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SMART SHOPPING TROLLEY USING RFID AND IOT

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Abstract: *A supermarket or a hypermarket is a form where wide variety of product items is available. These product items can be food, beverages or any household product. The main purpose of supermarkets is to provide availability of all the products and save the time of the customers but sometimes customer gets frustrated while waiting in the queue at billing counter and sometimes they get confused while comparing the total price of all the products with the budget in the pocket before billing. To overcome these problems, we have designed a smart trolley using Arduino. With this system, there is no need for customer to wait in the queue for the scanning for the product items for billing purpose. Supermarkets or Hypermarkets provide this faculty to only those customers which having membership cards. When the customer inserts the membership card in the basket or trolley only then it will work as a smart trolley. Otherwise, it will work as a normal trolley. Supermarkets and hypermarkets use this technique as a strategy to increase the number of customers. In this project we are using NodemcuESP8266 Board, lcd display and rf-id module. When the person wants any item must and should show the item to reader. Rfid reader will read that number and compares that number in to the internal database and display the amount on to the lcd display. We can continuously add the item in to the trolley. Otherwise, if we are not interested any item, we can show the same item to the reader. Rfid reader will detect particular card and erase the money. lcd display will show the amount and item in trolley.*

I. INTRODUCTION

The Internet of Things (IoT) is a rapidly expanding sector that has introduced exciting new developments and opened the door to novel applications of technology in many different industries. The combination of wireless communication with radio and frequency sensing opens up whole new possibilities for human interaction with and usage of technological objects. Supermarkets and other shopping centres are so widespread now that they are no longer a privilege enjoyed solely by those living in major metropolitan areas. They're not only confined to the city anymore; they've spread out into the countryside as well. Even though anybody may go to these businesses and get what they need, they aren't exactly handy, particularly on busy days when customers have to wait for hours in lines.

This ushers in the era of electronic tags that are fastened to certain items. RFID technology is used to record data about an item on a tag, which can then be read wirelessly when the tag comes within range of a reader. RFID is crucial to many Internets of Things uses.

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There are three main parts to an RFID system: the RFID tags, which are affixed to objects and store identification or data about them; the RFID reader, which retrieves this information; and the central processing system, which facilitates communication between the RFID system and other electronic equipment. Aircraft maintenance, anticounterfeiting, healthcare, baggage handling, and supply chain management are just few of the fields that will be profoundly impacted.

RFID tags are utilised for data processing, making them identical to standard barcodes in their function and purpose. However, the two are not exactly the same. Unlike barcodes, which need a barcode reader to visually register the code in order to receive information, radio waves may be used to record data in the case of RFID, therefore there is no need for direct line of sight. When compared to barcode scanning, which needs human monitoring of data and no option for updating records, RFID's automated tracking features and ability to add new information at regular intervals are clear advantages. RFID is an improvement over the barcode method that addresses problems with readability and longevity.

A consumer may scan their purchases at any time to see their updated total and final charge. It also allows users to remove goods and their associated costs from the overall bill if they think it superfluous, as well as establish a budget that, if exceeded, triggers an alert. The ESP8266 Wi-Fi module keeps tabs on all the shopping carts and lets customers pay for their purchases in an instant through an integrated app. This data is sent in real time to a central server. The RFID-enabled shopping cart is a cutting-edge device because of its intuitive design, wide range of uses, and flexibility. When the consumer is done shopping, he or she presses a button on the trolley, which triggers a servo motor to lock the trolley to deter theft, and the total cost is calculated.

II. LITERATURE SURVEY

Now a days shopping at the mall have become a daily routine in big cities. People buy a different product and deposit them in the trolley. After total purchase one need to go to billing counter for the payment which is very time consuming and at times very frustrating. So, our main objective for designing this prototype is to reduce the human efforts, eliminate the queue and also eliminate the time taken during billing. Our prototype consists of components such as RFID tags which is used for identification of the product, RFID reader which is used for scanning of product when put in the trolley and it display in the LCD Display. So, at the billing counter the data is sent into the server.

• The authors have developed a smart shopping cart fitted with facial recognition and information retrieval features. They have also used an automated billing system to avoid queues during checkouts to provide a comfortable shopping experience with the integration of the Internet of Things into the cart for a smart system that assists the customers.

