

A Survey on Technologies Used for Billing System in Supermarkets

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ABSTRACT: RFID (radiofrequency identification) technology offers the ability to provide many new services and conveniences in the retail environment. An innovative product with societal acceptance is the one that aids the comfort, convenience and efficiency in everyday life. There are number of supermarkets in each city having huge amount of people visiting daily basis. Now days purchasing and shopping at big malls is becoming a daily activity in metro cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discount. These malls, supermarkets use various technologies for electronic commerce to save the time and increase the comfort, ease, and efficiency required for billing in everyday life. For every technology used in supermarkets requires a Tag and a Reader. The tag is uniquely generated identity which is applied on the product that helps to identify the goods/products uniquely. These Tags are detected and identified by the Reader. Reader is electronic the device that identifies the Tags which are known to it. There are various technologies and their efficiencies in terms of electronic commerce used in supermarkets which are covered in this paper. Each technology has its own different tag and read which are compatible to that particular technology. The main objective of proposed system is to provide a technology oriented, low-cost, easily scalable, and rugged system for assisting shopping in person. The developed system consists of 3 key components/modules (a) Server Communication component (SCC) (b) User Interface and display component (UIDC), and (c) Automatic billing component (ABC).

KEYWORDS: RFID, IR, barcode, QR code, OCR.

I. INTRODUCTION

Supermarkets are always the busy stores, there are number of customers purchasing products in small or bulk amount in everyday life and the supermarket management staff have to keep the track of the products they sell, to make sure what they are selling is in the stock. Hence the supermarkets come up with the various new technologies or systems that result in the smart billing and stock management of the purchased items to save the time required for the billing and also inventory or stock management [1] [2]. The bill is generated automatically when the reader detects product tag and the information stored with the tag. The information can be the product name and the cost of the product. The stock management can be done by developing and interfacing the software with these technologies. When the reader reads information from the tag it displays the cost and quantity of the product which is being purchased by customer. After checkout, the purchased items are deducted from the main database server which manages the stock and quantity. These new technologies are being very useful in today's life by reducing the lots of efforts and human work. There are many such technologies like Barcode, QR Code, RFID, OCR. The technologies used in current billing system.

II. LITERATURE SURVEY

A. Barcode

Barcode is also known as the Auto ID (Automatic Identification). It was invented in the early 1970s. the barcode was created to help large retail stores and markets process their goods. The barcode technology is quite efficient for the management and information updating in the computers [1]. Barcode is one of the familiar business standards. It is

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used for scanning the items at supermarket for checkouts [2]. The barcode reader is used to detect the tag on items and identifies the product and related information. Barcode result in a visual representation of the data which is scanned and interpreted for information. Barcode is smaller, lighter and less expensive. The barcode must be in the direct line of sight to be read by barcode scanner. Barcode have no read/write capabilities hence they cannot contain information such as product expiry date etc. The barcodes can be easily reproduced and forged those results in less security. If the barcode is ripped, damaged there's no way to scan the product.

The barcode based data collection system can be typically comprised of any of the components like Barcode scanner; barcode based mobile computer, barcode printers, barcode label, barcode data collection software etc. The computer looks up the price in a master database (the price of a product is not in the barcode!), subtracts it from the store inventory, and calculates the change. The software also creates reports regarding inventory levels, shows what products are the most and least popular, creates demographic reports on individual products and customers, and tracks much more. The key to the whole system is accurate reporting of the product purchased. Cashiers are inherently fallible and slow. Barcoding is neither. Barcode benefits in data accuracy, consistency and efficiency. Barcode is used in Retail Operations, Receiving & shipping Operations, asset management, manufacturing operations, Office & Customer Service Applications and Warehousing etc. Barcodes are measured by the width of the narrow bar and are recorded in mils, or 1/1000 inch. A 15 Mil bar code, for instance, has a narrow bar that is 15/1000 inches wide. Further, "quiet zones," or blank spaces to the left and right of barcode symbols, are included to insure the barcode can be read.

