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AUTOMATED BILLING SYSTEM SMART TROLLEY USING ESP32 CAM MODULE WITH THE HELP OF ARDUINO UNO

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Abstract

On festivals and weekends usually, we see a huge rush, especially in the metro cities. Huge offers and discounts make more rush to shopping malls or supermarkets. The primary goal of supermarkets is to make all products available to customers while also saving them time. However, customers can become frustrated while waiting in line at the billing counter, and they can also become confused when comparing the total price of all products to the budget in their pocket before billing. To address these issues, we developed a low-cost, robust passive Arduino-based shopping cart, to work this system a QR Scanner and an LCD display are connected to the trolley. The QR Scanner routinely detects the QR at the product while we positioned the object with inside the trolley and with the assistance of a display, the object info could be displayed and enables real-time tracking and processing of shopping data. In this manner, the price of the object is added to the bill. By this method trolley will itself do all the billing and the hassle of the lengthy queue on counters could be solved. Thanks to this system customers will no longer have to wait in line to have their product items scanned for invoicing purposes.

Keywords- Smart Trolley, Microcontrollers, ESP32 Module, QR code.

I. Introduction

Today, the human lifestyle is changing. The daily life of ordinary people has become much busier. Time has turned into money. So, people don't have much time to shop. This is inevitable. Therefore, people prefer to shop at the mall so that they can get all the goods in the same place. This eliminates the need to go to another store to buy only a limited variety of products. Mall shopping gives people the advantage of saving time, but they only have weekends to visit the mall. Barcode systems are no longer the best way to do business. Customers are tired of waiting at department stores for long and slow checkout lines, especially during vacations. Today, people are very attracted to online transactions because of the boring and time-consuming process at billing counters. People buy various items in the mall and put them in their shopping carts. Billing will be done at checkout using a barcode scanner. As prices have fallen due to technological efficiency and mass production of wireless semiconductor components, new markets where semiconductor chips can be used have been sought. This has led to the use of smart trolleys, also known as automatic billing systems.

Today, when a consumer wants to buy something in a mall, the consumer must take the specified item off the store shelves and then line up and wait for his turn to be paid. It takes a lot of time for consumers to wait for a customer to scan each item in front of the queue and then make a payment. Most consumers are worried that the amount they bring in isn't enough to pay for everything they want to buy until it's their turn to pay at checkout. When smart trolly technology is implemented. Consumers can get information about all the products in the mall, sum up the prices of the products when shopping, and save time wasted on checkout. The method currently available in shopping malls is the barcode method.

(This system consists of an ESP32 camera module, Arduino UNO, 16*2 LCD, power supply, switches) ESP32 camera will scan the QR codes on the products and the total number of items and price will be displayed on the led screen which is connected to Arduino later it will be visible on pc or smartphone with the little help of ZigBee.

II. Literature Review

- In this article [1] Sangeetha, et.al has proposed an ingenious idea it reduces overall customer latency, which potentially eliminates stress, reduces overall store staffing requirements, and increases overall efficiency. it is appropriate to suggest a "SHOPPING CART". In a world where technology is replacing the roots of our daily activities, the future of retail is also in increasingly automated devices.

- In an article titled Development of Sensor Controlled Convertible Cart-Trolley by [2], O.J. Oyejide et al proposed a unique Trolley consisting of three mechanisms, designed such that: when stretched, the system turns into a cart; when tilted it turns to an incline cart with a flat plate. Both the steering and the driving of the trolley are controlled by the two wiper motors, which are attached to the two wheels and powered by 12V DC batteries. The wireless module (ESP8266EX) serves as the microcontroller housing the commands to be executed by the cart.

- The research was done by [3] G Sharmila et al proposed an RFID Based Smart-Cart system with automated billing and assistance for the visually impaired, it contains a smart stick that identifies the object using the RFID technology for blind people. Whenever the stick is kept near the product, the information is announced through voice IC and speaker. It comes with the existing smart trolley. It is made up of RFID Reader, microcontroller, voice IC, speaker, and battery. When the battery is powered on, the RFID reader starts its working process. It will sense the product details through the RFID tag and reflects the product name through the speaker.

- The research published in Elsevier B.V by [4] A S Gunawan et- al present an automatic moving trolley that uses an IOIO microcontroller and Android smartphone as sensors and controller. Android smartphone controls the robot by sending a signal to the IOIO microcontroller paired with the trolley's actuator and monitoring the situation using the smartphone camera. It has also equipped with an indoor positioning system to detect user position using Navisens which is based on a gyroscope and accelerometer in the smartphone.