• The authors succeeded in implementing a low budget, smart and fully functional system to make the experience of shopping convenient and comfortable for customers. They made use of RFID technology because of its efficient tracking capabilities and security features. The system deployed features like setting a budget, product addition, and removal, recommendation, as well as addition and deduction of the cost of the product depending upon its presence in the cart.

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• The authors of devised a smart shopping trolley by installing RFID readers on the trolley which were connected to a centralized server using a mode of wireless communication known as ZigBee. It facilitated automatic bill generation on scanning the products, which was transmitted to a central department for billing. The drawback of this system was that it only allowed payments over the counter which compromised on user experience.

• The authors created a concept model which made use of RFID tags fitted on the products as well as ZigBee to transmit bills to a central server. The drawback here is again, the lack of alternative options for payment of bill as opposed to the traditional counter payments.

The worker is supposed to collect the bill once the customer is identified, which leads to the customer waiting in queues.

• The authors conceptualized an advanced shopping trolley, wherein each trolley had an RFID reader and RFID tags were present for each product. Once the product is scanned, the information is displayed on the LCD screen to show all product related information to the consumer. The aim was to help customer evade long queues but it also posed the disadvantage of possible thefts as well as collisions.

• The authors of accomplished in creating a centralized system for automatic billing. Every trolley was fitted with a Product Identification Device(PID) containing an RFID reader, LCD, EEPROM, a microcontroller and ZigBee Module for wireless transmission. The biggest advantage of this system was that enabled the customer to go cashless, thus, successfully implementing a method to avoid queues.

III SYSTEM DESIGN

The current system involves a large amount of manual handling on the part of the customer. It helps in tracking and identification of trolleys, which is useful for the management of the shop but does nothing for the customer. It does not provide a feasible solution to reduce the time spent by the customer in the store, mainly while standing in line for billing and payment. This is because of a lack of alternative mode of payments and collision issues as signals are easily intercepted. The main drawback is the lack of satisfaction and ease of use on the part of the customer.

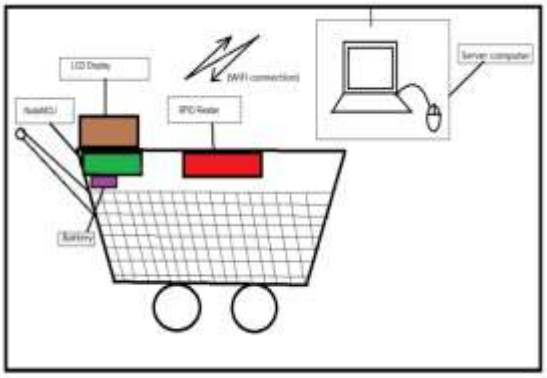

Figure 4.1 System architected

Methodology

Our proposed method of billing is simple, stable as well as reliable. Customers don't have to wait in queues for getting billed. They can easily pay online through our app, thus saving them time. Also, we provide our trolley with security by locking it with the help of servo motor once the shopping is completed. As RFID tags don't work on the line-of-sight technology, no product can be put inside the trolley without being scanned. Also, as a backup, a security check is done at the door. Another advantage of our project is that we have used ionic framework to develop our app, which enabled us to provide users with app compatibility with all three formats i.e., Android, Ios and Windows. Hence, our customers won't just be limited to Android users.

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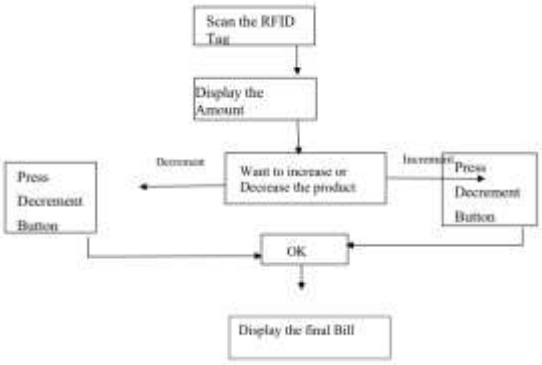

