

# AUTO-BILLING SMART CART

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## ABSTRACT

*This paper explores the innovative integration of artificial intelligence (AI) in the development of a smart cart for retail and shopping environments. The proposed AI-based smart cart's incorporates advanced features such as product theft detection, auto-billing, and person-following capabilities to enhance the shopping experience and streamline the checkout process. The auto-billing feature leverages AI-powered sensors and cameras to automatically scan barcodes or RFID tags on products as they are placed in the cart. This eliminates the need for manual scanning at the checkout counter, reducing wait times and enhancing overall shopping efficiency. The system calculates the total bill in real time, offering a seamless and hassle-free payment experience.*

*The product theft detection feature utilizes computer vision and AI algorithms to monitor the items placed in the Cart. Infrared sensors and image recognition technology work in tandem to identify discrepancies between items added to the cart and those scanned during checkout. Suspicious activities trigger real-time alerts, mitigating the risk of theft and enhancing store security. Furthermore, the person-following capability integrates AI algorithms and sensor technology to enable the cart to autonomously navigate through the store, following the shopper as they move. This hands-free navigation simplifies the shopping process, particularly for elderly or physically challenged individuals. The AI ensures safe and collision-free movement, enhancing convenience and accessibility.*

**Keyword:** - Automation, Artificial Intelligence, Shopping cart, ESP32

## 1. INTRODUCTION

In an era of rapid technological advancement, the shopping experience is undergoing a remarkable transformation. Imagine a shopping cart that not only serves as a receptacle for your chosen products but also functions as a vigilant guardian, a convenient cashier, and an intelligent companion throughout your retail journey. Welcome to the world of the AI-Based Smart Cart, a groundbreaking innovation that seamlessly integrates product theft detection, auto billing, and man-following capabilities into your shopping experience. This cutting-edge smart cart is not just a cart; it is a sophisticated piece of technology designed to revolutionize the way we shop. It employs artificial intelligence to ensure the security of your selected items, automatically calculates your bill as you shop, and even follows you as you navigate the store. Let us delve deeper into the remarkable features that make this cart a game-changer in the world of retail.

The electronic shopping system intends to assist shopping in person that will minimize the time spent in shopping as well as intended to aid the store management with real-time updates on the inventory. The emergence of new technologies, such as RFID scanner and wireless networks, makes the shopping processes faster, transparent, and efficient. Our aim is to develop the shopping system which can be used in shopping malls to solve the problem mentioned above. The Shopping system is equipped with RFID scanner for product identification. Besides, it also has an LCD display that informs customers about product prices, discounts, offers and the total bill. As soon as the object is purchased, the RFID reader identifies the product and updates the bill. When the customer is done with shopping, he can just press the 'End shopping' button and the details are display and the customer has to pay online just the amount and leave.

The proposed system is easy to use and does not need any special training. In this system there is inbuilt automatic billing system makes shopping a breeze and has other positive spin-offs such as freeing staff from repetitive checkout scanning, reducing total number of staffs required and increasing operational efficiency of the system, excellent way to help customers reduce the time spent in shopping by displaying the list of products, their cost, the best deals/rates on the products and automatic billing. The system helps the store management with an automatic update of the inventory on every purchase of an item shopping system has the potential to make shopping more pleasurable and efficient for the shopper and the inventory control easier for the store management. The shopping system has the potential to make shopping more pleasurable and efficient for the shopper and the inventory control easier for the store management.

## **2. LITERATURE SURVEY**

### **2.1 Design of a Control System for Robot Shopping Carts[1]:**

Authors here introduced a secure-smart and modern shopping system using and utilizing the modern RFID methodology. For first-time the ultra-high frequency RFID had been employed to enhance the shopping experience. The security problems are described in the area of the modern secure and smart shopping system. All the shopping carts in the mall are coupled with RFID tags. When a product which also has an RFID tag is placed in the cart the billing information with respect to that cart is updated by reading the details of the respective product. The malls are installed with smart shelves which are also coupled with RFID readers. This will help in maintaining an inventory list of all the products in the mall and hence improve stock maintenance.

### **2.2 RFID Based Smart Trolley Using IOT [2]**

This paper describes the idea of creating an automatic billing system while shopping made possible using RFID assisted by other IOT based technologies. All the products in the shopping malls or supermarkets are provided a unique RFID tag instead of a barcode. Each shopping trolley has its own setup which contains an RFID reader, a servo motor along with a door, ESP module, a push button to make payments or cancel orders, and an LCD screen to display all information related to the item.

