An Automated Shopping cart using RFID

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Abstract:
A supermarket where customers can buy product/s for their regular use. The customers have to wait in long queues to get their products scanned using barcode scanner and get it billed. This scenario is even more pathetic during weekends and holidays as huge mob of people move towards shopping in supermarkets to avail the special discounts and offers. Also in al l these attractions, the bill gets so high such that people fall short of money as they don't have prior idea. To improve this condition, we discuss a concept of RFID based smart shopping trolley in the field of retail merchandise. Ever since the debut of science and advancements, wireless technology has developed to such an extent to provide convenience, comfort and efficiency in day-to-day life. Our whole shopping experience is often marred by the long checkout queues. Soon we can end this problem by replacing the bar code by smart labels, known as radio frequency identification (RFID) tag. The key idea here is to aid in everyday shopping in terms of reduction in time spent, eliminating the daily hassle of locating the right product and standing in long lines. The primary goal is to provide a technology oriented, reduced cost, time saving, hassle free, commercially oriented system for an enhanced shopping experience.

Keywords: Smart shopping, RFID (Radio Frequency Identification), Arduino board.

I. INTRODUCTION

A supermarket is a large retailing shop where goods are displayed in such a way that buyers select products for themselves. Buyers collect their product off the shelves invariably in a trolley and get them billed by the counter clerk. Supermarket operates on self service basis. Supermarket offers large varieties of products under one roof. With the growing economy, urbanization, industrial growth in recent years, there has been a significant change in the global market. With the grocery sector playing an important part in the worldwide economy, it has become one of the most convenient and diverse business across the globe. So there is a need of smart supermarket where customers purchases all the products and leave the supermarket without being standing in long queue for billing. Smart supermarket offers customers a self-checkout system which will reduce the wasting of time required to stand in long queue thereby enhances shopping experience of customers. The emergence of RFID makes the traditional retail process faster, transparent and efficient. With the proposed system, soon, when the UPC codes would be replaced by RFID tags. RFID is abbreviation of Radio Frequency Identification. RFID signifies to tiny electronic gadgets that comprise of a small chip and an antenna. This small chip is competent of accumulating approx 2000 bytes of data or information.

RFID devices is used as a substitute of bar code or a magnetic strip which is noticed at the back of an ATM card or credit card, it gives a unique identification code to each item. And similar to the magnetic strip or barcode, RFID devices too have to be scanned to get the details (identifying information).
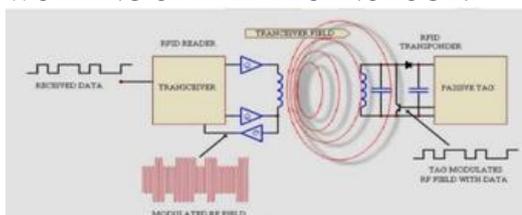
WORKING OF RFID TECHNOLOGY:

Figure.1. Working of RFID Technology

Every RFID system the transponder Tags contain information. Information can be as little as a single binary bit, or large array of bits like an identity code, personal medical information, or literally any type of information that can be stored in digital binary format Reader generates RF carrier sine waves. Once tag receives sufficient energy, Tags output transistor shunts the coil corresponding to the data being clocked out of memory array Reader performed digital data encoding.

Advantages of RFID
● RFID tags don't need to be positioned in a line of sight with the scanner.
● RFID tags can be read at a faster rate than barcodes.
● RFID tags are read/write devices.
● RFID contain high levels of security; data can be encrypted, password protected or set to include a 'Kill' feature to remove data permanently
● RFID tags carry large data capabilities such as product maintenance, shipping histories and expiry dates; which can all be programmed to the tag.
● Once these are set up; it can be run with minimal human participation.
● RFID tags are more reusable and rugged as they are protected by a plastic cover.

Disadvantages of RFID
● RFID involves assembling and inserting a computerized chip; which works out to be more expensive.
● RFID readers struggle picking up information when passing through metal or liquid.
● Reader collision can occur where two signals from different readers overlap and the tag is unable to respond to both.

II.LITERATURE REVIEW

Shopping in the present day usually involves waiting in line to get your items scanned for checkout. This can result in a great deal of wasting time for customers. Furthermore, the

technology currently used in checkouts barcodes - is from another era, developed in the 1970s. Today most of the shopping mall uses barcode system. Barcodes are a universal technology in that they are the pattern for retail products; stores that own a barcode reader can process barcodes and imprint it on the products. The most significant factor that is involved in barcode technology is that the product must be in the Line of Sight (LOS) of the reader in order to get the barcode imprinted on the product scanned which being cost effective will see its implementation in small and large scale store. In [1], the authors "Zeeshan Ali, Reena Sonkusare" developed RFID based automatic billing cart, with this model the system consists RFID reader and the products in the malls equipped with RFID tags. When a person puts any product in the trolley its code will be detected by RFID reader and the details of the products will be stored in the memory. At the billing counter the total bill data will be transferred to the pc by wireless RF modules. In [2], the authors "P Chandrashekar, T Sangeetha" proposed a model automation of shopping cart to ease queue in mall by using RFID module and Zigbee module. In this system we are using RFID tags instead of barcodes, whenever a customer puts a product into a trolley, it will get scan by RFID reader and product price and it will be displayed on the LCD.