- In this article [5] Udit Gangwal. et.al introduces a new way to make a shopping cart smarter by adding self-billing using MIFARE tags and card readers. These systems mainly use technologies such as barcodes, QR codes, RFID tags, and smart cards. A newly proposed system using MIFARE tag technology turns out to be a better solution to the problem of long latency in the billing queue by facilitating billing. Prepare the invoice by updating it at the same time in the shopping cart. It is a system that uses RFID tags, but differs in operating frequency, scan distance, and primarily tag availability. MIFARE tags come in a variety of shapes and sizes and can be easily attached to any type of product.

- In this article [6] Blundell. et. al has proposed a low-cost, robust passive UHF-RFID-based shopping cart system that enables real-time tracking and processing of shopping data. A shopping cart with a UHF antenna is defined as a "smart trolley" and shopping items are tagged with a UHF RFID tag with a unique identification code. Retailers are often interested in cost-effective mechanisms for efficiently and effectively storing and tracking

products along the supply chain. In addition, shoplifting is another issue that exists due to the inefficiencies of product tracking technologies such as "barcodes" used in retail supermarkets. Amazon Go, a smart retail layout launched by Amazon to address the above issues, turned out to be inefficient because the system was overly dependent on past consumer buying patterns.

III. Proposed Methodology

This part explains about the methodology we intend to adopt to achieve the overall aim of proposing effective mechanisms to develop a smart trolley for supermarkets. The proposed system consists of the two section namely: -

- Trolley Section
- Billing Section

The smart trolley which is designed with additional features compared with the usual trolley in all supermarkets. This Smart trolley includes a camera which scan the QR code of the product and display all the information of product in LCD display with the help of Arduino. Once the item is scanned user can add or remove any product with the buttons present on console board, based on that the system calculates the bill. Then with the help of ZigBee final bill is transferred to billing counter computer where user can pay the bill.

