

# RFID BASED SMART CART

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**Abstract**--Even though E-Commerce has grown exponentially in the past few years, sales made from retail still account for around 85% of the total sales made. Among the difficulties faced by customers, one difficulty is lining up in a queue to follow through with the billing process. The goal is to develop technology that can meet all the needs of the customer while simplifying the billing process and saving the time of the customer. The proposed method is to have the customer directly process products and bill them in the trolley instead of waiting in a queue for long periods. The customers have to add the products after a short scan in the trolley and when they're done, the amount will be displayed in the trolley. The customer can also log in to the website which will display the list of all the products added and their amount. Here we use RFID cards and RFID readers with Microcontroller to build the Smart Shopping Cart project. The cart information and total value will be displayed on the OLED. Each RFID card is associated with a certain product and an RFID reader is installed in the cart, which reads the product details like Price and Product details and sends the details to the microcontroller. The total cart value that is displayed on the OLED paves the way for easier payment with the concerned organization.

Keywords --Liquid crystal Display(OLED), Radio Frequency Identification and Detection (RFID)

## I. INTRODUCTION

Throughout the century many innovations and information technologies are drastically changing and so are our views and expectations. The main thing where humans spend maximum time is shopping. According to the survey, we can say

humans spend approximately 1 to 1.5 hours shopping and most of the customers will always tend to walk out of a queue if it is long. In the modern world, all supermarkets and malls have shopping trolleys and baskets for customers to store the purchased products. When shopping is done customers have to proceed to checkout at the billing counter. Here this billing process is quite timeconsuming and must employ more human resources in the billing section. To overcome this problem, we are implementing RFID based smart trolley system to minimize the rush and save time and human efforts. Our prototype has some enhanced features which will overcome this queue issue. The smart trolley system is equipped with an RFID tag, RFID reader, OLED Display, and Node-MCU Controller. The RFID tag is attached to a product. When a person puts that product in the trolley the RFID reader automatically scans the products and the details regarding the product name, cost, and quantity are displayed on the OLED. When the customer is done with the shopping the details are sent to the server and the customer has to just pay the amount and leave the counter. Thus, it has the potential to make shopping more pleasurable, easier, and efficient for the customer. This experimental prototype is designed to eliminate time-consuming shopping processes and quality of service issues. The proposed system can easily be implemented and tested at a commercial scale under the real scenario in the future. That is why the proposed model is more competitive compared to others.

To implement a smarter RFID Based Cart. An RFID tag (of frequency 13.56Mhz) is attached to every product in the mall and the reader (RC522) is attached to the trolley. At the time of purchase, the tag attached to the product is scanned by the reader.

Each tag has a unique passcode. Based on the passcode received by the Node-MCU controller, the information of the product is displayed on the OLED along with the 2 updated costs. This information is also sent to the central PC with the help of the Wi-Fi Module present in the controller.

## II. LITERATURE SURVEY

According to the literature research, In [1], 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. In [2], 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.

The authors of [3] 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 by scanning the products, which were 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

In [4], 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 bills 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.

In [5], 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 OLED screen to show all product-related information to the consumer. The aim was to help customers evade long queues, but it

also posed the disadvantage of possible thefts as well as collisions.

## III. APPROACH

### A) PROBLEM STATEMENT

In the existing system, the customers have to drop every product they wish to purchase into the shopping cart and then proceed to checkout at the billing counter. While billing by having the barcode scanner we need to detect every barcode attached to every item in the purchased item list. When all the items get scanned the price and quantity of items are automatically get into the system and then the bill is got generated. Customers can pay the bill through credit/debit cards or by cash. But it is a time-consuming process as the billing process is quite tedious and has created the need for shops to employ more human resources in the billing section and yet waiting time remains considerably high. The barcode scanners are also used at the counters which consumes more time.

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 modes 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.

### B) PROPOSED SYSTEM

The main objective of the proposed system is to provide a technology-oriented, low-cost, easily scalable, and rugged system for assisting shopping in person. The RFID-powered electronic shopping cart is built to enhance the overall shopping experience for electronics store consumers. Upon placing an item in the shopping cart, the consumer can access an array of product information, advanced product specifications, product features, consumer reviews, and combination deals with other store products. Other features include a live total of

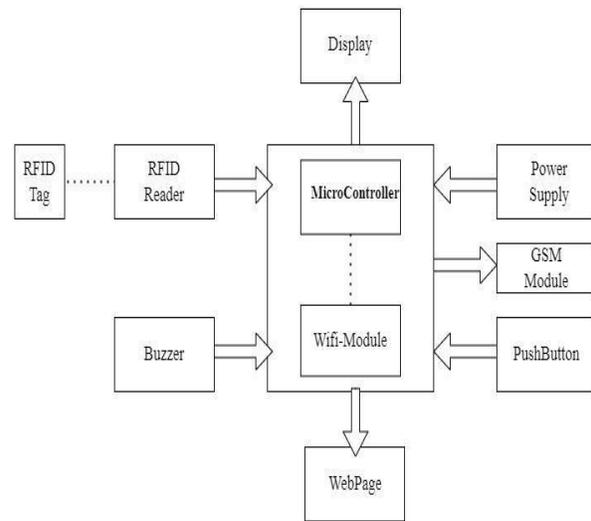
all items in the cart and the system paves the way for the easier cashless transaction of payment.

The system allows a customer to scan the items and the trolley automatically updates the total cost and bills the customer. It also has the provision of setting a budget, which when exceeded, sounds an alarm, as well as the removal of products and their cost from the total bill if a person deems it unnecessary. The system is built such that billing information is sent to a central server in real-time using the ESP8266 wifi module which tracks all the shopping trolleys. The ease of functionality, versatility, and adaptability of the RFID-enabled shopping cart makes it a state-of-the-art system for shopping. On completion of the customer's shopping, he/she will press the button present on the trolley, which will lock it through the help of a servo motor installed on the trolley to provide security and prevent theft and the final bill will be generated.