We are using zigbee transmitter which is used to transfer the data to the main pc. Automated shopping trolley was developed for billing system based on barcode system. S.Sainath, K. Surender, V. Vikram Arvind developed a system which was designed using a Raspberry Pi embedded chip with two barcode scanners and battery kit to allow users to self checkout at supermarkets. But problem with this system is it is expensive to implement on large scale thus it is very difficult for small vendors to implement. This system requires constant battery backup.[3] Later on, in 2016 LIFI based automated trolley using RFID was developed. In this system RFID readers are used to scan each product. Along with RFID technology, Visible Light Communication (VLC) technology was used to transfer the data to main computer instead of wireless standards such as Zigbee, bluetooth etc. At the billing section, the LIFI receiver is used which is connected to the main computer.

LIFI technology solves the insufficiency of radio frequ ency,it provides high security and speed.[4] Under the existing operation structure of supermarkets, OuWenxingm, Wang Lei, Jiang Zhipeng, Yu Changhong [5] aims to propose a Smart Shopping System based on NFC Technology. This system includes technical support of mobile applications, and users will be able to conduct a series of actions like product searching, pre-ordering and online payment on the mobile app. With NFC users can even pay the bills without credit card which would simplify the purchasing process.

III.SYSTEM ARCHITECTURE

The concept of smart shopping has gained a significant interest in the field of shopping that targets the task of reducing queuing time n billing in markets. In this process the customer registers on the website provided by the market and creates an account. The customers pick up the trolley an goes through racks for shopping and picks up the products one by one and drops it into the trolley. After completing shopping at the time of billing, it is when the customer has to stand in long queues which are considered as annoying process by the customers.

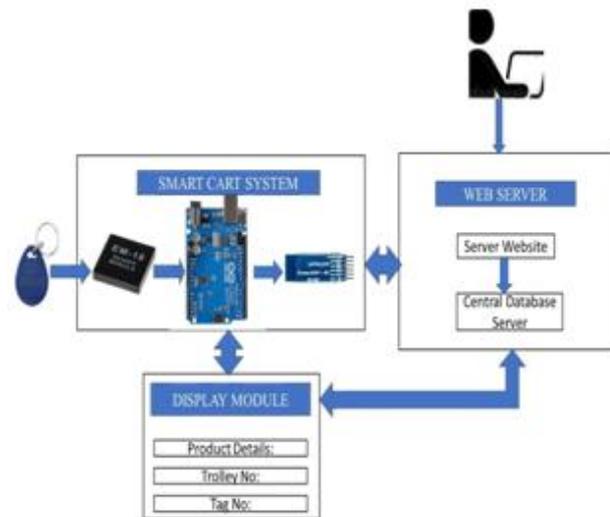Hence we are proposing a system in which issues related to queuing and billing will be overcome.

Figure.1. System architecture

The fig. above gives a detail view of the system architecture for smart shopping that is to be implemented for enhanced shopping model. The components and technologies that have been included in an Automated Shopping Cart are discussed below.

A. Arduino UNO R3
Arduino UNO R3 is a microcontroller board based on ATMEGA 328 microcontroller. It acts as a processor for the Arduino board It consists of 14 digital input/output pins (of which 6 can be used as PVM outputs), 6 analog inputs, a 16MHz crystal oscillator, a USB connection, an ICPS header, and a reset button. The ATMEGA 328 has a 32KB (with 0.5KB used for the boot loader).

B. RFID READER- EM18 READER MODULE
Radio Frequency Identification (RFID) Card Reader provides a low cost solution to read passive transponder tags. The RFID card reader read the RFID tag in range and outputs unique identification code of tag at a baud rate of 9600. Buzzer and LED indicate valid RFID tag detection. The range of EM18 READER MODULE is upto 7-10 cm.

C. HC-05 BLUETOOTH MODULE
It is an Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial Port Bluetooth module is qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHZ radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

D. ON CART POWER SUPPLY

Power supply is an important part of the project. For our project we require +5v regulated power supply with maximum current rating 500Ma. Following blocks are required to generate regulated power supply.

1- Step-down transformer
2- Rectifier unit
3- Filter circuit
4- Three terminal voltage regulator.

E. THE MARKET WEBSITE

The main functions of the market website are:
1.   Provide customer registration.
2.   Communicate with database and retrieve user data.
3.   Provide reliable money transfer from user bank accounts or web-money sources.
4.   Provide convenient visual interface and user account.

F. DISPLAY DEVICE

In the proposed system, we are building an android application as a display module. It has the ability to display all the information relate to customer and also the product details.

IV. METHODOLOGY

Firstly, the customers who intend to use smart cart system registers and creates an account provided by the market. After this, the customer transfer money to the account. Hence the smart cart user will acquire money he/she deposited in the account. The amount of money and personal information of the user will be saved on the database. After creating an account the customer obtains trolley with a trolley number on it. Secondly, customer does shopping, selects the items with RFID tags and scans through the RFID reader. As the products are scanned, information related to the product is displayed on the display device. The customer looks into the display and can see the list of products lying inside the cart and all relevant information and total cost so that customer can make a better decision of what to purchase. Customer can easily remove an unwanted product out of the cart. However it is expected that the customer will remove the unwanted product from the list by selecting it and pressing the "delete" option on the device. Finally, when the customer decides to finish shopping he or she will select the "pay" button on the device which will send all information to the database and will withdraw the total amount from the personal account. The products which are not scanned, is passed through a security gate, the security staff will approach the user and will instruct how to use the Smart cart system.

V.CONCLUSION

The smart supermarket shopping cart based on RFID have the advantage of real time interactions, greater efficiency, convenience of installation and maintenance. The proposed self checkout system will reduce the wasting of time required to stand in long queue at billing counter thereby provide greater efficiency. More sophisticated micro -controller and larger display system can be used to provide better customers experience. Simplified shopping experience for the customers can be created by using proposed self checkout system.

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