- **Block Diagram**

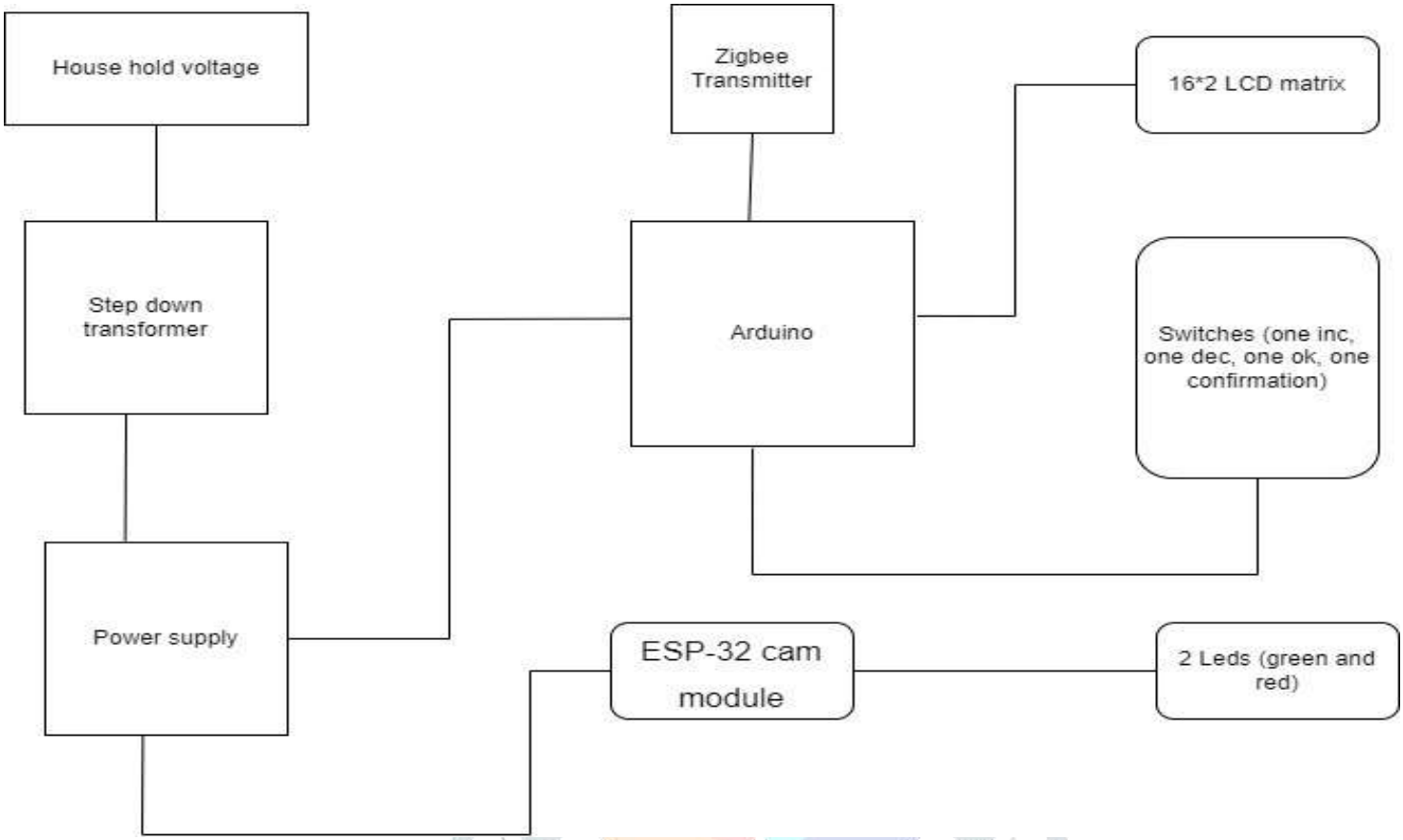


Fig. 1 Trolley Section

From our block diagram we can see that the trolley section consists of all the device which are required for our project like the Arduino board, Zigbee transmitter, LCD display and the camera module. All the components are connected with the Arduino board. There is a console panel in our trolley where the customer can increase or remove any products from the trolley, after they scan the product.