Figure 4.2 Working Block Diagram

FLOW CHART

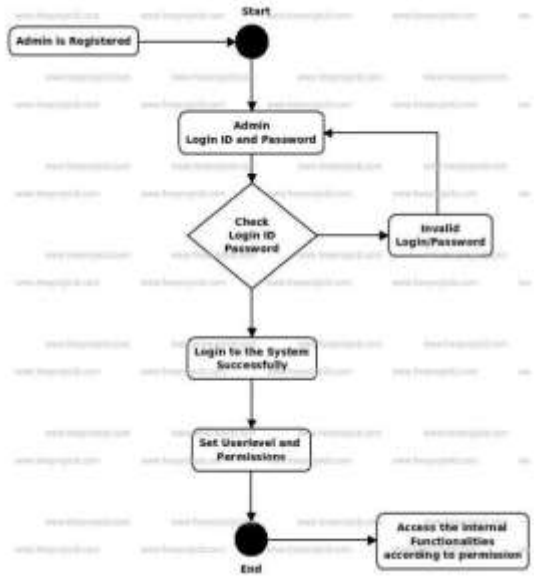

Figure 4.3 Flow chart

IV IMPLEMENTATION

This project reduces the time and makes billing easier. For the smart cart, we use RFID cards and a Card reader with Node MCU. At first Node, MCU is connected to the system to upload the required code. Node MCU is a wi-fi module and it is connected to the given network. Node MCU is connected to the EM-18 reader module at GROUND, Vcc, Tx. For connecting LCD to Node MCU, I2C is required. An I2C contains 4 pins with interfaces to the world. The connections are ground which is connected to the ground of MCU and Vcc which supplies power to the module and LCD. The Vcc of the I2C LCD should be connected to the 5v pin in MCU. The billing information (i.e., items) is displayed on LCD as well as on the webpage. Each Item is updated on each RFID card. RFID card stores a 12-digit unique number which is decoded by an EM18 reader module when the card comes in a range of the Reader.

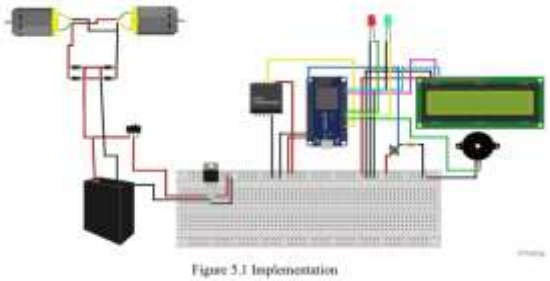

Figure 5.1 Implementation

INSTALLATION OF SOFTWARE

It is used for downloading, installing, and testing the Arduino software (also known as the Arduino IDE - short for Integrated Development Environment). Before you jump to the page for your operating system, make sure you've got all the right equipment.

5.2 RequiredMaterials

• A computer (Windows, Mac, or Linux)
• An Arduino-compatible microcontroller (anything from this guide should work)
• A USB A-to-B cable, or another appropriate way to connect your Arduino-compatible microcontroller to your computer (check out this USB buying guide if you're not sure which cable to get).

Windows

The below procedure shows the how to install and test the Arduino software with a Windows operating system (Windows 8, Windows 7, Vista, and XP).

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• Go to the Arduino download page and download the latest version of the Arduino software for Windows.
• When the download is finished, un-zip it and open up the Arduino folder to confirm that yes, there are indeed some files and sub-folders inside. The file structure is important so don't be moving any files around unless you really know what you're doing.

V RESULTS

• The above figure shows the result of the system which is used to generate the total bill.
• The EM-18 module scans the RFID tags. Display the bill on LCD
• If we want add or delete the items/products, we can do that by using switches.

As said earlier, when we scan the RFID tag with the help of RFID reader i.e., EM-18 we can see the product name and price in the server which is created with the help of NODE MCU micro controller

V CONCLUSION

Thus, with the help of the conclusion we say that, Automatic billing of products by using RFID technique will be a more viable option in the future. The system based on RFID technique is efficient, compact and has promising performance. Also, RFID is better and faster than barcode reading because the later works on line of sight which is not the case for RFID technique. This will take the overall shopping experience to a different level. Different parameters such as the system parameters of smart trolley like product name, product cost, product weight etc. are display.

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