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IOT BASED SMART AUTOMATIC SHOPPING CART

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ABSTRACT

The popularity of conventional shopping hasn't diminished despite the tremendous growth of e-commerce and other internet applications. Following up in a line for the billing procedure might be tough. There is a need for simple and speedy bill payment. Due to a barcode-based billing system, a large population in the supermarket over weekends or when there are discounts makes it difficult to avoid standing in long lines. In this regard, the Radio Frequency Identification (RFID) sensors, Arduino micro controller, Bluetooth module, and mobile application-based Smart Shopping Cart is presented. Each product may have a cheap RFID tag affixed as part of an IOT system, and when that product is placed in a smart shopping cart, the RFID reader on the cart can scan the tag automatically. Moreover, RFID-equipped smart shelving that can track inventory and maybe update a central server can be included into this system. This type of technology also makes inventory management simpler because all goods can be automatically scanned by an RFID reader to determine whether a product's expiration date is still valid. The IOT website will be updated with all information.

Keywords— Internet of things, microcontroller, Electronic tags.

INTRODUCTION

The fresh and interesting system's dynamic growth and advancement have expanded quickly. Nonetheless, buyers may find a wide variety of things under one roof at shopping centres or malls, which is a huge convenience. Shopping is become quite commonplace and not so much a luxury as a fundamental necessity. Consumers have several challenges while buying, one of which is standing in line to simply bill the purchases, and the majority of customers are frugal buyers. Most often, they would learn that the bill is more than the budget value and that issues are encountered in removing the items only at the very end. The majority of the times, consumers miss out on some of the items they need to purchase. Second, modern consumers prefer to make purchases from home rather than making a list and making a trip to the store. The next challenge is finding the items here. Overall, this procedure takes a lot of time [1].

Electronic tools known as sensors are able to gather data from the environment. A wireless sensor network (WSN) is used to connect several sensors so they may communicate with one another and wirelessly share data [2]–[6]. Networked systems, which provide more intelligent and autonomous applications, are more valuable than isolated systems. When wireless sensors are coupled with networked systems, a variety of data may be gathered. The Internet of Things (IoT) is a closely coupled system that connects communication networks and sensor networks, either directly or indirectly, to manage and analyse data, We can connect with the physical environment thanks to the Internet of Things because of the sensors and actuators. It is made up

of the phrases physical, smart, and connection, which describe how intelligently sensors, microcontrollers, microprocessors, and physically present devices like actuators can handle data with other electronic devices [7-14].

IoT gives individuals the ability to effectively manage their lives and businesses while also bringing about fundamental changes in society that have the potential to totally reshape business and industry. Many applications in the fields of aerospace and aviation, automotive, telecommunication, medical, healthcare, independent living, pharmaceutical, transportation, manufacturing, retail, logistics, and supply chain management may be created thanks to the IoT's potential. IoT's primary goal is to remotely monitor specific things and the surroundings. Electronic tags that are connected to certain things are now used. RFID technology reads the object's stored information wirelessly when these tags come within range of the reader [15]–[20].

In the IoT's applications, RFID is essential. It is made up of three parts, including RFID tags that are affixed to objects and hold information about them, an RFID reader that reads the information from the tags, and a central processing system that facilitates communication between the RFID system and other electronic equipment [21]. It is having a transformative impact on a variety of applications, including supply chain management, healthcare, anti-counterfeiting, and aeroplane maintenance [22].

The main component of supply chain management that advertises the items to consumers and distributors is the merchandising process. A group of individuals coming together to buy goods at one location is known as shopping. There are places for people to shop, such supermarkets or shopping centres, where merchants advertise their wares to customers, who then buy them based on factors like the product's brand, expiration date, brand of ingredients, affordable price, and quantity. Traditional retailing is another name for this. Supermarkets are useful for both urban and retail development. The weekend is when supermarkets are the most congested.

Numerous people have occasionally demonstrated their attempts to bring about a change in traditional purchasing. Barcode technology is being used by several supermarkets. Applications for mobile devices, Zigbee, Arduino microcontrollers, RFID and wireless sensors. Some supermarkets have barcode technology installed and operational today. A barcode is a series of uninterrupted, vertical, black bars that contains some recorded data about an object. With a smart trolley, each item is self-scanned by the user using ultrasonic sensors. Product identifiers are kept on printed bars with barcodes that are connected to backend databases. As the printed barcode comes into line of sight, a barcode scanner scans it. Compared to the RFID sensor system, that is a slower procedure [23].

Because to their extensive use and ability to respond quickly and effectively, RFIDs are being used in many cutting-edge applications. RFID tags are often used to uniquely identify items by employing radio waves. Conventional barcodes have a significant disadvantage known as line of sight technology, and these barcode tags also have limitations in their longevity, but the RFID's tags are more durable and able to read/write data that may even be encrypted.

Shopping is made simpler by using RFID technology to create a unique representation of each goods in a market. This may be accomplished by equipping a shopping cart with an RFID reader that would scan each product and load it under the direction of a micro controller. Remaining paper is organized as Literature Survey in Section II, Section III consists of proposed system, Section IV concludes.