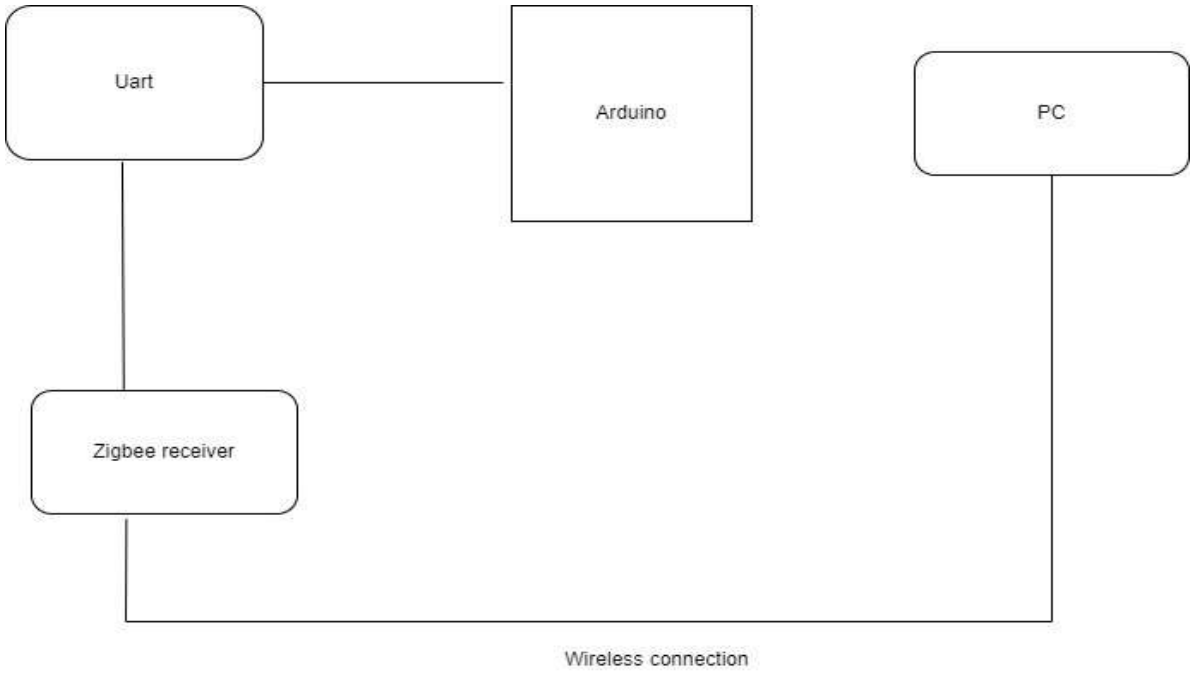
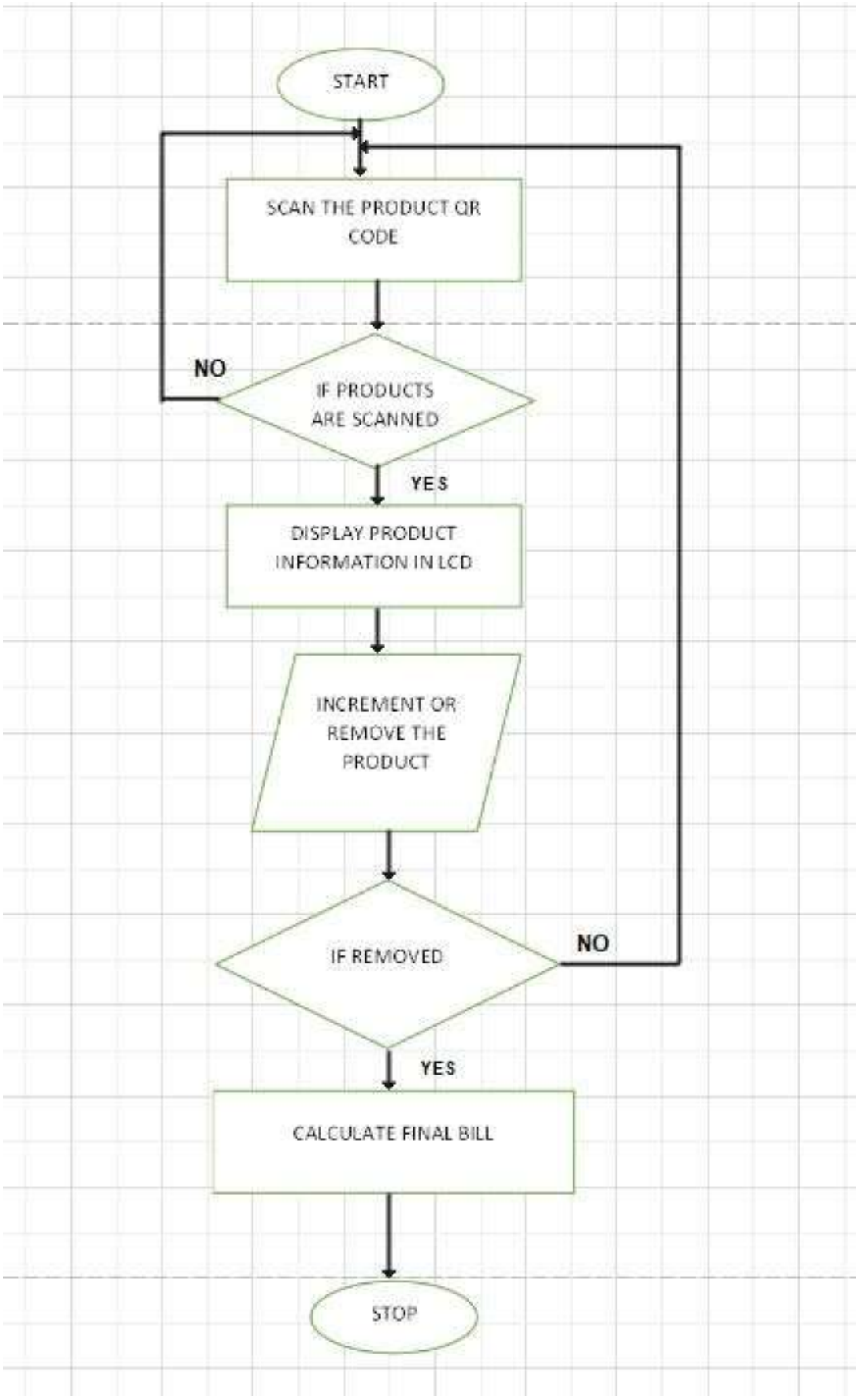


Fig. 2 Billing Section

The billing section consists of a Zigbee receiver which is connected to the counter's Computer where the sales person can receive the total bill amount of the customer and the customer can pay the bill at the counter or in his/her smartphone.

