



Development of Smart Shopping Trolley Using RFID Data Module

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Abstract: In today's technology, most of the customers have to make an appointment in supermarkets to shop because it is a time-consuming process. Due to the barcode payment system, large crowds in supermarkets during discount periods or holidays can cause long queues. Smart stores with RFID data modules are a revolution that improves traditional products using radio frequency identification (RFID) technology. The aim is to simplify and improve the purchasing process, making it more efficient, convenient and personal for retailers and customers. All products are equipped with an RFID tag containing personal information, allowing tracking and management of the entire supply chain. The project offers a smart way for people to pay for items while shopping and provides an Android app-based smart trolley assistant for people walking in supermarkets.

Keywords: RFID reader; RFID tags; Arduino Micro-controller; Bluetooth Module; Switch; LCD Display etc.

I. INTRODUCTION

In the fast-paced retail world, technological innovations continue to redefine shopping by making shopping more efficient, personal and connected. The smart store with RFID information module is a successful project that changes the entire shopping process using radio frequency identification (RFID) technology. With the ability to wirelessly identify and track products, RFID offers a revolutionary solution for inventory management, customer interaction and overall sales.

Modern retailers often face problems such as poor stock management and time-consuming checkout processes. There are restrictions on being a personal shopper. The integration of RFID technology solves these problems by providing real-time data and insights that improve every aspect of shopping.

RFID involves the use of small electronic tags, or RFID tags, attached to objects that can be read wirelessly by an RFID reader. Each symbol has a unique identifier that allows an object to be tracked and managed. RFID is known for its speed, accuracy, and ability to operate without direct line of sight, making it a powerful tool in retail.

Smart business with RFID data module represents a revolution in the retail industry. A retail environment that promises a more connected, efficient and consumer-focused business. The project solves long-standing problems in the business world by leveraging the power of RFID technology and lays the foundation for a smarter, more efficient point of sale.

The main purpose of our work is to provide a technological tool, an easily scalable system that will assist the buyer. Each product in the store is affixed with an RFID tag that contains detailed information about the product, including product ID, brand name, product type, production date, expiration date, and other information.

RFID reader modules are mounted on shopping carts in supermarkets. When a registered user comes to the store, he makes the purchase by entering the connected shopping cart using the mobile application installed on the phone.

II. PROBLEM IDENTIFICATION

In a rapidly changing world, technological developments are increasing exponentially. Many businesses invest in research and development to ensure their customers are happy on every level. A shopping cart, often referred to as a shopping cart, is a way to temporarily load items before checkout. The shopping cart has undergone minor changes since its inception.



Extension is usually done to change the capacity and weight of the car. But as technology advances, some research companies have turned to improving customer service.

In this project, product prices and other information will be stored on RFID tags along with the products.

We need to use a reader to scan the RFID tag, and then the reader will read the content of the item stored in the tag and send the information to the application number from the Bluetooth module.

