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INTELLIGENT SHOPPING TROLLEY FOR AUTOMATED BILLING USING IOT AND RFID

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ABSTRACT: The extended duration of waiting in grocery store queues to complete their purchases continues to be perceived as bothersome by a significant number of customers, despite the advancements in technology. The supermarket uses a barcode-based invoicing system, which can lead to frustratingly long lines when a large number of customers visit on weekends or during special events. The project's major objective is to implement an IoT-based intelligent shopping cart. Software, an RFID sensor, a wireless communication module, and an Arduino microcontroller make up the cart. RFID sensors can execute their functions solely when wirelessly connected. In order to get product information, the RFID reader accurately deciphers the RFID identifier of every product. Afterwards, the phone app displays the product details for each item. Customerscan personalize their shopping list to their liking with the help of the mobile app. After the purchase data is converted to digital format, bills are automatically created. Quickening the procurement process and fixing service quality problems are the goals of this prototype. After that, the suggested approach can be tested in actual mass production settings.

Keywords-*IoT, RFID sensors, microcontroller, PhoneApp, Subsequently, digitally.*

1. INTRODUCTION

The age of sense technology has arrived. Among the many examples of cutting-edge technology that permeate our daily lives are smartwatches, cellphones, smart cars, and smart clothing. Our daily lives would be completely different if we weren't able to access the internet and participate in various online activities. New sensing applications have emerged as a result of the rapid pace at which technology is evolving. In connection with the IoT, the word "intelligent" has only lately surfaced. As a framework for how we envision building projects, the "Internet of Things" defines our approach. In 1999, the phrase "internet of things" was first used by Kevin Ashon.

Sensors, actuators, and appliances are just a few examples of the many physical components that can interact and share data through the internet. The internet's capacity to connect numerous physical entities makes this connection possible. Through the IoT, physical things are able to communicate with one another. Through the use of language and computation, seemingly unrelated everyday events can in fact have profound effects on one another. While this technology has improved the financial sector, the environment, and the economy as a whole, it has also made crucial decision-making, data collecting, and wireless communication more difficult.

Electronic health records (e-health), home automation, and the Internet of Things (IoT) have all been the subject of extensive research. By mentioning the number 3, the user has indicated that they are referring to a certain source. An increase in consumer willingness to spend money and buy things

is the main driver of retail establishments' global expansion. Prolonged checkout lines or a lack of product details are common sources of customer annoyance. Food and household supplies are among the most often purchased commodities from stores.

The shopping district sees crowds of several thousand people during major events and holidays. The use of calculators to determine prices and provide receipts for items purchased in supermarkets or shopping malls was once commonplace. Because it is a lengthy operation, clients have to wait a long time to receive their invoices. Sometimes people make mistakes (Figure 1). This issue has been resolved by implementing barcode payment. Unlike the old ways, this technology gets rid of long lines and human error when pricing products. Using a sight line is key to accomplishing this. The content that the viewer examines.

Fig.1.Something that mall shoppers must cope with.

Generic brands are more likely to be chosen by consumers who are accurately informed about prices. Compared to shoppers whose purchases were priced transparently, individuals whose purchases were at least 22% more costly reported greater levels of enjoyment upon checkout. However, true consumer feedback is causing even those without a budget to alter their purchasing habits. On average, they reduced their expenditure by 19% and now they only purchase store brands, occasionally buying recognized brands at a discount. To identify an intelligent shopping cart, you need a thorough scanner and a distinguishing characteristic. Theft of a customer's store card could compromise their ability to view their transaction history. Using this data, we may make a list of things to buy, send out sales notifications, and even request the return of potentially stolen products.

Rfid technology has the potential to supersede barcodes. To enable autonomous object recognition, radio frequency identification (RFID) devices employ tags, sometimes called transponders, to remotely store and retrieve data. Radio frequency identification tags, which can be applied to anything or anyone, are becoming increasingly common. RFID readers that rely on chip technology use antennas attached to silicon chips. With the magazine's convenient shopping cart function, customers can see their totals and complete their purchases without ever leaving the page. With the advent of a new technology known as RFID, the retail industry appears to have a promising future. People who like to shop alone may find this technology useful in a number of ways. As cheaper techniques of generating RFID tags have emerged, the possibility of RFID technology replacing barcodes has grown.

