Smart Trolley using RFID

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Abstract—**shopping is easy but waiting on a bill counter after shopping is too boring and tedious task. Huge amount of rush plus cashier preparing the bill with barcode scanner is too time consuming and results in long ques. So here we have made an innovative project which will be placed in the shopping trolley itself. The system consists of a RFID reader which is controlled by Arduino Uno microcontroller. So whenever the shopper puts any product in trolley it is been detected by the RFID module and it is displayed on LCD along with the price of the product. As the shopper adds more things it is detected by the module and the price according to that increases. In case if customer changes his/her mind and doesn't want any product added in the trolley he can remove it and the price added will be deducted automatically. At the end of shopping the shopper will press the button which when pressed adsthe entire product along with their price and gives the total bill to be paid. At exit for verification the shopkeeper can verify the shopping with the help of master card. Hence this system is suitable for use in places such as supermarkets, where it can help in reducing man power and in creating a better shopping experience for its customers.**

Keywords—**RFID, billing trolley, Arduino, LCD**

I. INTRODUCTION

Today every supermarket and shopping mall makes use of the shopping baskets and shopping trolleys to collect the items from the racks. The customers have to put every product which they want to purchase into the trolley and they have to wait in the long queue for the billing system. It is a complex process. To overcome this problem several technological solutions have been developed. But the effectiveness of the developed system should be improvised.

Throughout the 20th centuries our views, expectations and methods of doing work have changed drastically. Many of the Innovations and information Technologies have caused a revolution in values, knowledge and perceptions in practically all areas of human understanding. One regular task that human beings spend a considerable amount of time is in Shopping. The customers face the problems regarding the wastage of unnecessary time at the counters for bill. An improvement is required in the billing system to update the quality of shopping & experience to the customers. To overcome these problems stated above and to improve the

existing system, we have designed an AUTOMATIC BILLING TROLLEY. This upgraded system will intend to assist shopping to the individual that will minimize their time spent in shopping.

The electronic shopping system intends to assist shopping in person that will minimize the time spent in shopping as well as intended to aid the store management with real-time updates on the inventory. The emergence of new technologies, such as barcode scanner and wireless networks, makes the shopping processes faster, transparent and efficient. Our aim is to develop the shopping system which can be used in shopping malls to solve the problem mentioned above. The Shopping system is equipped with barcode scanner for product identification and a consistent Wi-Fi connection with the shop's server. As soon as the object is purchased, the barcode reader identifies the product and updates the bill. When the customer is done with shopping, he can just press the 'End shopping' button and the details are sent to the shop's server and the customer has to pay just the amount and leave. The shopping system will change the way people shop as radically as ATM's changed banking. The proposed system is easy to use and does not need any special training. In this system there is inbuilt automatic billing system makes shopping a breeze and has other positive spin-offs such as freeing staff from repetitive checkout scanning, reducing total number of staffs required and increasing operational efficiency of the system.

Now days purchasing and shopping at big malls is becoming daily activity in metro cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there is special offer and discount. People purchase different items and put them in trolley. After total purchase one needs to go to the billing counter for payments. Customer feels annoyed by waiting too long because not all cashiers are open for payment. Most of the time customer find it difficult to know the total cost of items they have bought and worry about the amount of money they brought is enough or not. Many of the customers find it difficult to search a particular product in the shopping mall. Also some of them face the problem of different sections of items located in the mall. It is becomes difficult for shopkeeper to scan all product and do the billing process of

so many customers. This problem can be solved with this Smart Trolley. Consumers will feel satisfaction and comfortable while shopping.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. Node MCU works as controlling as well as communicating unit. It fetches inputs from barcode scanner, convert it into text. Then send this text on android app. Node MCU uses ESP8266 for wirelessly communicating with android app. Wi-Fi protocol is used for communication.

Despite the presence of E-commerce people tend to buy many products only in supermarkets and malls for the sake of their own satisfaction. Among the difficulties faced by the customers one difficulty is to follow queue through the billing process. Though their intent is just to buy one or two products, waiting to bill products consumes time and also inconvenient these days as people live in a busy environment. As per our survey money and average time spent on each customer is high especially in over-crowded supermarkets. The shopkeepers are ready to welcome any smart machines that automate the billing process to reduce manpower and time consumed for that process. The main aim is to satisfy the customer and also reduce the time spent on the billing process which is to complete the billing process in the trolley rather than waiting in a queue even for one or two products. The customers have to add the products after a short scan in trolley and when done the finalized amount will be displayed in the trolley.

