SMART SHOPPING CART USING IOT

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Abstract

The ultramodern age of technology in which utmost of the customers needs to stay in the supermarket for shopping because it's a largely time- consuming process. A huge crowd in the supermarket makes trouble to stay by long ranges because of a bar- law grounded billing process. In this regard, an Internet of effects(IoT) grounded smart shopping wain using RFID detectors, an Arduino, a Bluetooth module is proposed as a result to this issue. RFID detectors works on wireless communication. RFID markers are attached to each product and RFID anthology reads the product information efficiently. After this, each product information is showed in the web page. The bill will be generated automatically via WiFi module in web page, which helps customers to get bill conveniently and payment can be done through card at the wain. Since the entire process of billing is automated it reduces the possibility of mortal error mainly. Also the system has a point to cancel the scrutinized products by client to further optimize the shopping experience and it shows offers grounded on our scrutinized products. This is an IOT grounded system which is stoner interactive, ensures security, also time saving which avoids long ranges for billing. This will exclude time- consuming shopping process and quality of services issues.

1.INTRODUCTION

A new revolution against industrial, economic, and environmental institutions has been sparked by the Internet of Things. IoT refers to a network of devices, including cars, household appliances, and other goods, that are connected to one another and may exchange data. These devices are integrated with electronics, software, sensors, actuators, and connections. Interactions between objects are now a reality in this Internet of Things era. With the aid of the Internet, everything in our world is about to be connected together. People purchase everything they need on a daily basis from stores, including food items, clothing, electrical goods, and so on. Thousands of large and small stores are currently up all over the world due to rising consumer demand and expenditure. Customers occasionally complain about incomplete sales data for the goods and unnecessary waiting periods at the billing counters. The traditional billing system needs constant improvement to give customers a better shopping experience. This is an RFID BASED SHOPPING CART to overcome such problems and improve the current technology. This may be accomplished by actually identifying the products with RFID tags and using an RFID reader with a shopping cart. This device makes it possible for the customer to understand the product data, including the rate for everything that is scanned through the RFID Reader.

Many people have repeatedly demonstrated their desire to revolutionised the way we shop. The barcode generating applications for mobile devices, Arduino microcontroller, RFID, and wi-fi sensors are widely used in supermarkets. In many supermarkets nowadays, barcode generation is used as well as in operation. A barcode is a

continuous black vertical bar that contains some recorded information about an object. Through the use of ultrasonic sensors, a person may utilise an advanced trolley to check out each product for himself. Product identifying information is stored in the barcodes that can be linked to the databases in the back end. The disclosed barcode is scanned by a barcode scanner as soon as it comes into view. That method is slower than the RFID sensor device.

RFID plays a crucial role in the retailing process by regulating the flow of goods from production to inventory and from stock to customer. The Arduino microcontroller enables the web page to instantly communicate with product statistics that are kept inside the RFID product tag. A shopping cart attached to an RFID device is equipped with a software that is entirely built on a user-friendly and attractive display. The user may use this program to display product, control current shopping list, see past purchases, take advantage of product promotions and special offers, arrange products in front of customers, and login using RFID technology for increased security. when the items in the shopping cart are close to the RFID reader.

The advent of IoT and rising popularity have sparked the creation of new applications and structures across several industries, especially marketing and retail. The shopping experience is one area where IoT had a huge influence. The days of lengthy customer lines for invoicing and payment processes are gone. Customers may now benefit from the ease of self-scanning and cashless transactions at grocery shops because of the development of smart trolleys. Without any need to deal with the inconvenience of standing in queue, these trolleys enable consumers to easily enter the store, choose their chosen items, scan them using the cart and leave.

Customers could also benefit from the enhanced items that are made available by this technology. Overall, the adoption of IoT in the retail industry has transformed the shopping process and made it easier and more pleasant for customers.

2. RELATED WORK

IoT application research has become a hot topic in recent years, but smart shopping systems have not received enough attention.Recent years have seen the publication of some studies aimed at enhancing the shopping experience for consumers.