2. TYPES AND WORKING PROCESS OF RFID

RFID can be classified into two distinct groups. Being both composed and powerful is certainly doable. In contrast to

passive tags, active tags contain cells. The ability of mobile devices and RFID technologies to independently locate objects has simplified the process of developing software for smart carts. Radio frequency identification (RFID) employs radio networks to optimize, automate, and subsequently replace human workers in retail contexts.

WorkingProcessofRFID

The use of an RFID reader allows for the extraction of data from tags located several feet away. Now it's feasible to link a gadget to a PC for the sake of authentication. In order for the RFID tag and reader to communicate, radio waves are utilized. The sign doesn't need to be positioned precisely in the center of the observer's field of view for scanning. Figure 2 shows an image of a radio frequency identification reader. Through its transmitters and tags, it can communicate with others.

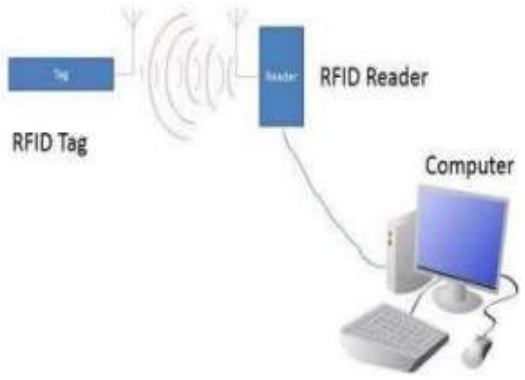

Fig.2.WorkingProcessofRFID

3. WORKING FLOW OF INTERNET OF THINKS BASED SMART SHOPPING CART USING RFI

The steps that a customer must take in order to log in to the smart shopping cart function are illustrated in the following image (Fig. 3), which may be found below. It is an application that runs on the Android operating system but with certain modifications.

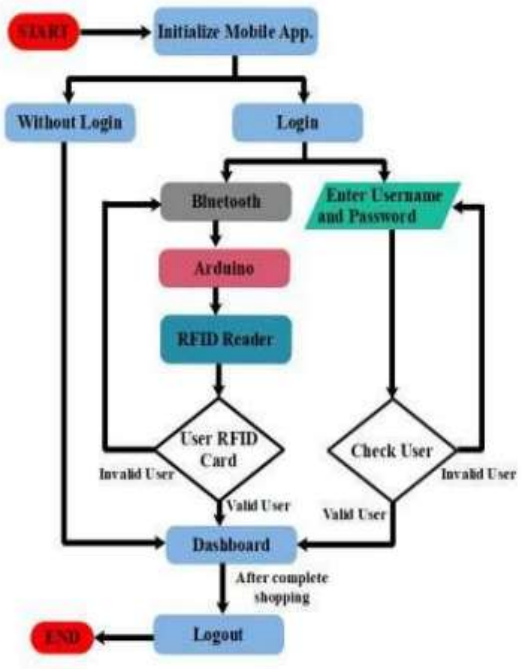

Fig. 3. Purchasing organizations use smart cards that integrate RFID technology.

The technology has an easy-to-understand and -use user interface (UI). Customers can put items to their shopping carts after using the recommended services to locate the greatest bargains on those goods. The charges will be reflected in their final bill. After the customer's order is finished, the data will be transmitted to the main computer. Customers would have an easier time navigating the mall and have a better experience overall if the proposed system's map used segmentation tactics. Because this method is less labor-intensive, customers might be able to afford to spend more. The network database is a crucial component of any intelligent shopping cart. It includes a WiFi device, a virtual user interface, and hardware integration.