LITERATURE SURVEY

Nowadays, the procedure is carried out at malls utilising bar code scanners, with the vendor scanning the product via the scanner. The customer must wait in a long line since this procedure is thought to be slow[24].

The smart cart built on Arduino avoids labor-intensive tasks like self-packaging, utilises cart storage, and incorporates a security mechanism to prevent theft [25].

The development of RFID using "ZigBee" technology to establish wireless communication between each RFID (916 to 924MHz) and the main server main server is discussed in the majority of publications pertaining to the cart. Low power Bluetooth is used by the shopping to communicate.

The present system's flaws have been determined through the literature review, and the suggested framework has been modified. New and innovative systems are developing quickly and growing quickly.

When the items are scanned using a barcode scanner, the procedure is sluggish. The current method wastes consumers' time while they wait in line for billing, which interferes with the whole shopping

experience. This is because there is no billing system in place. Major issues include theft and placing products in trolleys that are larger than the customer's projected limit [26].

PROPOSED SYSTEM

To verify the quantity of the commodity, an RFID scanner is employed. The maximum weight that may be placed onto the cart is determined using the weight scanner. With the aid of nodeMcu, all the measured data will be uploaded to the IOT website. The measured information was displayed on an LCD screen. The mechanism will sound a buzzer alarm if the product is expired. With the two distinct IOT websites, the product demand will be updated.

BLOCK DIAGRAM

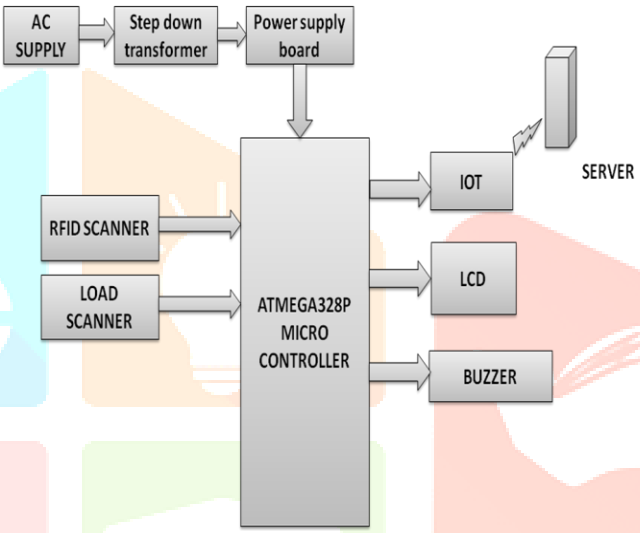


Fig 1: Block diagram

As shown in above figure, In this regard, the Radio Frequency Identification (RFID) sensors, Arduino microcontroller, Internet of Things (IoT) module, and Mobile application-based Smart Shopping Cart is presented. Wireless connection is necessary for RFID sensors. Each product has an RFID tag attached to it, and an RFID reader that effectively receives the information from the tag is the other component. Each product's information then appears on the mobile application after this. The consumer may quickly customise the shopping list via the mobile application. The server is then wirelessly sent the shopping information, and billing is generated automatically.

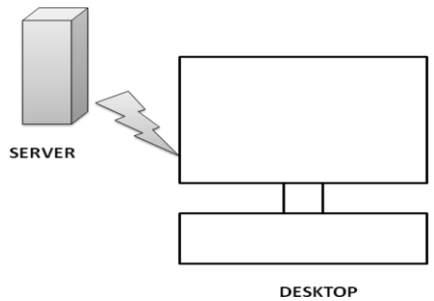


Fig 2: Receiver Section

SOFTWARE AND HARDWARE REQUIREMENTS

The programming language used is embedded C.

ARDUINO IDE

The compiler is Arduino Ide 1.8.3 is shown in Fig 3.

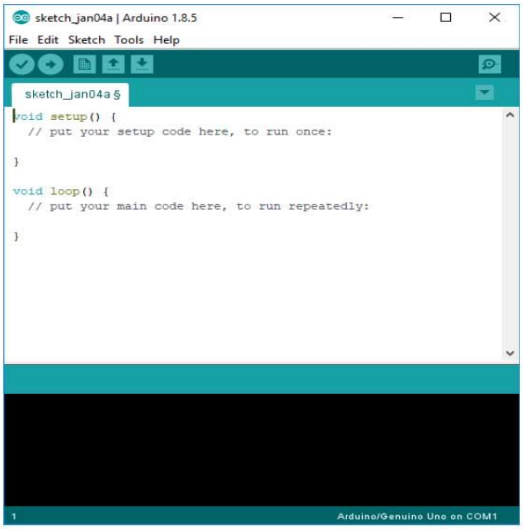


Figure 3: IDLE of Arduino

Java was used to create the cross-platform Arduino integrated development environment (IDE), which is available for Windows, macOS, and Linux. Writing and uploading programmes to an Arduino board are done using it. An open-source electronics platform called Arduino is built on simple hardware and software. A motor can be started, an LED can be turned on, and anything may be published online by using an Arduino board to receive inputs like light on a sensor, a finger on a button, or a tweet. By delivering a set of instructions to the board's microcontroller, you may direct your board's actions.