#### IV. BLOCK DIAGRAM

To implement a smarter RFID Based Cart, the hardware requirements are Node-MCU Controller(ESP8266), RFID Reader (RC522), RFID Tags, GSM Module, Buzzer, OLED Display, Pushbutton. An RFID tag (of frequency 13.56Mhz) is attached to every product and the reader (RC522) is attached to the trolley.

At the time of purchase, the tag attached to the product is scanned by the reader. Each tag has a unique passcode. Based on the passcode received by the Node-MCU controller, the information of the product is displayed along with the updated cost. This information is also sent to the central PC with the help of a Wi-Fi Module(ESP8266) present in the controller. An EMessage can also be sent to the concerned owners by GSM Modules through messages.



#### V. WORKING

A Shopping Cart is used to drop off the products the customer wishes to purchase. Once the product is dropped, the RFID scanner can automatically detect the product based on the passcode present on the RFID Tags. After the product is sensed then it automatically generates the bill by using the WiFi module. The entire database is attached to the main module of the system where it generates the product bill. So the waiting time of a customer is reduced. The software components used here are Arduino IDE and Freeboard IoT Platform. The Microcontroller is programmed and loaded using Arduino IDE Software and Freeboard is used to host the website for this Smart Cart. In addition to this, a GSM Module is attached to the system to notify regarding the purchase through messages.

#### WEBSITE DEVELOPMENT

We can simply make our website with the help of Freeboard. This enables one to view the messages conveyed by the patient across the world. For every change in the message sent, the receiver website also gets updated.

#### CREATING A NEW WEBSITE USING FREEBOARD

The following steps are followed for creating a new website using a Google site:

1. Go to the internet browser and open the new Freeboard site.
2. At the top, under "Start a new site," select a template as per our need.

3. At the top left, enter the name of the site as “Smart Cart” and press Enter.
4. Add content to our site.
5. At the top right, click Publish to publish our website Website image

## VI. RESULT

Thus, “RFID based Smart Cart” has been developed and the data has been collected using RFID module and the data is processed in the Node-MCU microcontroller and then the processed data was stored in the cloud with the help of wi-fi module using IoT and messages are sent through the registered numbers using GSMModule.

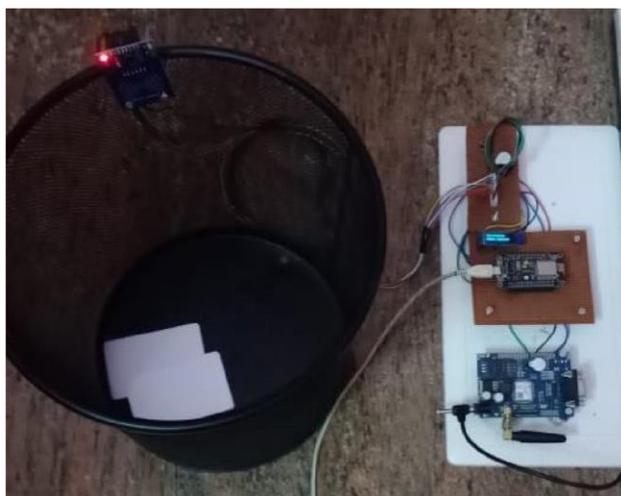


Fig 1 Hardware Implementation

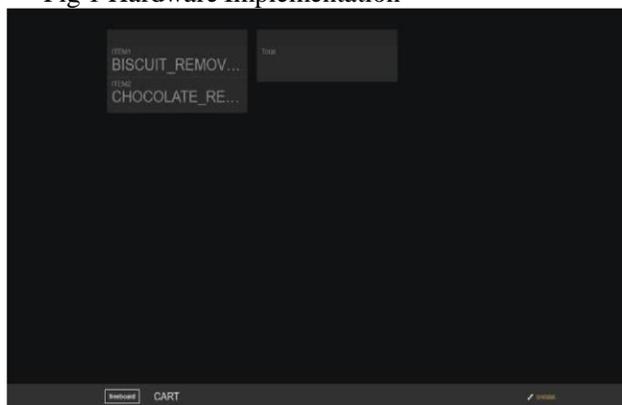


Fig 2 Software Implementation

## CONCLUSION AND FUTURE SCOPE

The Work is done with the help of RFID technology, EM-18 reader, RFID tags, and

NodeMCU controller. It aims to reduce the time of billing for the customers and to ease the process of shopping so that the customers get benefited. It can be implemented in shopping malls where there is a large crowd and a huge rush into malls. In the world of Automation. This technology will replace the present barcode system which is presently being followed. Hence this technology can help people to make their shopping easy and time-saving too without any tedious shopping process.

According to the customer’s point of view, this project has redefined the way of purchasing. RFID has outsmarted barcodes with its accuracy, fast response, and durability. This concept has erased the tradition of customers relying on the shopkeeper for acquiring information about products. Billing is completely avoided which in turn saves time for the customer and makes the process easy for the shopkeeper. It avoids queues for the customer since billing is completed in the trolley. It reduces onethird of the overall investment of the shopkeeper for the billing department. Thus, the model allows a better shopping experience using improved technology which can be handled by any common man who just knows to read and write things

A)Analysis



A system based on RFID technology that could replace the traditional barcode system was successfully established. The barcode system had various drawbacks including the strict requirements on the line of sight and its need to be placed in one particular boundary while scanning, not to mention the issues concerning its durability and inability to update information. The only constraint that RFID scanning is known to have is the distance and range

coverage. RFID tags are durable and allow constant updates of information as well as a rewrite of data to account for change

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