A component or piece of hardware

The final components required are these wires:

RFID Readers

Mifare tag readers that are compatible with RFID are offered by numerous online retailers. The Secure Platform Interface (SPI) may facilitate communication between the CPU and the card reader. With the 13.56MHz magnetic field, the card reader and tags can communicate more easily. Electric waves are what make the RFID reader function. The RFID Reader's built-in mechanism may detect RFID tags by emitting electromagnetic waves within a given range of 0 to 60 mm. The tagged objects are in close proximity to the RFID scanner. Radio frequency identification tags allow for data recovery. It monitors the duration and sales of items at sporting events. Despite the fact that RFID can facilitate distant barcode scanning, barcodes should still be utilized. Quickly identifying people, items, or deliveries is much easier using this strategy.

RFID Tag

Smart tags, sometimes called RFID tags, have the ability to retain information. Active RFID tags consume far more energy than their passive counterparts. For radio frequency identification tags that are active, batteries are required. When radio frequency identification (RFID) readers and passive RFID devices come into touch, a phenomenon known as flux occurs. When current flows through the coil and activates the chip, electricity is generated.

SOFTWARE COMPONENT

The program controls the flow of data and information to the mobile app through the link. The initial version of the mobile app was built using the Android operating system. After completing their purchase, customers may get a comprehensive list of all the items they have bought along with the fees that were charged. Afterwards, a QR code and the Order ID are delivered via email.

WIRELESS COMMUNICATION

- The Bluetooth adaptor enables wireless data transmission using serial interfaces. The 2.4 GHz ISM band is where it gets its juice.
- A highly valuable and extensively utilized band. Right now, Bluetooth 2.0+EDR is the king of technologies. So, this shows...
- Bluetooth 2.0 can only send a message every 30 seconds, so the chip needs to be bigger.
- Bluetooth has the potential to reduce stress and enhance the quality of sleep. An intuitive USB port is included in this part.
- The production and creation processes are accelerated. Configuring the HC-06 to function as a Bluetooth slave for Class 2.
- Numbers and every phenomenon in the world are clearly related.
- Connecting the device to a main Bluetooth device, like a computer, tablet, or smartphone, is essential for the device to work.
- Received data is transmitted wirelessly after passing through the USB port.
- The module always receives data wirelessly and then transmits it via the serial port.
- The HC-06 can work between 3.6 and 6 volts, even though the logic level of the RXD pin can only handle 3.3 volts and is incompatible with 5 volts.
- The best level of safety, it is

recommended to utilize a Logic Level Converter when connecting sensors to a 5V device, such as an Arduino. You have two options: the Arduino Uno or the Arduino Mega.

NETWORK DATABASE

- The graphic displays the Central Automated Billing System. Each package contains a single item.
- Using ZigBee technology, this PID device transmits data to an automatic invoicing system located in a central location.
- determines the total cost of the items purchased. Customers can view their remaining balance in the shopping cart.
- Navigate to the section corresponding to your shipment to locate the Identification Number. There are zero costs for customers who pay with their debit or credit cards.
- A designated individual is not necessary for fundraising initiatives. Having a commodities database is crucial to the automated central billing system. Visual Basic for Applications
- An automatic payout mechanism will be built using it. For those who aren't very good with computers, Visual Basic was made.

Fig. 4. Central automated billing system

Data processing at the administration or cashier level is handled by a web application called the Supermarket System.

4. CONCLUSION

Faster, safer, and easier payments are possible with this device because it uses RFID technology. Ultimately, this will enhance the purchasing experience. Weight, price, and item name criteria are constantly displayed. We are entitled to claim it since we discovered it.

- Automatic order placement might benefit from RFID technology along the road.
- Radio frequency identification technology is space-saving, effective, and simple to use.
- The availability of high-quality items is a direct result of technological advancements. Automated shopping carts are only one example of how the proposed technology simplifies mundane tasks.
- An Android app can get system data by wirelessly connecting to the server and reading RFID tags on products to detect customer purchases or by using an RFID card for identification verification and registration. Thanks to the products' data retrieval capabilities, shoppers may learn more about the products while they browse the store.

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