to be known the worker goes the manager/owner and ask him. This process takes a lot of time and effort, which in return also wastes managers and the customer's time as well. The process is explained in the fig. Current System.

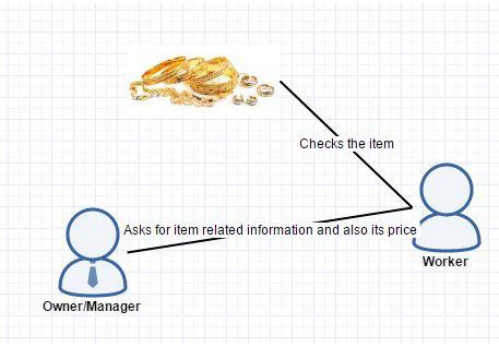


Fig. 17 Current System

The proposed system consist of three parts:

➔ Adding records of new items in the database

Adding records as the name suggests adds a new item to the database and each item is given a unique SKU.

➔ Scanning QR code

Scanning QR code consists of scanning of QR code which are attached to each item and after the QR Code is scanned the item related information is shown on the screen.

➔ Generating QR Code for an item

Generating QR code involves generation of QR Code which can be used to attach it to each item. Afterwards the generated QR code can then be printed by Label printer.

The application uses uses ZXing library[6] for QR Code Scanning and has used an QR Code API[5] to generate the QR Code for each item.

4. RESULTS

4.1 The Android part

Fig. 18 Home Activity

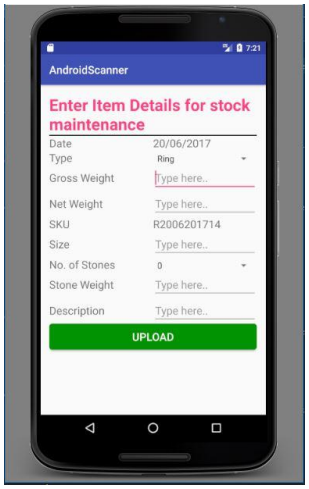
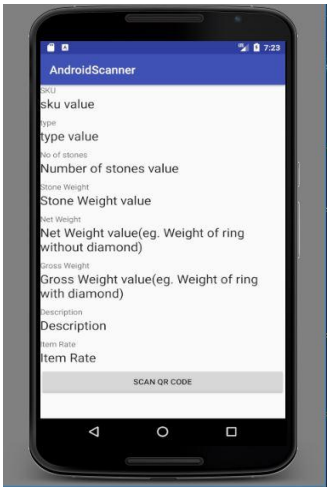


Fig. 19 New Item Activity

The Android application begins with the Home Activity where three options are provided viz. Addition of New Item, Scanning of QR Code, & Generation of QR Code.

The New Item Activity is used by the workers to insert a record of new item into the database. This activity accepts several parameters related to the gold item such as Gross weight, item type etc. Once the upload button is clicked all the information is uploaded to the server. This activity is then redirected to the Generate QR Code activity to generate a QR Code specific to the item. After the QR Code is generated he then can print it or scan it to find item related information.



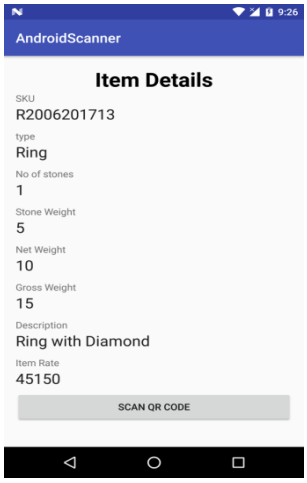


Fig. 20 Scan QR Code **Fig. 21 Scanned and fetched**

The Scan QR Code activity scans the QR code and the information is then fetched and displayed on the same activity. When the Scan QR Code button is clicked, the Phone Camera scanner opens up which then scans the QR Code of the item and thus the information is displayed on the same activity after all the details are fetched from it.

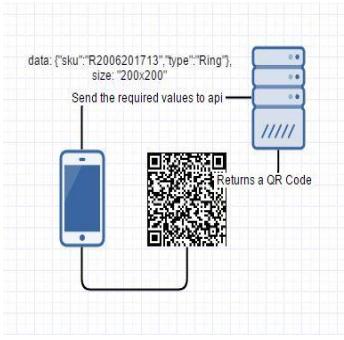


Fig 22 Generate QR Code Activity **Fig.23 Fetching of QR image from API**

4.2 DATABASE Part

The database used in this project was MySQL which included a table named stock.

stock_id	sku	type	date	size	no_of_stones	stone_weight	bill_no	net_weight	gross_weight	sale_date	status	description
1	E08620171	Earrings	2017-06-08	236	0	0	bill3	10	10	2017-06-08	SOLD	Earrings Set
2	R08620172	Ring	2017-06-08	230	2	20	Bill2	5	5	2017-06-08	SOLD	Ring with stone
5	R14062075	Ring	2017-06-14	235	1	20		10	10	0000-00-00	INSTOCK	Ring with stone
6	N19062076	Necklace	2017-06-19	200	1	20		20	20	0000-00-00	INSTOCK	Ring with diamond
7	R19062077	Ring	2017-06-19	0	0	0		12	12	0000-00-00	INSTOCK	Ring
8	R19062078	Ring	2017-06-19	0	0	0		6	6	0000-00-00	INSTOCK	Ring Diamond
9	C19062079	Chain	2017-06-19	200	0	0		25	25	0000-00-00	INSTOCK	Chain
10	R2006201710	Ring	2017-06-20	0	0	0		5	10	0000-00-00	INSTOCK	Ring

Fig. 24 Stock Table Structure

4.2 Web Services

All the web services were written in PHP language which are hosted on the server. The item related information of uploading and fetching from the database was handled using web services.

ACKNOWLEDGEMENT

This research was supported by SIES college of Management Studies. I thank Prof. Pankaj Raibagkar for his assistance and for comments that greatly improved the manuscript.

CONCLUSION

Thus a complete stock management system was created which would help the owners/managers/workers of the shop to maintain their stocks using the barcode scanner.
It will reduce the worker's efforts to manually maintain the track of each item and their headache of maintaining the register since everything would be stored in the database.
It will also make the workers give accurate gold price(item price) to the customers and will reduce the process time in which worker goes to the owner to ask information related to the item and also save the time to calculate the item price, since the current gold price will be automatically fetched from the server and item price will then be automatically calculated and shown to the customer.

REFERENCES

[1] Barcode based Student Attendance System, International Journal of Computer Applications(0975-8887), Volume 119 – No.2, June 2015.
[2] QR codes and 2D barcodes http://www.explainthatstuff.com/how-data-matrix-codes-work.html.
[3] Barcodes and barcode scanners on http://www.explainthatstuff.com/barcodescanners.html.
[4] Choosing the right barcode https://www.scandit.com/types-barcodes-choosing-right-barcode/
[5] http://goqr.me/api/
[6] https://github.com/zxing/zxing
[7] https://www.semantics3.com/blog/why-the-u-in-upc-doesnt-mean-universal-a1a675eea0ea