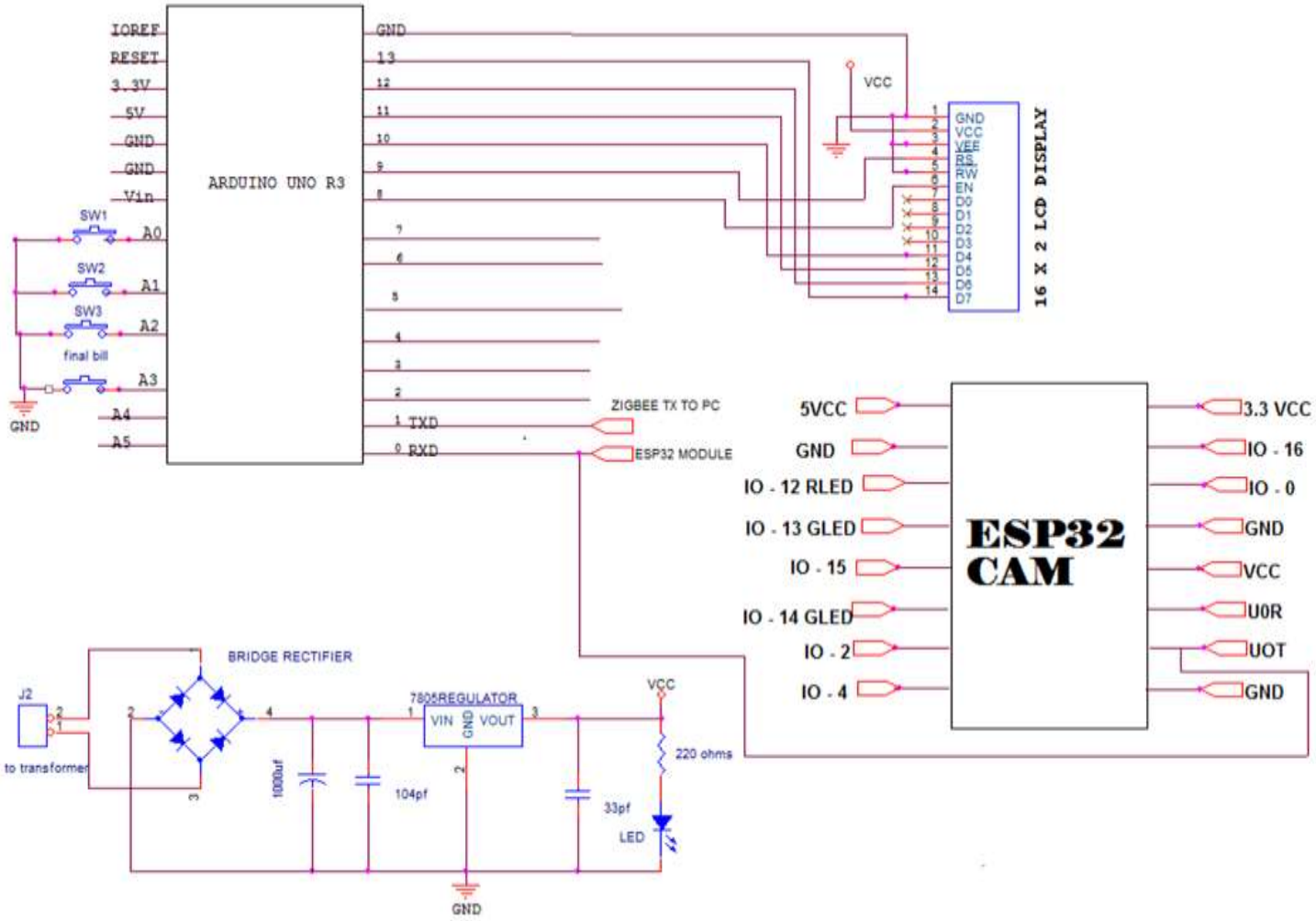
- **System Flow Chart**

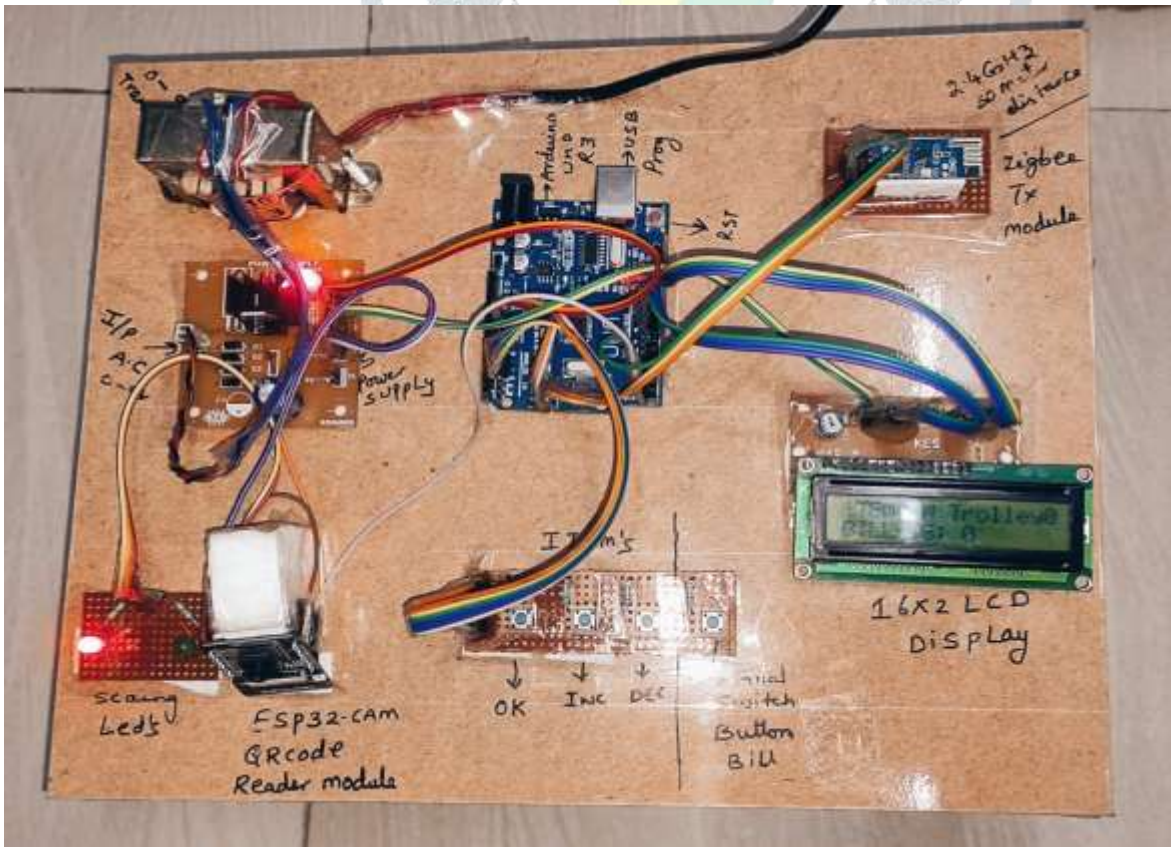


IV. Working Methodology

A customer goes into a shopping center then he/she first take the smart trolley. In shopping center every product has an QR code which contains all the information of that product. If a person wants to purchase any product, he must scan the QR code of the product using the ***camera module*** connected in the trolley and all the information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated. When a customer wants to add or remove any product from the trolley, then there will be two options on the Trolley "*ADD*" and "*REMOVE*". By selecting desired ***button*** one can add or remove any product from the cart. 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 ***final bill*** button is pressed. This generated bill is sent to billing side computer to get the computerized bill. At the end of shopping, the customer is asked for the trolley number, to generate computerized bill. The customer can straight away pay the bill and leave. At the same time the inventory status of the products is also updated at the end of shopping. Simultaneously the temporary data present in microcontroller is reset by resetting the microcontroller so that it can be reused.

- **Circuit Diagram**





V. Prototype And Result

The Trolley's database would get updated every time when a product is being dropped into the trolley. The trolley's database consists of the details of the name of the product, cost of the product, manufacturing and expiry dates of the products and the total cost of the products that is being purchased. Whenever a product is being removed from the trolley, it is updated in the database as well as on the LCD display automatically.

Fig. 3 Prototype

VI. Conclusion

The project has succeeded in demonstrating the potential of developing a smart shopping system that automates the entire billing process using the ESP32 module on Arduino. The developed system is very reliable, fair, and cost-effective. The effectiveness of the ESP32 combined with reliable image processing technology makes it reliable and fair. The system uses passive sensors to reduce communication requirements and is also a power constraint. The decision-making

process runs locally in the car, eliminating communication overhead between motes. What's more, the application does not use the complex routine mechanism transmission, and our implementation uses simple technology. It is trustworthy, highly dependable and time efficiency.

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