In 2020, MOBEEN SHAHROZ and MUHAMMAD FAHEEM MUSHTAQ proposed a system for creating a smart shopping cart that utilizes radio frequency identification (RFID) technology and the Internet of Things (IoT) to enhance the shopping experience. The system uses RFID tags attached to products in the store, which are then scanned by readers attached to the smart shopping cart. This allows for real-time tracking of the products being purchased, as well as providing information on product availability and pricing.The system also includes a touch screen display on the cart that allows customers to view their shopping list, locate products in the store, and receive personalized product recommendations based on their purchase history. The display also provides information on product nutrition and allergen information, as well as offering the ability to scan QR codes to access additional product information [1].

Similar implements were made in 2021, Charles Paul and Rachel Angelin proposed an innovative smart shopping application that utilizes the Internet of Things (IoT) and a recommendation system to improve the grocery shopping experience. The application is designed to help shoppers save time and make informed purchasing decisions by providing personalized recommendations based on their preferences and purchasing history.The application uses sensors and RFID technology to track inventory levels and provide real-time updates on product availability. This allows shoppers to quickly find the products they need and avoid wasting time searching for items that are out of stock[3].

There were multiple attempts made in 2017,Ruinian Li, Tianyi Song, Nicholas Capurso, Jiguo Yu, Jason Couture, and Xiuzhen Cheng proposed a secure smart shopping system based on the Internet of Things (IoT) technology. The proposed system aims to provide a seamless and

secure shopping experience to customers while offering retailers valuable insights into their customers' behavior and preferences.The authors propose a system architecture consisting of several interconnected IoT devices, including RFID readers, sensors, and cameras, that enable the system to track and monitor customer movements and behavior in real-time. The system can also provide personalized recommendations to customers based on their shopping history and preferences. In addition, the system can detect and prevent theft and other security issues by monitoring the movement of products and customers.To ensure the security of the system, the authors propose the use of advanced encryption techniques to protect customer data and prevent unauthorized access. The system also includes a secure payment system that uses Near Field Communication (NFC) technology to enable secure and convenient payments[2].

There are more designs in this area in the last three years,Tapan Kumar Das and Asis Kumar Tripathy proposed a system that aims to improve the shopping experience by introducing a smart shopping trolley. The system consists of a trolley equipped with various sensors and a display unit. The sensors are used to detect the products placed in the trolley and provide information such as product name, price, and nutritional value. The display unit provides relevant information to the user, such as the total cost of the products in the trolley, special offers and discounts, and alternative products.The smart trolley system also includes a mobile application that can be used by the customers to create a shopping list, find the location of the products in the store, and receive personalized recommendations. The application also allows customers to check the availability of the products and make a payment using various payment options, such as credit/debit cards, mobile wallets, and UPI[4].

3. SYSTEM REQUIREMENT

SPECIFICATION

3.1 SOFTWARE REQUIREMENTS

• Development Tool: Arduino Software (IDE) Programming: Embedded C

• Operating System: Windows 10

3.2 HARDWARE REQUIREMENTS

• MFRC522 RFID reader

• RFID tags

• Arduino UNO and ATmega328

• Bluetooth HC-06

• ESP32 WiFi module

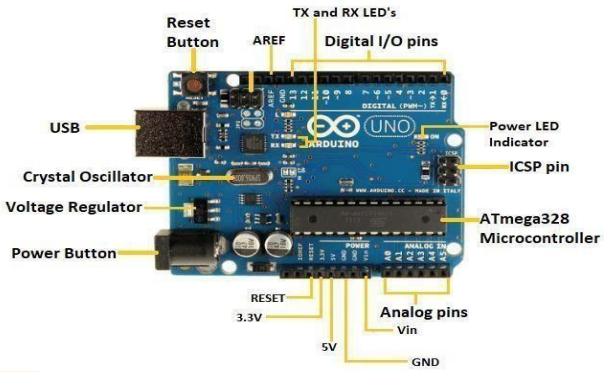
• Buzzer

• LED's

• Power Supply

• Processor-Intel center i5 or later

• RAM-8GB



4. METHODOLOGY

4.1 System Architecture

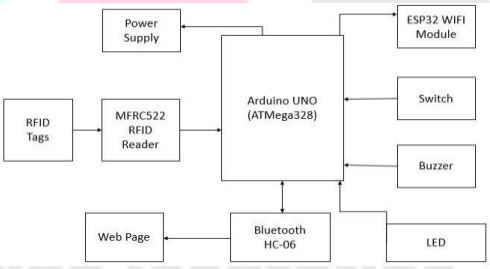


Fig:4.1 Block diagram of system architecture

The goal of the proposed system is to enhance customer's mall or shopping centre shopping