III. PROPOSED SYSTEM

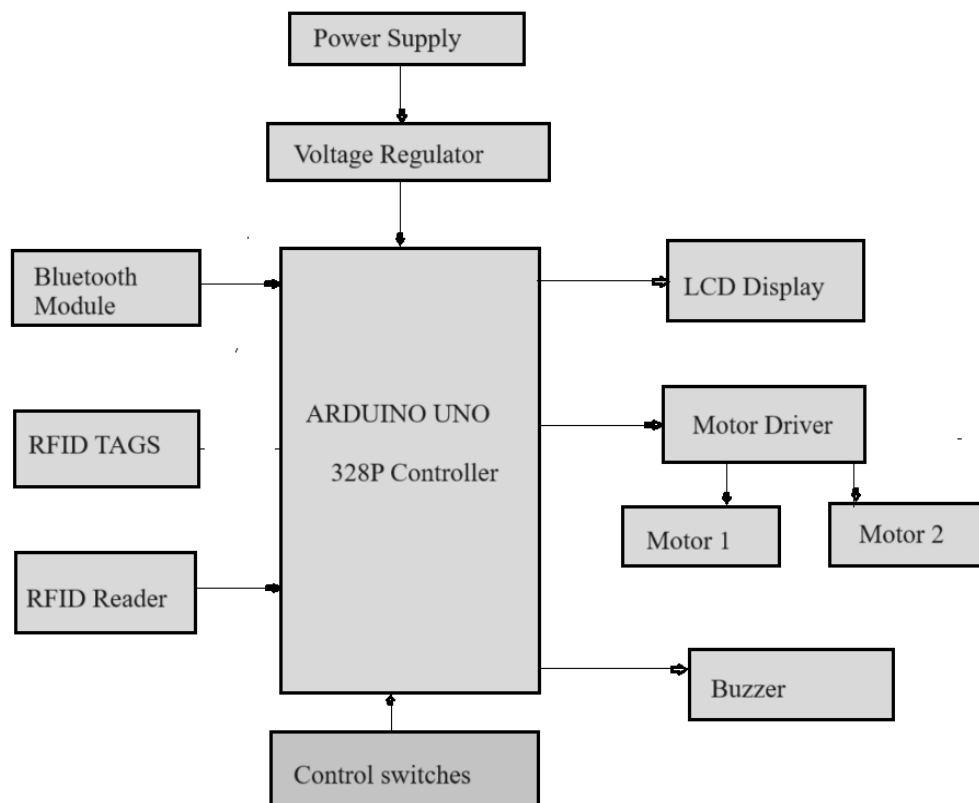


Fig. 1. Block Diagram of system

- Our plan is to introduce a car that uses the transportation system. The car has a robot model. The system consists of RFID tags and readers, Bluetooth modules, driver ICs and DC motors.
- DC motor is connected to the car and used to move the robot to the location of the products in the store.
- Bluetooth module is used to drive the vehicle in any way. It is also used to track updates to the shopping cart.
- The proposed system has automatic billing functionality when customers bring carts full of products through RFID tags and readers.
- All products have a unique ID, with this code it will determine the price of the product and automatically generate prices on the internet.

The aim is to create a business that can track, price and pay products in smart baskets using RFID technology.

The system is designed to enhance the customer's shopping experience, increase the efficiency of sales associates and provide personalized support based on customers' purchasing history.



IV. COMPONENTS SPECIFICATION

- Adapter
 - Battery
 - Power supply unit
 - Bluetooth module
 - Arduino controller
 - LCD Display
 - Motor Driver
 - DC Motor
 - RF ID Tags
 - RF ID reader
 - Buzzer
 - Wheels
 - Frame
 - Others
- Arduino Uno (12v)

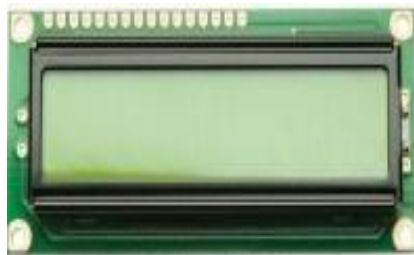
The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.



- LCD Display (5v)

A liquid crystal display (LCD) is a thin, flat panel used for electronically displaying information such as text, images, and moving pictures.

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs).



- 12 v Battery

12 V , 2 Amp Battery is high power battery easily handle all the function.

Main things are to collect electrical energy from solar panel and provide to various components For running specific function.



- Bluetooth module (HC-05)

The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop.



- DC motor

DC motor is an electrical machine that utilizes electric power resulting in mechanical power output. Normally the motor output is a rotational motion of the shaft. The input may be direct current supply or alternating supply. But in case of DC motor direct current is used.



- Motor Driver IC (L293D)

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits.





