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***Abstract*— This project's objective is to provide an overview of a project that improves the shopping experience for regular people, particularly for those who dislike standing in lines and wish to leave on their own. The main benefit of this is that it prevents the spread of infectious diseases at periods when people are unable to connect with one another. This project helps clients save valuable time. This initiative assists clients in choosing their products in accordance with their budgets. The smart shopping cart is a creative solution created to improve the shopping experience. It uses RFID, Arduino Uno, and Arduino Nano. The inclusion of RFID technology enables the cart to recognize the items placed in it automatically, facilitating effective inventory management and tracking. The Arduino Uno and Arduino Nano function as the system's brain, managing the RFID reader and analysis the information gathered. Customers may easily make informed purchases because to the system's ability to display product details and prices on an LCD screen with ease. This project is affordable and easily accessible to retailers who are unable to make larger financial investments in improving the shopping experience.**

Keywords—Shopping cart, Arduino Uno, RFID, Arduino Nano, Inventory Management.

I. INTRODUCTION

It's crucial for our clients to have a seamless and efficient shopping experience without hassle or delays, caused by the outdated manual billing process. The automatic billing system allows for quick and accurate transactions, ensuring customer satisfaction and loyalty. Furthermore, the integration of RFID technology enhances security measures and reduces the chances of errors in the billing process. An innovative technological solution that improves the shopping experience for consumers is a smart trolley, commonly referred to as a smart shopping cart. This ground-breaking technology makes shopping more practical, effective, and engaging by using a variety of instruments like RFID (Radio-Frequency Identification) scanners, sensors, and screens. Inventory tracking is one of the most important benefits of employing a smart trolley. The system can automatically identify the products placed to the cart thanks to RFID scanners mounted in the trolley, negating the need for manual scanning. Customers wait less and checkout times are shortened as a result. A user-friendly screen on smart trolleys can also show product details, pricing, and recommendations. Customers can use this function to find new products and make educated purchasing selections. Another benefit of adopting a smart trolley is that it might give customers a more tailored shopping experience. The trolley can provide customised product recommendations and provide unique discounts thanks to the system's ability to track user behaviour and purchase history. Also, retailers can analyse and improve their operations with the use of smart trolleys. Retailers can modify their inventory, marketing plans, and pricing by gathering data on consumer behaviour and product preferences. Ultimately, smart trolleys are an innovative and intriguing technology that has the potential to change how we buy. Retailers can boost customer happiness, loyalty, and sales by giving customers a more convenient, effective, and customised experience.

II. LITERATURE SURVEY

Nivas Chandra Reddy developed the cashier creates the bill using a barcode scanner, which might be a time-consuming process. Long lines form the billing counters as a result of this. This project outlines a strategy for creating a framework at shopping malls to address the aforementioned problem. Making progress in science and innovation requires constant effort. The most innovative devices and technologies are being planned and created. This programme used in shopping malls to assist customers by saving them a lot of time when making purchases. RFID is used in this project as a safe entry point for the object, which improves observation performance [2]. In this paper [3,4], The barcode scanner's sensor is reflected light from the lighted area. The decoder takes the created analogue signal from the sensor, analyses it, and uses the check digit to verify the barcode's authenticity. The sensor detects the reflected light and creates the analogue signal from the illuminating reflected light. The barcode is a symbology representation of the encoded information or data that can be scanned by the barcode scanner in a quick, accurate, and efficient way. This method was designed to address this issue, where the serial number or unique number that may be utilised. Barcode technology is being used in libraries as a tool to handle customer requests as quickly as possible. Because to its success, barcode technology is mostly employed in libraries'

circulation systems. This is because it is quick, precise, and dependable.