experiences. It tracks the things that a consumer adds to their shopping cart, computes the total cost of those products, and generates an immediate bill for payment using a combination of hardware and software.An Arduino UNO microcontroller, which is coupled to numerous other parts such as switches, buzzers, LEDs, RFID sensors, and RFID tags, powers the system. Each shopping cart has an RFID reader built in that is linked to the microcontroller. The RFID reader is turned on as soon as a customer enters the shopping centre and grabs a cart, and the micro controller starts keeping watch over the cart.

The RFID sensor scans the RFID tag of the item when the customer places it in the cart, sending the information to the microcontroller. After that, the microcontroller compares the data to the data that is already recorded in its memory. The buzzer sounds to signal that the item has been successfully added to the cart if the data matches. This ensures that the customer is aware of what they are adding to their cart and gives them fast feedback.A switch on the cart can be used by the customer to remove a product from the cart. The switch is wired to the microcontroller, and when it is turned on, it immediately deducts the price of that item from the total. This enables the customer to make modifications to their purchases as they shop rather of having to wait until checkout.After the customer has finished shopping, a web page with the product information and final cost will be presented.

When a customer adds items to their shopping cart, the website displays offers that are pertinent to those items.The buyer can also add those items to their cart if they are interested in any of the offers that are listed on the website. This enables the customer to benefit from any discounts or special offers that might be available.On the other side, if none of the offers appeal to the customer, they can just carry on with their original purchase and go through the checkout process.

The system offers a practical payment option in addition to delivering real-time information about the customer's transactions. Customers can use a card to pay for their products at the cart, saving them from having to stand in line at the checkout desk for a reloadable card. An RFID reader may read the RFID card's unique identification number when the user taps or holds the card close to the reader. The RFID card is a contactless smart card. Time is saved, and the customer's purchasing experience is more effective and convenient as a result.

When a user is ready to pay after finishing their purchase, they need only tap or hold their RFID card close to the RFID reader. The identifying number on the card will then be read by the RFID reader and sent to the microcontroller. The microcontroller will next deduct the full cost of the purchases from the card's remaining balance.Customers no longer need to carry cash or credit cards, making this a handy and hassle-free method of payment. The RFID card is a convenient way for frequent customers to rapidly top off their balance.

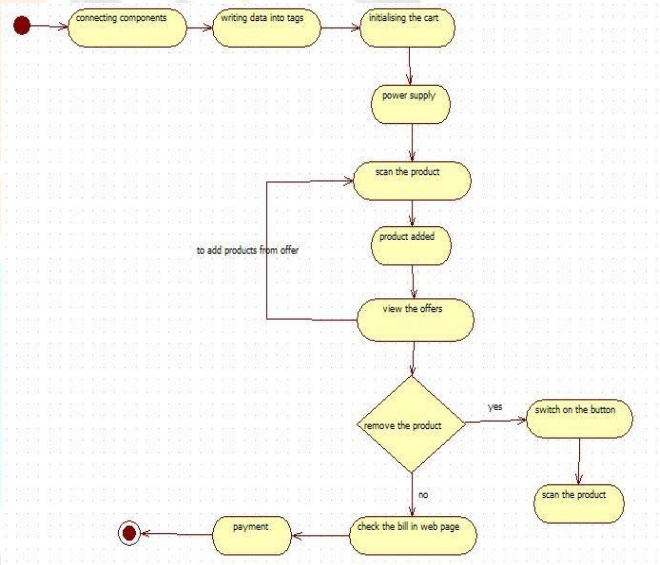


Fig 4.2 Flow diagram of smart shopping cart

The system's overall goal is to enhance customers purchasing experiences by giving them access to real-time transaction information and a quick payment option. The system can track products as they are added to or withdrawn from the cart and determine the total cost of those items quickly thanks to RFID technology and microcontrollers. This increases the overall effectiveness of the shopping experience while also making it simpler for clients to shop and pay for their products.