### **2.3 RFID Based Smart Shopping Kart [3]**

In this research work Intended objective is successfully achieved in the developed proto type model. The developed product is easy to use and does not require any specific training. It has the effective usage of LIFI technology and the smart trolley can minimize the queues in the mall. So that customer's time can be saved. Physical challenged persons gain benefits. The following process is very use to friendly process. Theft has been reduced by this process. In the previous technology is has been controlled by manual process by overcome it is automatic process.

### **2.4 IoT Based Smart Shopping Cart Using Radio Frequency Identification [4]:**

This paper describes that when a customer successfully enters into an android mobile application dashboard, an attractive screen display in front of the customer. On this screen, there are previous shopping lists and promotion modules. It helps the customer to remember his/her routine wise shopping items and maintain shopping according to budget. When customer login into the android mobile application, then according to this login information android mobile application extract the customer shopping history data wirelessly from the server and display it to the customer. Also, a promotion module displays the different special discounts and promotions of the products. By selecting the desired product from the previous list of shopping or the promotion module, the customer can enter into the search module in which customers can see an indoor map of the supermarket. In this module, customers can select the desired category of the product, then the current location of the product display to the customer on the map of the supermarket if it is available in stock.

### **2.5 The RFID Based Smart Shopping Cart [5]**

This paper discusses a ground-breaking concept of RFID based smart shopping cart in the field of retail merchandise. Our whole shopping experience is often marred by the long checkout lines. Soon we can end this problem by replacing the ubiquitous Universal Product Code (UPC) bar code by smart labels, known as radio frequency identification (RFID) tag. The key idea here is to provide assistance in everyday shopping in terms of reduction in time spent, eliminating the daily hassle of locating the right product and standing in long lines. The primary goal is to provide a technology oriented, reduced cost, time saving, hassle free, commercially oriented system for an enhanced shopping experience.