Rakshit Shetty [6] used A camera, Raspberry Pi 3 computer, LCD display, and weight sensor will be added to this sophisticated mobile cart. To establish a connection between the cart and the client's phone and enable the cart to deliver the bill data, the customer must first scan the QR code on the cart with their smartphone. Using the camera input, this clever cart automatically reads the barcode of the items that are placed in it. The machine vision technology also assists in tracking things that have not yet been purchased and averting potential item loss. The consumer has the choice to purchase and pay for exactly what they want thanks to object detection as well. In this framework [7], After the connection is established, the ultrasonic sensor in the shopping cart detects the item when the user places or removes it, and the Raspberry Pi saves the video captured by the cart's camera for seven seconds. After that, it notifies the main server that streaming has begun across the TCP/IP network. In comparison to existing unmanned shop options, the smart trolley system suggested in this article offers a greater cost performance ratio. Even if the capacity rises, it is unaffected under the proposed system. Moreover, it utilises comparatively minimal computational power. Also, unlike the traditional approach, not every product needs to have RFID attached to it. Hirak Dipak Ghael [8], observed The primary goal of the Raspberry Pi is to pique people's interest in computers, programming, and even helping them to solve challenging mathematical issues. The Raspberry Pi is the ideal board for integrating a broad variety of external peripherals since it combines embedded systems and conventional computer characteristics. Moath Awawdeh [9], The smart cart's hardware consists of a touch screen monitor, an integrated scale, and an automated bag dispenser. Customers may access a virtual shop map, product pricing, and suggestions based on past purchases on the touch screen display. Although the automated bag dispenser streamlines the bagging procedure, the built-in scale can weigh items and display their pricing on the touch screen. Customers may utilise a smartphone app included with the smart cart's software to make shopping lists, keep track of their purchases, and get customised promos. It's probable that a diverse team of engineers and developers worked together to design, create, and test the different hardware and software components for the smart cart.

A design for the smart shopping cart was created, which comprised both software and hardware elements. The hardware elements included the RFID reader, sensors, and microcontroller. Owners of supermarkets gain from reduced costs due to fewer employees, less space needed, and time savings. Any retail shopping centre, supermarket, hypermarket, or apparel showroom can employ the smart shopping cart. The system design stage, the proposed IoT-based smart shopping cart system was designed, and the components of the system were identified. The system consists of an RFID reader, an IoT gateway, and a mobile application. The RFID reader is used to identify the products in the cart, while the IoT gateway is responsible for collecting and sending data to the cloud for processing. The mobile application is used by the customers to interact with the system and obtain information about the products in the cart [10,12]. An LCD touch screen is integrated with the UHF-RFID reader to display the product information, such as the name, price, and quantity. A Zigbee adapter is also included to store and process the data collected by the UHF-RFID reader. A secure communication protocol is developed to ensure the privacy and integrity of the data transmitted between the RFID tags, UHF-RFID reader, LCD touch screen, and Zigbee adapter. The protocol uses encryption techniques to prevent unauthorized access and tampering of the data [11].

The smart shopping system comprises of trolleys that have RFID readers built in, and every item in the shopping centre has a different RFID card attached with a unique RFID number. When a consumer inserts a product they wish to purchase in the smart cart, the RFID read connected to the smart cart recognizes the product's RFID card number. The coordination of all the actions is the responsibility of the Raspberry Pi Controller. A membership card is supplied to each consumer. All of the customer's login details are shown on the web application when he swipes his membership card. As a consumer adds the purchased items to their cart, the application is dynamically updated [13].

Alexander Agung Santoso Gunawan [14], The authors have designed and built the Line Follower Smart Trolley System V2 using RFID from scratch, including selecting the appropriate hardware components (e.g., microcontroller, motor driver, RFID reader) and developing the software to control the trolley's movements and interactions with the RFID tags. Customers won't have to manually look for the location of the item they want to purchase thanks to this guidance. The smart trolley's whereabouts is also tracked using RFID technology. This undertaking executes Artificial Intelligence [15], Although these two systems operate differently and are not interrelated, they both rely on the Arduino Uno microcontroller for their functioning. Even if the billing system is not in operation, the moving cart system can function autonomously. The arrangement is made to simplify the process of relocating carts, even though they are not engaged in billing tasks, but still might be employed by the staff for miscellaneous purposes. The automated billing method features the use of an RFID sensor and load cell, with the consequent charge displayed on the LCD. Additionally, IR LEDs are used to detect motion, thus allowing the automated movement of the cart. The DC Motor then receives the appropriate input, and the cart travels as intended. So, by using this cart, customers may enjoy their hassle-free shopping without having to wait in line at the payment desk.