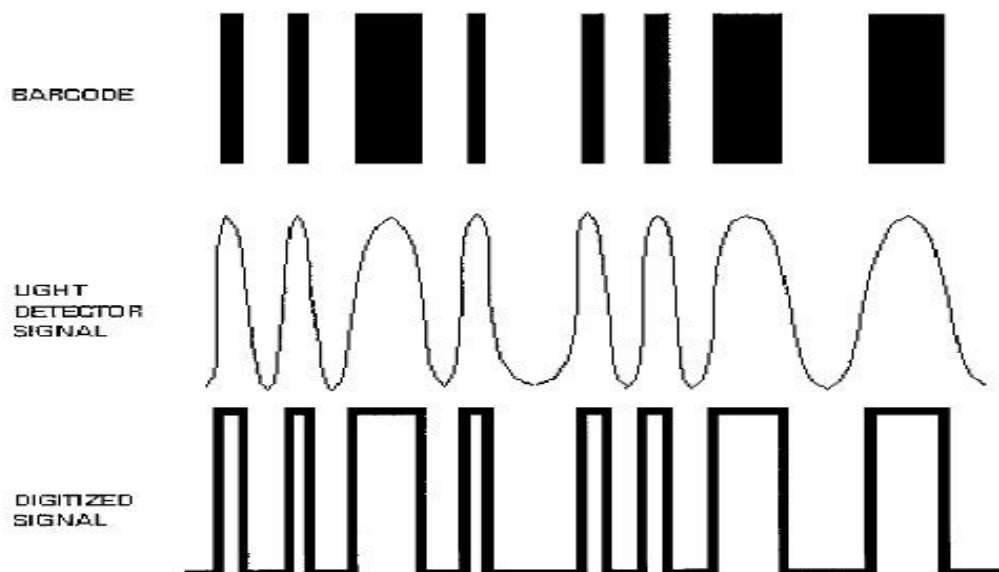


Fig (1). Barcode

B. QR Code

A QR code is Quick Response code. This code is a 2D barcode resulting in higher speed at decoding contents. The Japanese corporation Denso-Wave created the QR code for tracking purpose in 1994. QR Codes use a 2 dimensional matrix in order to store data. The more rows and columns the more data it holds. It supports the error correction. The code can be scanned using mobile phone camera or QR reader and QR code reader software. There are 4 diff level of error correction low medium quality high. The highest level of error correction can restore up to 30% of a corrupt file. When QR code is scanned it links to plain text, image, web pages and multimedia, maps locations or anything that can be accessed over the internet. QR code generator is required to create a QR code in which the required information is entered. An effective QR code should be generated using 40-80 characters and minimum of 2cm wide. The more characters result in degraded image. QR code allows us to decide the actions we want the customers to take. QR code is

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ISO standard, market proven and completely measurable. QR codes allows average person to decode the QR code by scanning and read by a camera-equipped Smartphone when you've downloaded a scanner app [3].



Fig(2). QR Code

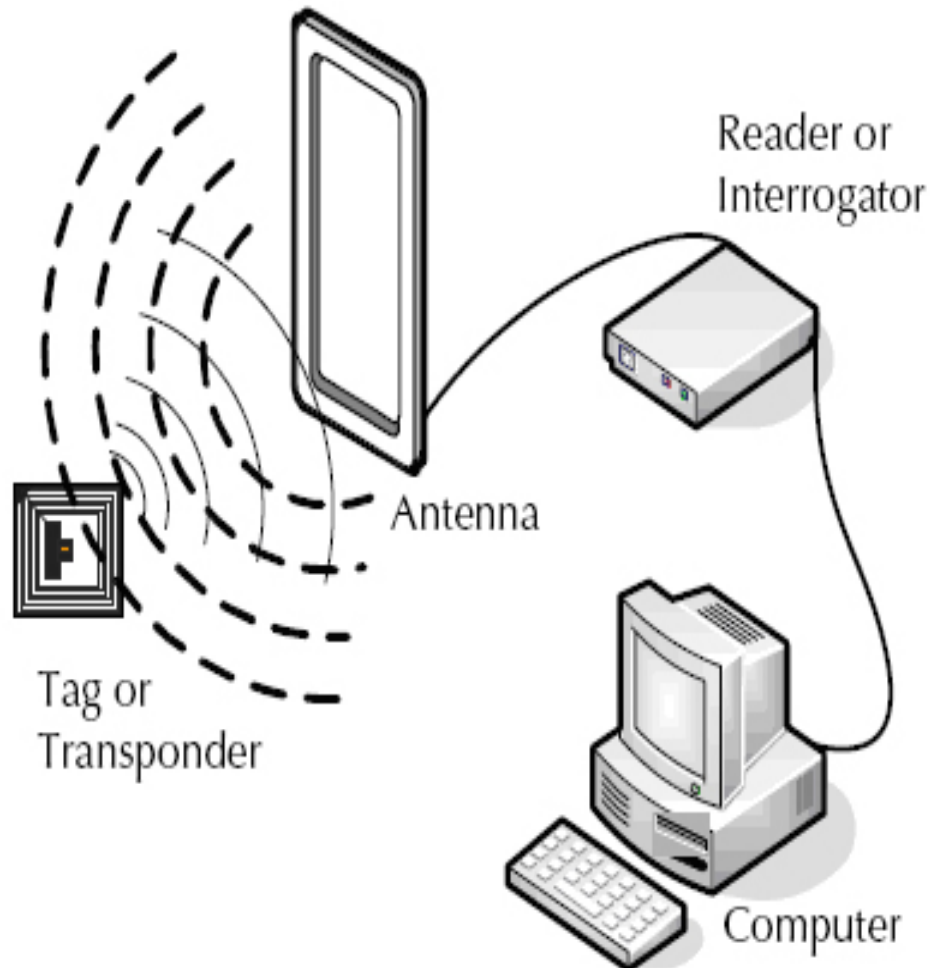
C. OCR (Optical Character Recognition)