II. LITERATURE SURVEY

The main objective of [1] for making this prototype is to reduce the labors and eliminate time taken in malls. This will work as when the individual will put any of the product in the trolley, its product code will be stored in the database of the controller, and then the bill i.e. the name of the item and the cost of the product will be displayed on the LCD, which uses a RFID reader, all the products are equipped with the RFID tags. So at the billing counter, the total bill data will be displayed on PC which will be transferred by the RF Trans receiver. And also the bill is sent to the mobile phone through the Bluetooth module. And Also we have added one billing method which is by the swiping the card.

System described in [2] is as follows: Each product in the shop or a mall will have an RFID tag on it. Each Cart will have an RFID reader and ZigBee Trans receiver implemented on it. There will be online payment procedure for billing. If the product is removed, it must get deleted from bill too. There must be an RFID reader at the exit door for anti-theft. Depending Upon Customer Buying Habits Display Offers/Discount on screen.Display Product Info, Expiry Date, and Better Alternative. So by making use of this, the super market shopping system will become easier. It will also provide anti- theft system for a supermarket. It will enable online transaction procedure for billing, and it will also give suggestions to the user for buying products, display offers, etc. Constraints: RFID tags and ZigBee should work properly.

Taking into account the changing trend in retail shopping, we come to a conclusion that the Intelligent Shopping Basket [3] is most certainly a definite necessity for the Retail marketing industry to step up their portfolios, cope up with the advancement in technology and save time and manpower.

By means of paper [4], Prof. S. R. Sawalakhe and et al intents to simplify the billing process, make it swift & increase the security using Barcode technique. This will take the overall shopping experience to a different level. Different parameters such as the system parameters of smart trolley like products name, products cost, product weight etc. Are continuously display

The main aim of [5] is to satisfy the customer and also reduce the time spent on the billing process which is to complete the billing process in the trolley rather than waiting in a queue even for one or two products. The customers have to add the products after a short scan in trolley and when done the finalized amount will be displayed in the trolley. Customer could either pay their bill by their ATM cards or through pre-recharged customer card provided by the shop. We have ensured security for preventing theft and also facilitated for users who unknowingly drop their projects into trolley by cautioning them.

[6] is based on the "ZigBee" technology which is very advanced technology. Every time the mart customers has to take the trolley and roam here there for collecting the items which takes a lot of time. After collecting all the shopping stuff the customer has to wait in the queue for payment at the accountant section. Due to large queue time is wasted, to overcome this they have developed a smart way of shopping. In this particular technology RFID tag is used by replacing the barcode form the product. The trolley will consist of a RFID reader, LCD screen and the ZigBee module. When a person put any product in the trolley it will scan the product and price and the brand of the product. The addition of price of the entire product will be added to generate the bill. This bill is stored in the microcontroller memory, which then transfers to main computer through ZigBee module.

In project [7] data transfer is processed between products and the mobile phone. Each and every product is having LIFI transmitter and it store the encoded data similar to the product id, cost of product and quantity. Here the mobile is integrated with LIFI receiver via OTG communication in the shopping cart. It can read the commodities' information when the LIFI transmitter holding goods are chosen by the customers, information about the goods can be entered by using the mobile LIFI and when the product is kept into the trolley, which also contains the LIFI module, double check the product identity. After completing the purchase, the payment is processed in mobile itself via mobile banking system. Finally the cart section will verify the payment and purchase of product which will again cross check the products by the trolley module when we come out of the exit section of the shopping center. If the product is mismatched at this stage it immediately alerts the owner. This technology is used in this project for finding out the information of the commodities.

In system [8], authors are using RFID tags instead of barcodes. Each and every product has RFID tag. Whenever the customer puts a product into the trolley, it will get scanned by RFID Reader. The name and cost of the product will be displayed on the LCD. We are using Visible Light Communication (VLC) technology to transfer the data to the main computer. At the billing counter, LIFI receiver will be placed, which will receive the data from the transmitter.