Denis Ivanko [16], The authors designed a smart shopping trolley that can recognize sign language gestures and respond accordingly. The trolley is equipped with a camera, a microphone, and a speaker to capture and process the input signals. The authors selected a set of sign language gestures that are commonly used in shopping scenarios, such as "help," "buy," "price," and "thank you." The gestures were chosen based on their relevance and ease of recognition. Anitha. R [17], The hardware design for the smart trolley is the first stage of the methodology. For the hardware design, the authors used a microcontroller, RFID readers, load cells, and a screen. The creation of the software for the smart trolley is the next step. The software's functions include controlling the hardware parts and creating invoices based on the items placed in the trolley. Customers may

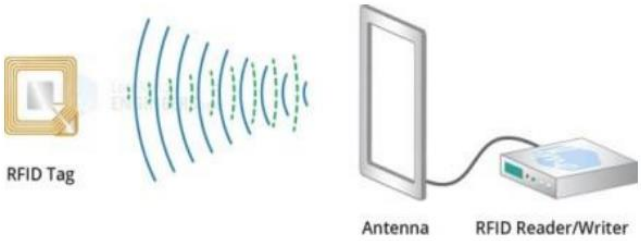
utilise an application built into the programme to communicate with the smart trolley.

The hardware design for the smart shopping cart is the first phase in the approach. For the hardware design, the authors employed a microcontroller, a Wi-Fi module, an ultrasonic sensor, a motor, and a touch screen display . The creation of the software for the smart shopping cart is the next phase. The software's main functions are to interact with the mobile application and manage the hardware parts. The consumer can communicate with the smart shopping cart via a mobile application that is part of the programme[18]. The product photos were resized and normalised by the writers using image processing techniques. Also, they standardised the product weights and prices and extracted characteristics from the photos. The deep learning model's training is the fifth phase. The model was trained by the authors using a convolutional neural network (CNN) to identify goods based on their photographs. The model was trained using the gathered data, and it was then adjusted to increase accuracy[19, 20].

III. HARDWARE AND TECHNOLOGIES USED

1.RFID

An RFID identification system has two main components, which are a tag that attaches to the object needing identification, and a reader that is responsible for reading the tag. Each reader comprises a radio frequency module and an antenna that creates a high frequency electromagnetic field. Typically, the tag is a passive device and does not contain a battery. It contains a microchip for storing and processing information, along with an antenna to receive and transmit a signal. Once the tag is near the reader, the reader initiates the generation of an electromagnetic field.



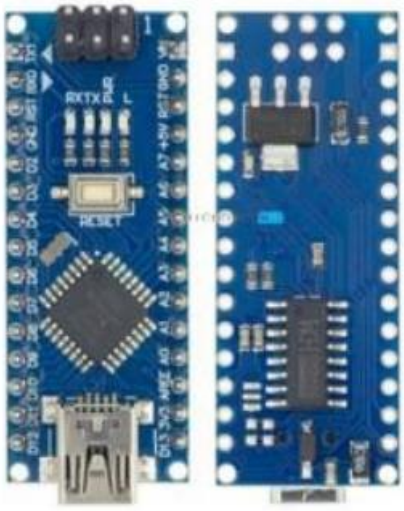
2. ARDUINO UNO

Based on the Microchip ATmega328P microprocessor, the Arduino Uno is an open-source microcontroller board. The board is equiped with sets of digital and analog input/ affair (I/ O) pins that may be connived to colorful expansion borads (securties) and other circuits. The board has 14 digital I/ O legs (six capable of PWM output), 6 analog I/ O pins, and is programmable with the Arduino IDE (Integrated Development Environment); via a type B USB cable. It takes voltages between 7 and 20 volts, however it can be fueled by the USB wire or an additional 9-volt battery. The Arduino Nano and Leonardo are comparable to the Arduino Uno.

Power: The Arduino Uno can be powered via the USB connection or an external force power. The power source is selected automatically. Moreover, External(non-USB) power can come from an AC- to- DC append age (wall-wart) or a battery. Connecting the adapter requires inserting a 2.1 mm center-positive connector into the power port on the board!! Leads from a battery can be fitted in the Gnd and Vin pin heads of the power connector... The board can operate on an external supply of 6 to 20volts. However, still the 5V pin may supply less than five volts and the board may be unstable, If supplied with lower than 7V. still, the voltage controller may heat and damage the board, If using further than 12V. The recommended range from 7 to 12 volts.