## **3. BLOCK DIAGRAM**

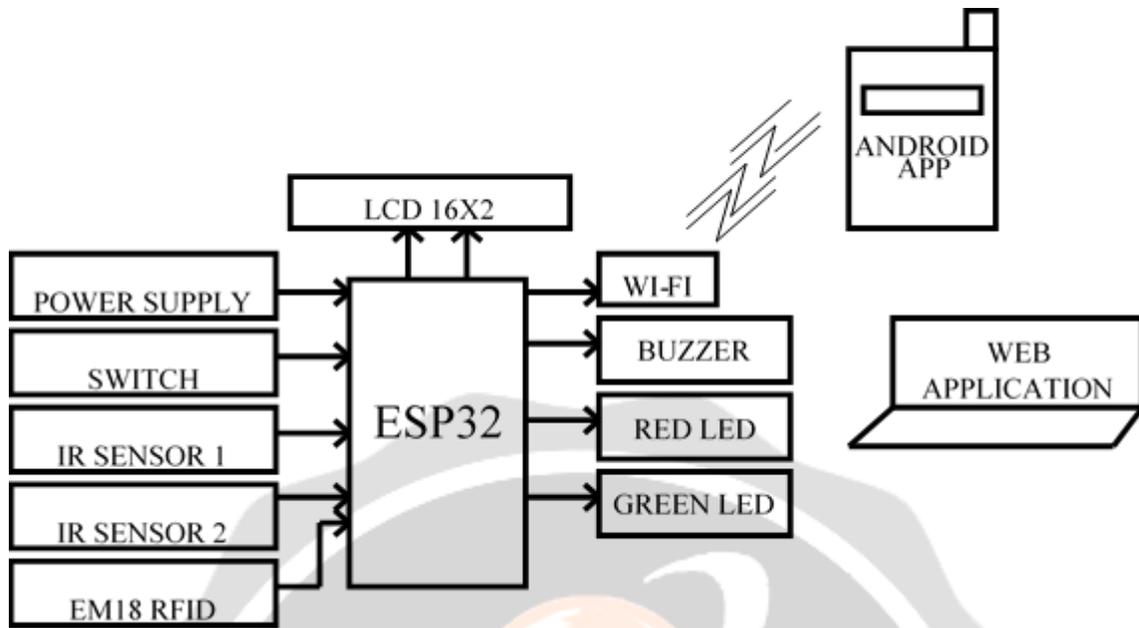


Fig -1: Block Diagram of System

4. CONNECTION DIAGRAM

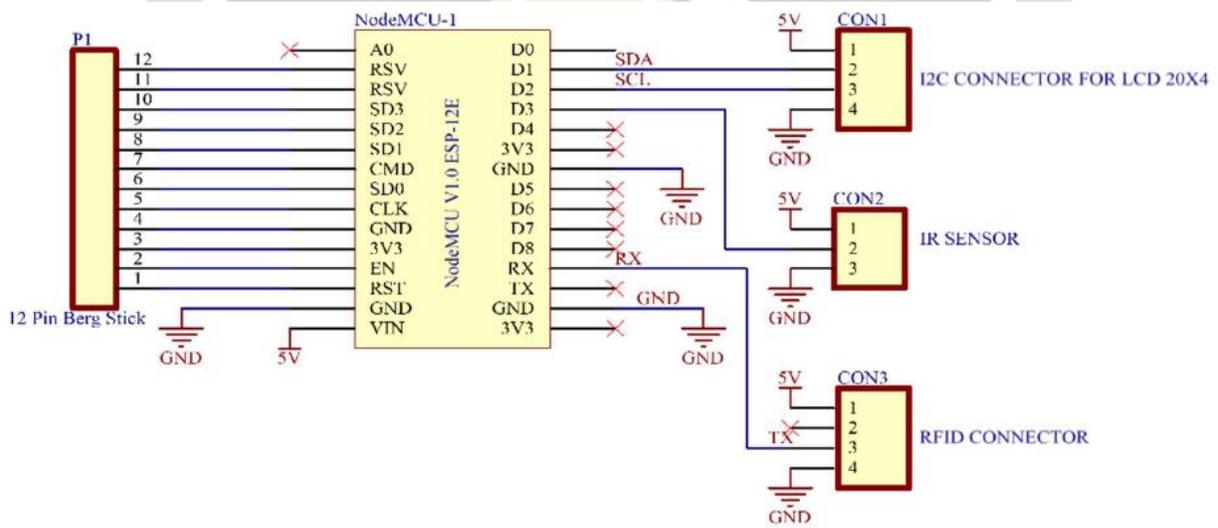
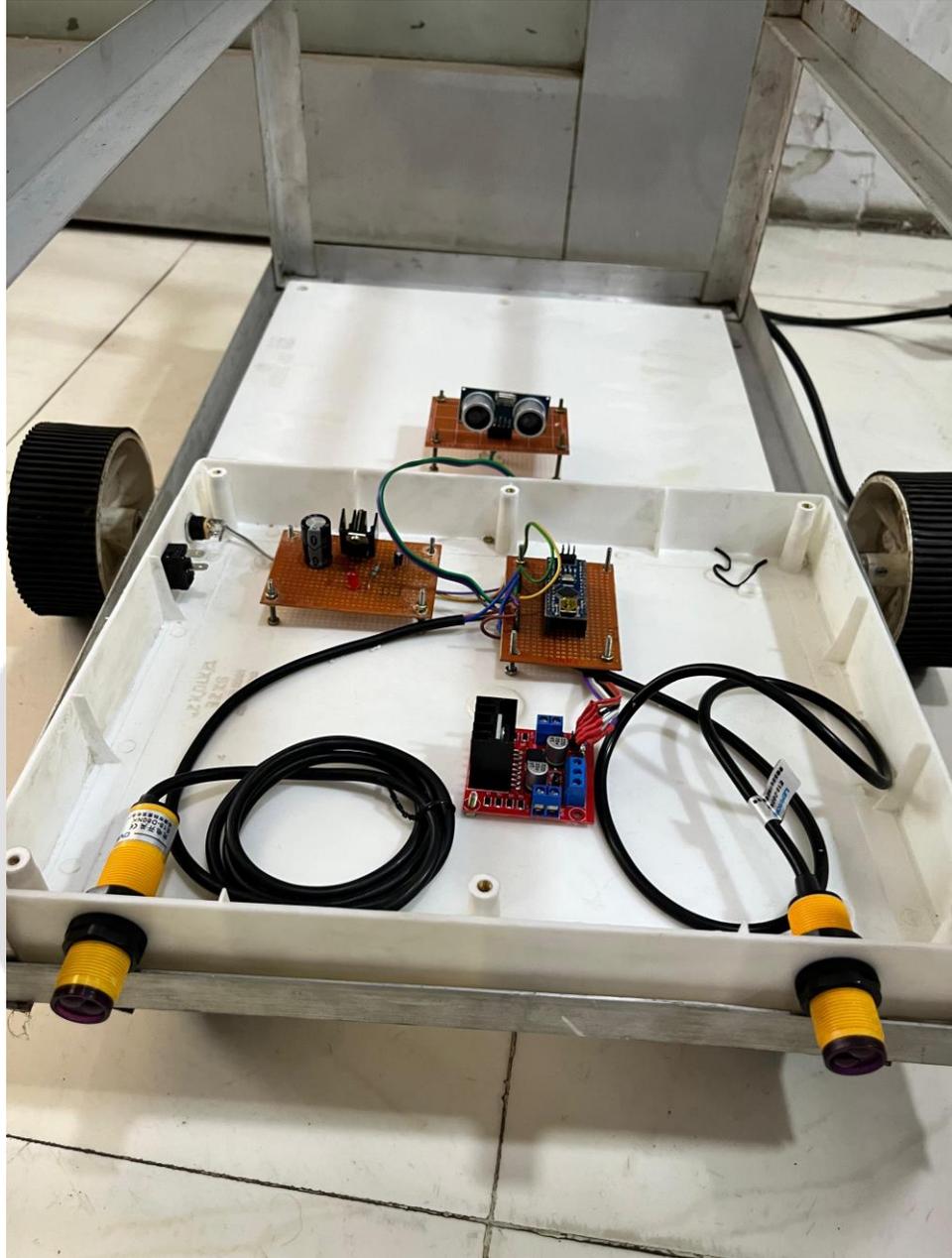