In system [9] LIFI technology is used. LIFI is a new emerging technology in trend which uses light waves to transfer data. In this paper, we propose an automatic billing system which is not only time effective but also reduces human effort. This system uses LIFI technology to transfer data quickly. The free accessible android application is deployed in mobile using which we get the product details and the payment is processed in the mobile itself. For security, the products are verified in the gate section by checking the products in the trolley. The main objective of this paper is to avoid queues in supermarkets and malls.

An RFID tag is used instead of barcodes in [10]. This RFID tags will be on the product. Whenever the customer puts a product into trolley it will get scanned by RFID reader and product price and cost will be display on LCD display. Like this the process goes on. We are using ZIGBEE transmitter which will be at trolley which is used to transfer data to main computer. At the main computer ZIGBEE receiver will be placed which will receive data from transmitter. To store the products price and total billing memory used will be Atmel AT24C04. LCD used will be 16X2 alphanumeric displays. It will be used to display products names, products cost etc.

III. PROPOSED SYSTEM

Fig 1 shows block diagram of proposed system. Every product has an RFID tag which contains a unique ID. These ID's are fed the database assigned to the corresponding products. There will be another option provided to get the location of required product. If there needs to be a purchase done then that product can be dropped in the cart where the RFID reader reads the tag. The information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated.
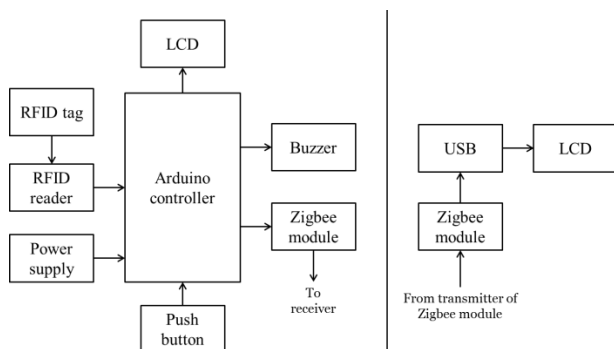

Fig. 1. *block diagram of proposed system*

When a customer wants to remove any product from the trolley then that product needs to be scanned again (shown in fig 2). At the same time the billing information is updated. The total amount of purchases is also displayed on screen. These steps are repeated until the end of shopping

button or send bill button is pressed. This generated bill is sent to billing side computer to get the computerized bill. The customer can straight away pay the bill and leave. Inventory status of the products is also updated at the end of shopping. Simultaneously the temporary data present in microcontroller is reset, So that it can be reused. If the customer has registered user card, the payment can be done by swapping user card in the trolley itself.
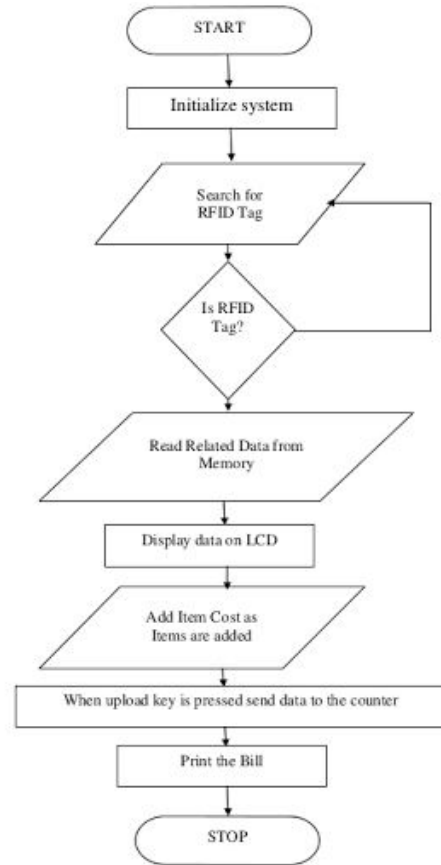

Fig. 2. *Flowchart of proposed system*

IV. CONCLUSION

Whenever a product is added into the cart, it reads the product and stores the data. After completion of adding items the customer choose their payment option and therefore the bill status is updated at the server of that particular cart. Customers can pay their bill through credit/debit cards near the cart or through cash at the billing section as automatically bill is generated. Hence, by using RFID based smart shopping cart and billing system the shopping can be made easy for the customers as well low cost and does not need any special training.

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