3.ARDUINO NANO

The Arduino Nano is a slightly, small, complete, and-friendly, breadboard-grounded board founded on the ATmega328P released back in 2008. It grasps the same connectivity and specs of the Arduino Uno board in a somewhat lower form factor. The Arduino Nano has thirty male I/O heads arranged in a DIP-30-like format. It may be programmed using the Arduino Software, an integrated programming environment (IDE) that is typically included with all Arduino boards. The Arduino Nano can operate both online and offline. The board can be empowered through a type- B mini-USB string or from a 9 V battery.

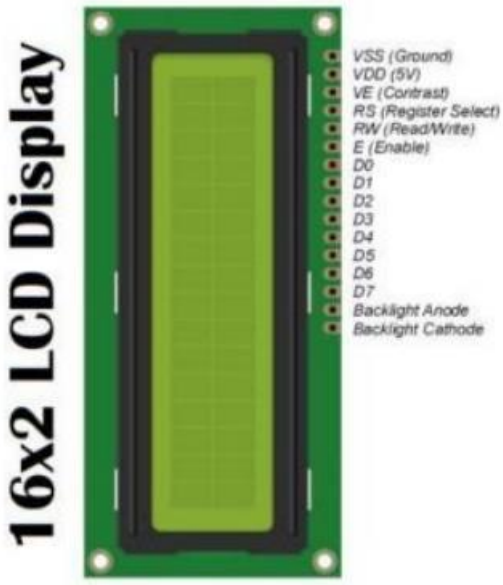


4.LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid chargers in its primary form of operation. LEDs have quite a large and varying set of use cases for consumers and businesses, as they can be generally set up in smartphones, boxes, computer observers, and also instrument panels.

Use of LCD display in this Project are:

• Displaying Product Information.
• Displaying Shopping List.
• Payment Information.

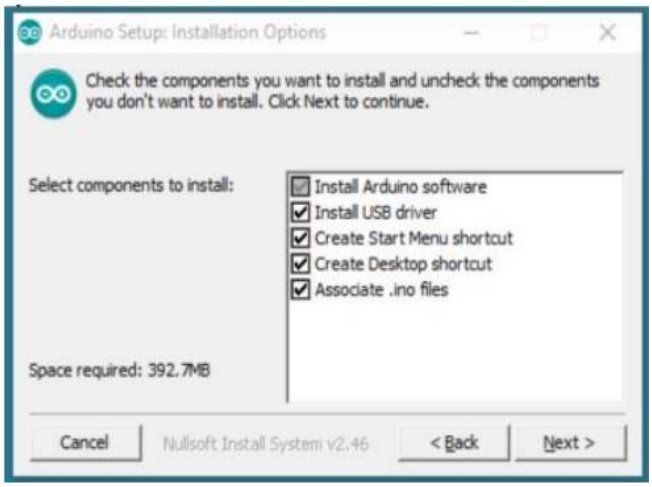


5.ARDUNIO BUZZER

The buzzer plays the crucial part in security in our design. It gets data from the payment and helps us to confirm whether the scrutinized item is paid or not. if either the payment is deficient or the item isn't added to the wain before payment it gets detected by the RFID and the RFID sends signals to the buzzer. latterly the buzzer makes sound so it can warn the security The buzzer keeps making sounds until the whole particulars is scrutinized at the exit gate. Indeed if one redundant item is added the buzzer detects it and makes some sounds to warn the security.