5. IMPLEMENTATION AND RESULTS

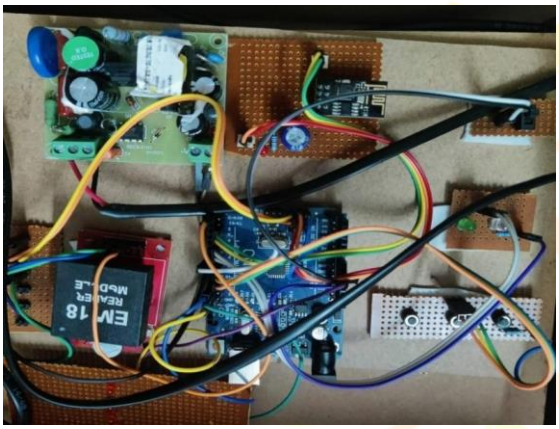


Fig:5.2 Smart shopping cart connections

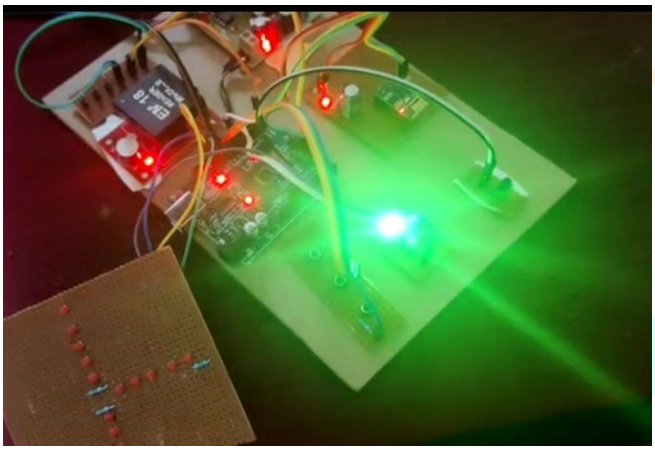


Fig:5.2 Adding the product to the cart

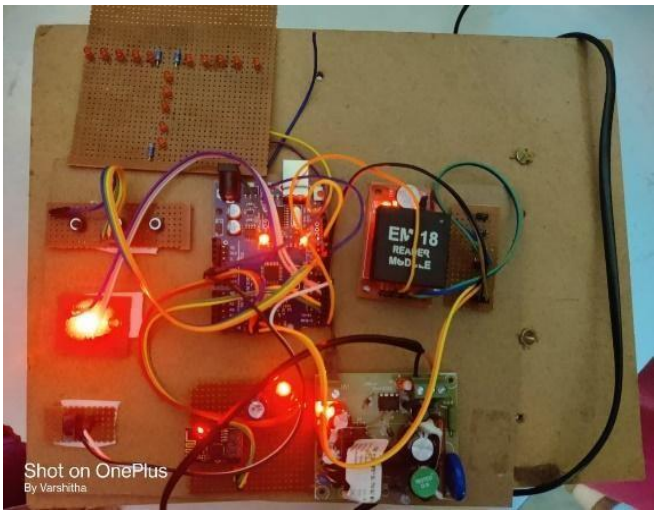
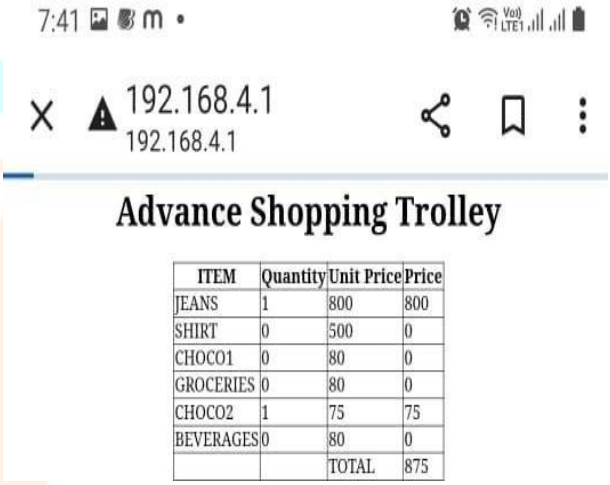
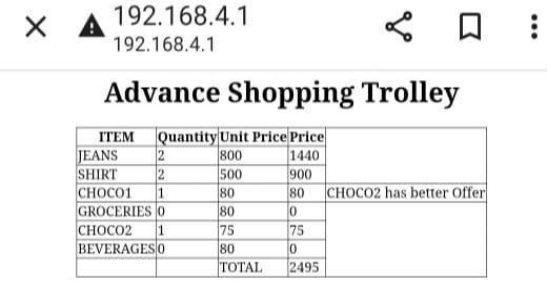


