



DESIGN AND IMPLEMENTATION OF SMART TROLLEY SYSTEM

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ABSTRACT

A supermarket is a place where a wide variety of items are available. People purchase things in supermarkets in order to satisfy their basic needs but gets frustrated while waiting in the queue for billing and gets confused while comparing the total price with the budget in pocket. This paper suggests implementing a smart trolley system based on RFID in order to reduce the billing time by creating two modes- Auto and manual mode. Auto mode guides and moves forward before the customers to find product when they are new to the supermarket and in the manual mode customers have to drag the trolley. In addition to this, the smart trolley is capable of recognizing the product with the help of RFID reader adds or redacts and displays its count, weight and price with the product name and calculates the final amount after purchasing. The RFID reader scans, adds and sends the final price of the purchased products to the cashier or server with trolley number for cash settlement using wireless transmission reducing the wastage of time in the queue.

Keywords: Smart trolley, RFID, Intelligent shopping cart system, Billing system.

1. INTRODUCTION

People have a list of items which they want to buy. The advancement in technology changes the way of shopping over the last decade. The owners of malls and supermarkets are working to improve the facilities for customers to make sure the customers are satisfied with the shopping experience and at the same time factors such as providing the customer's needs and to meet the expected sales growth and profit are also considered. The primary thing is to eliminate the waiting time taken for billing the items and in addition to this consumers prefer to have a then and there checking of the increasing count, rate of each and every item that is added in to the smart trolley. The customers prefer to have glimpse of quantity and price level to make purchase decisions. Anyways, increase in capital cost and accuracy when the shopping trolley is full with items are the major drawbacks of this smart trolley system. The RFID based smart shopping trolleys are trending in recent times. The implementation consists of RFID reader module which reads the unique ID of the RFID tags stuck to the items. Passive tags are cost efficient than active tags to use in each product in massive shopping malls. This smart shopping trolley is further provided with two different modes of operation. The primary is the auto-mode and the latter works in manual mode. Both the modes calculate and display the count, product rate and the final rate. The important part of this implementation is the development of wireless connection between the server and the smart container in the trolley.