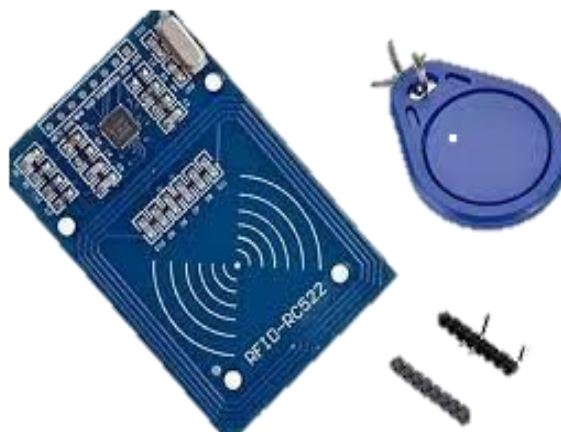
- RFID Reader Module

EM-18 RFID scanner module uses an RFID reader which will read a hundred twenty-five kilohertz tags. So, it will be known as a low-frequency RFID reader. It offers out a serial output and contains a range of 8- 12 cm. They convert radio waves returned from the RFID tag into a type of signal that will be passed on to Controllers, which can make use of it. RFID tags and readers need to be tuned to a similar frequency for communication.



- RFID Tag

An RFID reader is a device used to gather data from an RFID tag that is employed to trace individual objects. Radio waves are used to transfer signals from the tag to a reader. The RFID tag should be among the range of an RFID reader, which ranges from three to a few hundred feet, so on be scan. RFID tags haven't replaced bar codes thanks to their price and therefore they have to singly determine each item.



V. RESULTS AND DISCUSSION

After Bluetooth is connected to the car, the control message is transmitted to the Arduino from the Android Bluetooth control application. For example, if a person wants to go to the train from his smartphone, he can easily walk. Once the cart is gone at the desired time, people can start purchasing. When the product's tag is placed on the RFID reader, the quantity of the relevant product is added to the total purchase price. If the person wants to remove the product from the truck, they can have the product read by the RFID reader again, so that the cost of the removed product is deducted from the total purchase amount.

Project - Smart basket technology using RFID provides customers with easy shopping. It also takes less time than the traditional billing process. Customers do not need to wait in long queues. Product management can be easily monitored. Since the total price is displayed on the LCD, customers can purchase items using their wallet balance. The system is more reliable and does not require special training. This process reduces sales staff. It meets the needs of both customers and store owners.



VI. ADVANTAGES

- **Improved Shopping Experience:** The system enhances the shopping experience by eliminating the need for manual scanning and providing real-time updates on the total cost of items in the trolley.
- **Operational Efficiency:** By automating item tracking, cost calculation, and checkout processes, the system improves operational efficiency for retailers, reducing waiting times for customers and streamlining operations.
- **Real-time Inventory Management:** The integration with the store's inventory management system allows for real-time tracking of stock levels and helps retailers manage their inventory more effectively.
- **Personalized Promotions:** The system offers personalized promotions and recommendations based on customers shopping history, increasing customer engagement and loyalty.
- **Data Security:** Robust security measures protect customer information stored in the system, ensuring data security and privacy.

VII. CONCLUSION

The "Smart Shopping Trolley Using RFID Data Module and Bluetooth technology" project represents a significant advancement in retail technology, aiming to enhance the shopping experience for customers and improve operational efficiency for retailers. By leveraging RFID technology, the system automates key aspects of the shopping process, including item tracking, cost calculation, and checkout, leading to a more convenient and efficient shopping experience. It also consume less time when compared to regular billing technique. This system is more reliable, also it doesn't require special training. This system reduce the number of salesmen. It accomplishes both customers and shopkeeper demand.

The Smart Shopping Trolley Using RFID Data Module and Bluetooth technology project represents a significant advancement in retail technology. By leveraging RFID technology, the system automates key aspects of the shopping process, including item tracking, cost calculation, and checkout. This leads to a more convenient and efficient shopping experience for customers while improving operational efficiency for retailers. Notably, the system reduces the time spent at the checkout counter, eliminates manual item counting, and streamlines the billing process. It is user-friendly, reliable, and meets the demands of both customers and shopkeepers.

The project revolutionizes retail by seamlessly integrating technology into the shopping experience. Leveraging RFID tags, the system automates item tracking, cost calculation, and checkout. For customers, it means no more manual counting or mental math. The trolley keeps a real-time tally, reducing time at the billing counter. Retailers benefit from operational efficiency, reduced staff dependency, and increased customer satisfaction. In summary, this smart trolley bridges the gap between convenience and efficiency, benefiting both shoppers and shopkeepers.

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