Fig:5.3 Removing the product from the cart



ITEM	Quantity	Unit Price	Price
JEANS	1	800	800
SHIRT	0	500	0
CHOCO1	0	80	0
GROCERIES	0	80	0
CHOCO2	1	75	75
BEVERAGES	0	80	0
		TOTAL	875

Fig:5.3 Web page displaying all the items



ITEM	Quantity	Unit Price	Price	
JEANS	2	800	1440	
SHIRT	2	500	900	
CHOCO1	1	80	80	CHOCO2 has better Offer
GROCERIES	0	80	0	
CHOCO2	1	75	75	
BEVERAGES	0	80	0	
		TOTAL	2495	

Fig:5.4 Displaying the offer

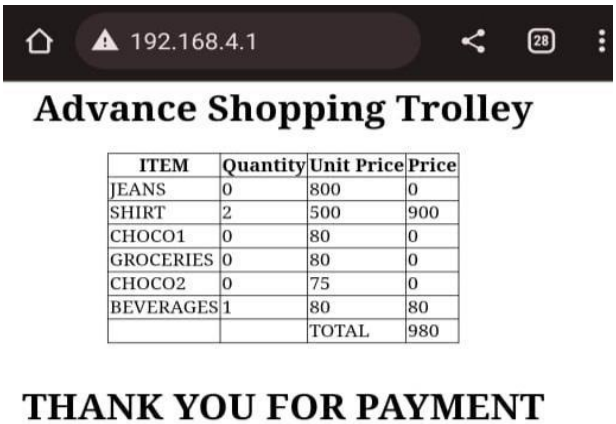


Fig:5.4 After Payment

6. CONCLUSION AND FUTURESCOPE

6.1 Conclusion

A clever cart which together with radio frequency identification (RFID) sensors which automates the purchasing manner. Billing and checkout manner is achieved quickly through this cart. It avoids status in strains for billing manner. The Web page constructed works as a manual for the client. Shopping merchandise may be displayed in a modern-day purchasing listing of the client that allows the client to hold its purchasing listing in step with need. That additionally allows to remind the ultimate merchandise to purchase. Customer also interacts with the product information. Searching for the product in a massive great marketplace will become much easier through this shopping cart. This may be carried out in purchasing shops where there is a massive crowd and large rush into the shops.

6.2 Limitations

The barriers of this proposed gadget are:

• This gadget does not offer security for the users.

• It does not read loose products

6.3 FUTURE SCOPE

• Better navigation: Smart purchasing carts can offer buyers with maps of the store, displaying them the vicinity of the objects on their purchasing listing.

• Enhanced safety: RFID era can assist you about the robbery through alerting workers while an object is eliminated from the cart with out being scanned.

• Enhanced stock management: Retailers can use clever purchasing carts to track stock information in real-time, mechanically restock merchandise, and optimize the deliver chain.

• Contactless Payment: It can assist to lessen checkout wait instances and enhance usual performance in stores.

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