2. METHODOLOGY

2.1 BLOCK DIAGRAM

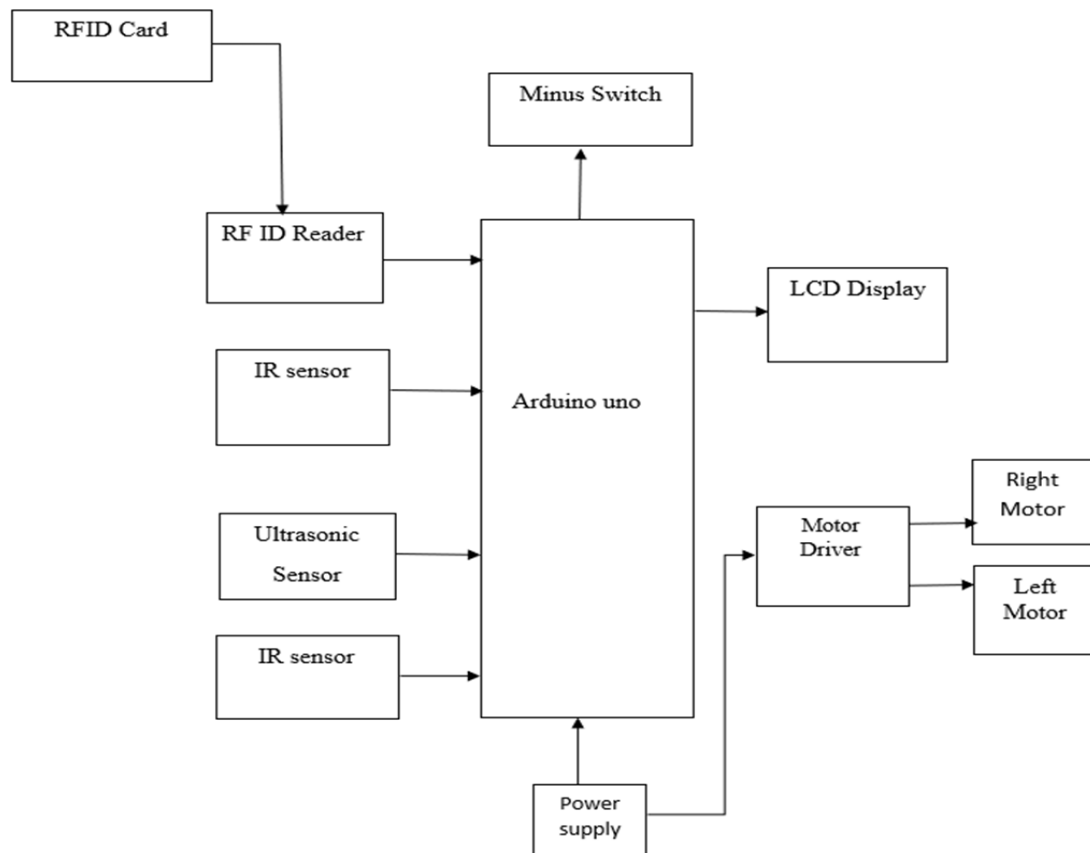


Fig.1 Block diagram of smart trolley system

2.2 CONNECTION DIAGRAM

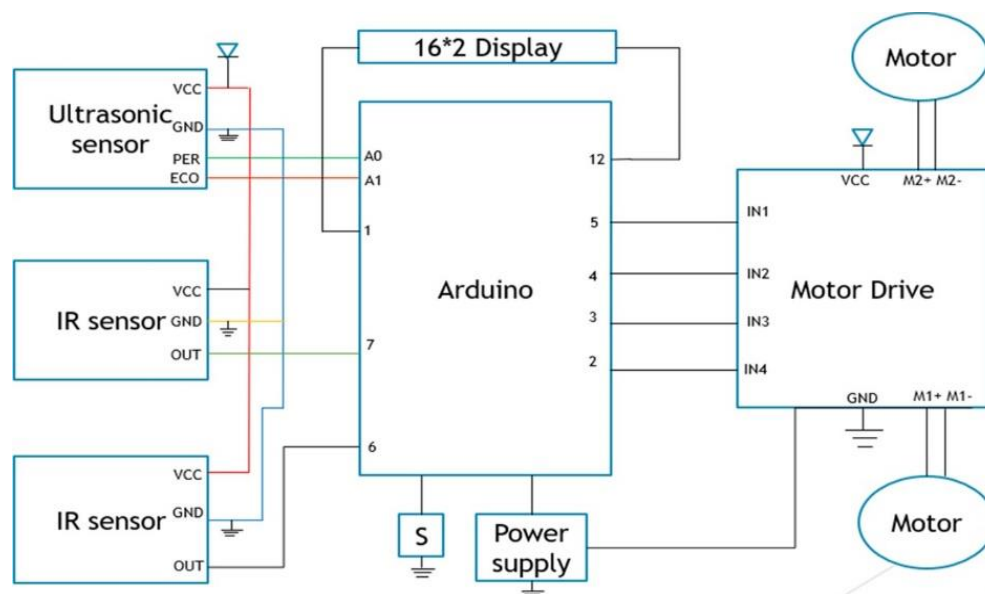


Fig.2 Connection diagram of smart trolley system

Functioning of RFID (Radio Frequency Identification) is a wireless technology that uses radio waves to read and



capture information stored on an RFID tag. The functioning of RFID technology involves the following steps:

- An RFID tag is attached to an item. The tag contains a microchip and an antenna, which transmits its unique identification number to an RFID reader.
- As the tagged item passes within range of the RFID reader, the reader sends out a radio signal, which powers the tag and prompts it to send its identification number back to the reader.
- The reader captures the identification number and sends it to a computer or other system, where it is used to identify and track the item.
- The computer or system can then access any information stored on the RFID tag, such as item name, price, or quantity.
- The use of RFID technology can improve efficiency and accuracy in various applications, including inventory management, supply chain management, and retail checkout processes.

Arduino Uno, the microcontroller's programming language allows for the creation of detailed instructions that can control various aspects of a product, including its behavior, data storage, and communication with other devices. The Arduino Uno's input/output pins enable the microcontroller to interact with various components, such as sensors, and switches, making it a useful tool for prototyping and testing electronic circuits. The microcontroller's output is connected to a Liquid Crystal Display (LCD) with a 16*2 display that can show up to sixteen characters in a single line. This display provides customers with the information of the items as they are added or removed from their trolley, including the item name, quantity and price. The LCD display helps customers keep track of the products they are purchasing with ease. Motor driver L293 used here to control the two DC motors oppositely connected to the wheels of smart trolley which sense the signal from the arduino to from sensors, which gives command signal to motors to move forward backward and sides direction. The two IR sensors and one Ultrasonic sensor is used for sensing the path forward, backward and side directions.

3. DESIGN AND IMPLEMENTATION

The smart trolley system at the mall utilizes the power of RFID technology to streamline the shopping experience for customers. Each product in the mall is equipped with an RFID tag operating at a frequency of 13.56MHz, which stores a unique Electronic Product Code (EPC).

The RFID Tag attached to the product which contains a unique number once scanned in front from RFID the item name with price of item will be added.

- If a customer wants to remove a product that was previously added to their bill, they should switch on first minus switch and then the products should be scanned again and its cost should be deducted from the total bill.