OCR is a technology that enables you to convert different types of documents, such as scanned paper documents, PDF files or images captured by a digital camera into editable and searchable data. Although Optical Character Recognition (OCR) scanning technology has increased rapidly over the years, there are limitations in regards to the source materials and character formatting. Text from a source with a font size of less than 12 points will result in more errors. OCR also requires a spell checking proofreading and reformatting for the desired layout. There are many factors that will affect the OCR such as forms, small texts, blurry copies, mathematical formulas, colored paper, and handwritten text.

D. RFID

Now days, radio frequency identification technology has gained position from obscurity to mainstream applications that results in the speed of handling manufactured goods and materials. RFID can detect the tags using RFID reader from distance without the line of sight. RFID support the huge amount of unique ids that helps in creating the unique tags for each items. It allows contact less detection of the objects using the radio frequency. RFID tag placement is less constrained as it does not require line of sight. It has maximum and stronger read range. RFID supports the read/write memory capability and it can hold large amount of data under a unique identifier. The adverse conditions such as dust, chemical, physical damage do not affect on RFID very much.

This technology has three parts: a scanning antenna, a transceiver with a decoder to interpret the data and a transponder (RFID tag) pre-set with information. RFID tags can be read at a faster rate as they approximately can read 40 RFID tags at same time. RFID contain high levels of security; data can be encrypted, password protected or set to include a 'kill' feature to remove data permanently [4].

**Fig(3). RFID**

The fig.(3) shows the standard working of the RFID technology. The Tag or Transponder gets identified by the Reader or Interrogator when it comes within the antenna range and the identified unique id is sent to the Computer or server.

III. PERFORMANCE AND EFFICIENCY TABLE

The table given below consists of the information about comparison of Barcode, OCR, Biometric, Smart Card and RFID. Each and every technology has its own advantages, efficiency and disadvantages. The suitable technology can be selected for particular environment using the table given below.

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Parameter	Barcode	OCR	Biometric	Smart card	RFID
Typical data capacity	1~100	1~100	-	16~64k	16~64k
Data Density	Low	Low	High	Very high	Very high
Readability by people	Limited	Simple	Difficult	Impossible	Impossible
Reading speed	Low	Low	Very low	Low	Fast
Reading distance	0~50cm	<1cm	0~2m	Contact	0~30m
Cost of reader	Very low	Medium	Very high	Low	Medium
Unauthorized copying/modification	Slight	Slight	Impossible	Difficult	Difficult
Dirt/ Damp	Very high	Very high	-	Possible	No influence
Covering	Totally fail	Totally fail	Possible	-	Very low
Direction and position	Low	Low	Unidirectional	-	Very low

IV. CONCLUSION

The payment of bill by standing in long queue is a tedious factor when people want to purchase products from marts. Though people can pay instantly using electronic money facility, they have to wait in the queue for longer time. The idea which is proposed using RFID technology will overcome the problem and it gets the task easier. The combined effects of easy and flexible implementation, secure transmission of account information, and reduced disputes offer the following benefits for all. It will save time, energy and manpower of Customer, Owner and supplier. There are many technologies which are currently being used for billing systems in supermarkets. The selection of the technology depends upon the performance, efficiency and QoS of the technology regarding to particular task and environment. The table contains the comparison of different technologies with respect to given parameters.

Sr No.	Paper Name	Author Name	Description
1.	The RFID based smart Shopping cart	Ms. Rupali Sawant, Kripa Krishnan, Shweta Bhokre, Priyanka Bhosale	In this paper they described about, replacing the ubiquitous Universal Product Code (UPC) bar code by smart labels, known as radio frequency identification (RFID) tag.
2.	Automated Shopping Trolley for Super Market Billing System	S. Sainath, K. Surender, V. Vikram Arvind	The Automated Shopping Trolley is a Smart Trolley which integrates a Raspberry Pie Embedded Chip with two Bar code Scanners and a Battery kit to allow users to self-checkout at Super Markets.
3.	RFID Based Smart Shopping and Billing	Zeeshan Ali, Reena Sonkusare	The developed system comprises of Cart location detection unit (CLDU), Server Communication unit (SCU), User Interface and display unit (UIDU) and Billing and Inventory management unit (BIMU).
4.	Smart Trolley in Mega Mall	J.S. Awati, S.B. Awati	Microcontroller based design, has acquired the status of most happening field in electronics. This is highly specialized field that has the power of integrating thousands of transistors on single silicon chip.

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