Fig -2: Interfacing of LCD 20X4, IR Proximity sensor, RFID Connector with Node MCU

5. IMPLETATION & RESULTS

5.1 Hardware Implementation



**Fig -3:** Hardware Implementation

## 5.2 Result

The AI-powered shopping trolley with auto billing, product theft detection, and man following ensures a smooth shopping experience. It combines convenience through automatic billing with security features, minimizing the risk of theft, and even follows you as you navigate the store. The AI-based shopping trolley with auto billing, product theft detection, and man following features offers a streamlined and secure shopping experience. It automates the billing process, enhances security by detecting potential theft, and employs a man-following capability for added convenience during the shopping journey.

The AI-powered shopping trolley, equipped with auto billing, product theft detection, and man-following features, offers a modern and efficient shopping experience. It ensures smooth transactions, enhances security against theft, and provides hands-free navigation for a convenient shopping journey. An AI-based smart shopping trolley with automatic billing streamlines the checkout process, enhancing efficiency and providing a seamless shopping experience for users. The system can accurately track items placed in the trolley, calculate the total cost in real-time,

and facilitate a smooth transaction without the need for traditional checkout queues. An AI-based smart shopping trolley with product theft detection uses advanced technology to identify and prevent unauthorized removal of items. Integrated sensors and computer vision help monitor the products in the trolley, triggering alerts or security measures if potential theft is detected, ensuring a secure shopping environment.

An AI-based smart shopping trolley with automatic man following incorporates computer vision and sensors to autonomously follow the user throughout the store. This feature enhances convenience for shoppers, allowing them to navigate the aisles without the need to push the trolley manually, creating a hands-free and effortless shopping experience.

## 6. ADVANTAGES

- **Enhanced Shopping Experience:** The implementation of AI in shopping carts can significantly improve the overall shopping experience, making it more convenient, efficient, and enjoyable for customers.
- **Reduced Theft and Improved Security:** The inclusion of product theft detection features can lead to a decrease in theft incidents within retail stores, providing a more secure shopping environment.
- **Efficient Checkout and Billing:** AI-powered automatic billing can streamline the checkout process, reducing waiting times and enhancing convenience for shoppers.
- **Cost Savings:** Retailers may realize cost savings through improved efficiency and reduced theft-related losses.
- **Increased Customer Engagement:** Man-following and personalized recommendations can engage shoppers more effectively, potentially leading to increased loyalty and sales.
- **Environmental Impact:** The project can contribute to environmental sustainability by reducing paper receipt usage and optimizing shopping routes.
- **Continued Innovation:** The project's success may encourage further innovation in AI and IoT technologies, potentially leading to new applications in the retail sector and beyond.

## 7. CONCLUSIONS

In conclusion, Smart Shopping Carts represent a promising innovation in the world of retail. These intelligent devices have the potential to transform the shopping experience for both consumers and retailers. By harnessing the power of artificial intelligence, they offer enhanced personalization, efficiency, and convenience to shoppers, making their trips to the store more enjoyable and productive. Additionally, Smart Shopping Carts can benefit retailers by providing valuable insights into customer behavior and preferences, enabling better inventory management, and potentially increasing sales through targeted marketing strategies. As technology continues to advance, we can expect Smart Shopping Carts to become increasingly sophisticated and integrated into the retail landscape, further enhancing the way we shop and interact with physical stores. This innovation holds the promise of a more efficient, sustainable, and customer-centric future for the retail industry.

## 8. FUTURE SCOPE

The system can connect to a backend database or cloud service to update the inventory in real-time. This provides accurate stock information, helping store managers optimize stock levels and reduce instances of stock outs. Node MCU is known for its low power consumption and cost-effectiveness, making it a suitable platform for RFID-enabled shopping cart systems that need to operate for extended periods without frequent maintenance.

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