The smart trolley as it containing ultrasonic sensor and infrared sensor it follows up person right left and lane direction because of its automated operation smart trolley system.

- To add or remove items from the trolley we have given manual switch with up and down operated on adding items up direction and while removing the items down direction.
- To make payment easy and convenient, the smart trolley system offers the option of using barcode scanning to promote digital payment, which are scanned by the customer and settle the bill .

- Once the payment is complete, the LCD display will show the up dated balance available in their card after deducting the total bill amount. Furthermore, the details of the scanned products and the corresponding bill will be available on the central PC's serial monitor for record purposes.

4. RESULTS AND DISCUSSIONS

The proposed smart billing system has many benefits, including easy accessibility and convenience for users, decreased manpower, time savings, and the ability to attend to multiple users at the same time. this system enhances the efficiency and accuracy of the shopping process for both retailers and customers. The system appears to e. The system reads the items, which could help prevent any errors or malpractice. However, if the system does detect any malpractice, malls or supermarkets will detect and give an alert sound.

Those are all potential benefits of implementing an RFID-based automated billing system in supermarkets and retail stores. By speeding up the checkout process and making it more efficient, customers can save time and have a better shopping experience. Providing the bill details in advance can also help customers to better manage their budgets and make more informed purchasing decisions. For businesses, faster checkout times can lead to increased customer satisfaction, which can in turn lead to more loyal customers and increased revenue. The introduction of artificial intelligence can also help businesses to optimize their inventory management and improve their overall efficiency and profitability. Overall, an RFID-based automated billing system has the potential to benefit both customers and businesses.

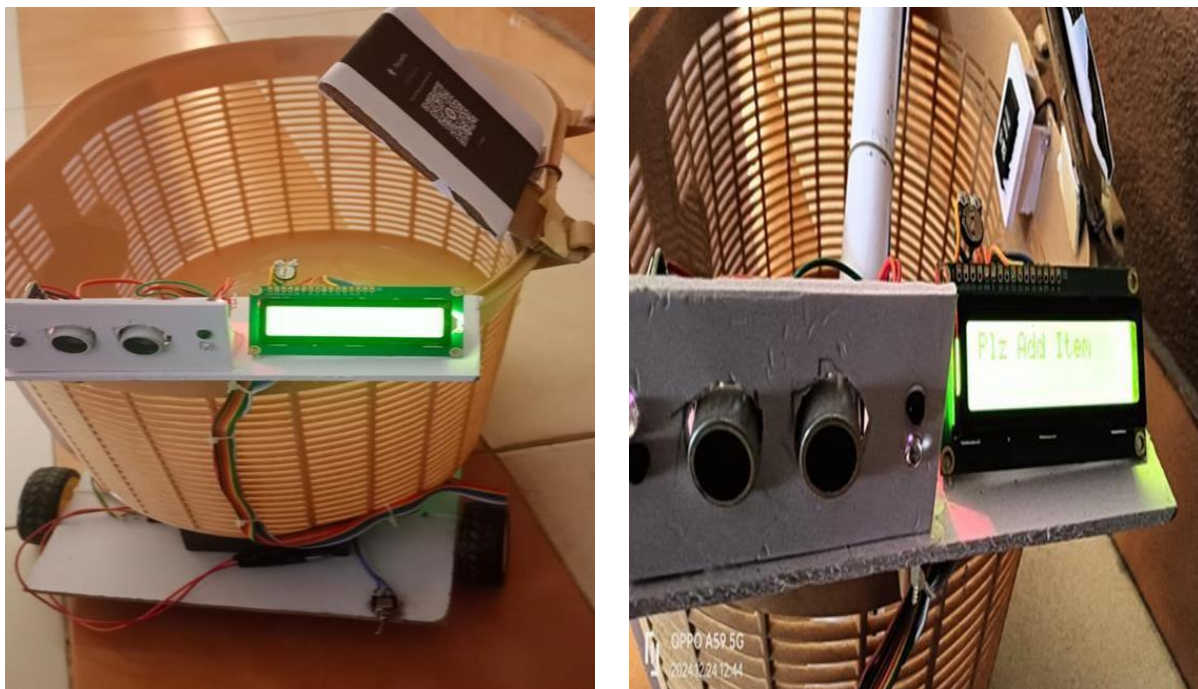


Fig.3&4 Prototype Model



Fig.5 Displaying billing details of product

5. CONCLUSION

The Smart Trolley System revolutionizes the shopping experience by automating item scanning, cart management, and payment. It eliminates long queues, enhances customer convenience, and reduces the need for manual checkout processes.

The customer does not even need to pull or push this trolley as it is automatic move. This system is especially useful for large supermarkets and retail stores, where it can significantly improve operation efficiency and enhance customer satisfaction.

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