PROTEUS

Simulation tool used is Proteus before being implemented into a real-time application.

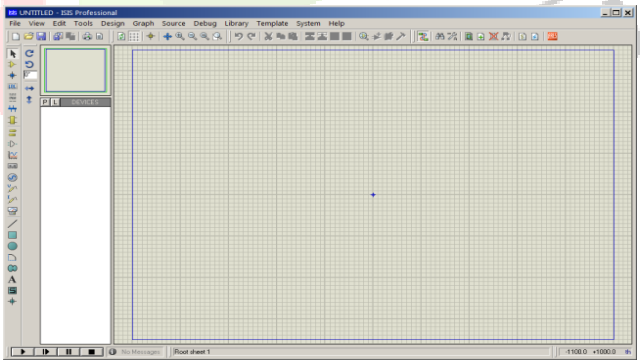


Figure 4: Proteus Application

Labcenter Electronics created Proteus, a simulation and design tool for electrical and electronic circuit design. The simulation function of Proteus. Proteus' many parts can be virtually recreated. There are two ways to simulate: Run simulator or go through frames one at a time.

The option "Run simulator" simulates the circuit at regular speed (If the circuit is not heavy). The "Advance frame by frame" option skips to the following frame and waits until you click this button again. When troubleshooting digital circuits, this is helpful. The proteus idle is as shown in figure 4.

LIQUID-CRYSTAL DISPLAY (16 X 2 LCD)

Liquid crystal display is referred to as LCD. It is a particular type of electronic display module used in a wide array of circuits and devices, including mobile phones, calculators, computers, TVs, and other electronics. These displays are mostly favoured for seven segments and multi-segment light-emitting diodes. The primary advantages of adopting this module are its low cost, ease of programming, animations, and unlimited ability to show bespoke characters, unique animations, etc. pin configuration is as shown in figure 5.

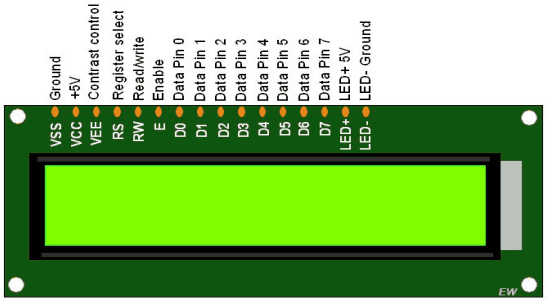
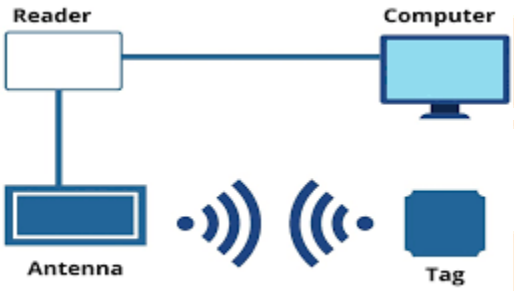


Figure 5: Pin diagram of LCD

RFID

Tags and readers are the two halves of the wireless technology known as Radio Frequency Identification (RFID). The reader is an electronic gadget with one or more antennas that transmit radio waves and take in signals from RFID tags. Tags can be passive or active, using radio waves to transmit their identification and other information to adjacent readers. Without a battery, passive RFID tags are powered by the reader. Batteries are used to power active RFID tags.



NODE MCU

An open-source firmware and development kit called NodeMCU V3 is essential for creating your own IoT device with a few lines of Lua code. The board has a number of GPIO pins that may be used to generate PWM, I2C, SPI, and UART serial communications when connected to additional peripherals. Pin Configuration is as ashown in figure 6.

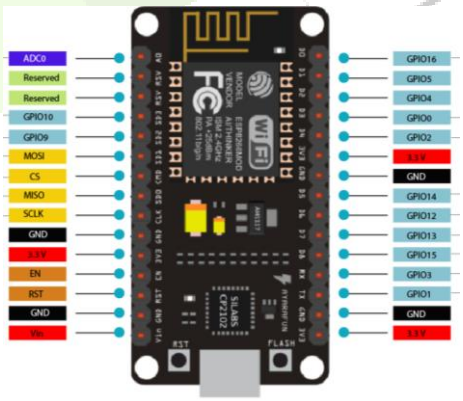


Figure 6: Pin diagram of Node MCU

CONCLUSION

The system design in the aforementioned study aims to automate the shopping process by combining many technologies, including the Arduino Microcontroller, RFID, and Android mobile application. It may be separated into two main groups: software components and electronic components. The Arduino Uno serves as a middleman microcontroller in electronic components, controlling built-in Bluetooth modules that enable RF & software components like Android mobile applications to communicate.

This article demonstrates how an RFID system may be successfully used with a smart shopping cart. Regardless of the direction, size, or form of the tags, the products may be identified. These were the issues that prior shopping trolley applications addressed and that this application overcame. The use of an IOT-based RFID scanner is improving the shopping experience. Ultimately, when consumers take advantage of the coordinated collaboration across technology, this specific application may offer a fresh experience.

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