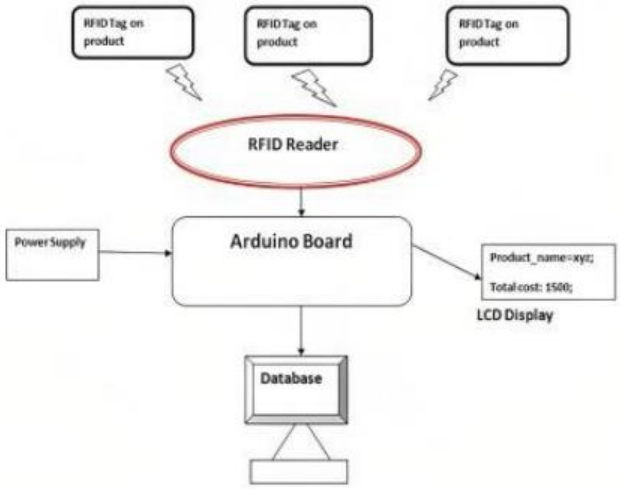
6. ARDUINO

There are many benefits to using the Arduino Software (IDE), such as its user-friendly interface and robust functionality. With just a few clicks, you can *develop* and test your code before uploading it to the board. Error detection is also a breeze, with helpful prompts guiding you through any mistakes you've made. *Additionally*, the compatibility with multiple operating systems ensures that you can work seamlessly across different platforms.



IV. IMPLEMENTATION

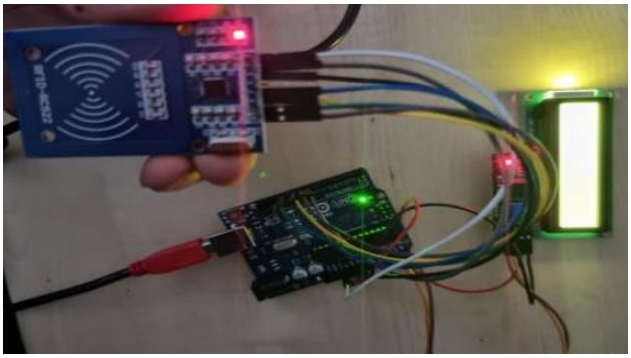
In our model we have a unique RFID label attached to it. Attached label contains not only cost of the product but also fresh information related with product like product name, manufacturing date, expiry date, etc. While client put the product in the wain at that time the RFID an technology reads that RFID label attached to that product. The RFID anthology will sends this information to the Arduino Board for farther process. Arduino performs colorful operations on the information entered by RFID anthology by reading RFID label attached to the product. With the help of Arduino, TV Display will show the name and total cost of the product. However, also client can remove that product by rescanning that product's Label, If client wants to remove any product from list of the bought product which is formerly in wain.



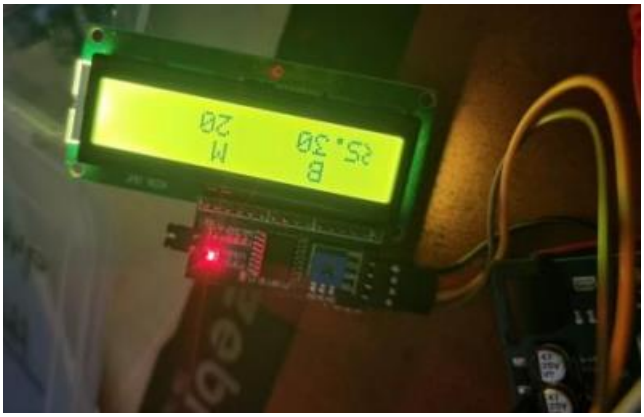
V. RESULT

At the starting the screen will be empty and ready to use. With no data in it except some pre defined values. Once the items are scanned it shall change. The RFID scanner here acts as a receiver and gathers the data from RFID tags and

later the information is sent to the lcd display. Once the items are tapped or scanned near the RFID the data is depicted on the lcd display so we can know the price and details of the item scanned.



Here the second item is tapped or scanned near the RFID the data is depicted on the lcd display as shown in the figure.



If the payment is done we shall get a message on the display as payment is done. So that the shopkeeper can acknowledge the payment and note it down.

If the payment is not done or incomplete we shall get the message payment is not done on the display screen.

CONCLUSION

This project is mostly based on avoiding human interaction and reducing waiting time in queues. By implementing this project these issues can be solved quickly. By this project grocery stores will be automated and secure. And Customers and easily shop the groceries. As it is connected to database it will automatically detect the low stock by reporting an issue through cart . payment can also be done without human interaction . hence this project is a attempt to make shopping experience easy.

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