

Smart Shopping Cart

Abstract

In conventional supermarkets, customers wait in long queues at the billing counter, which causes inconvenience and time wastage. This project proposes a Smart Shopping Cart system based on RFID technology, Arduino Uno, and LCD display to automate billing and eliminate queues. Each product is tagged with an RFID tag. The shopping cart is equipped with an RFID reader, IR sensor, LCD, servo motor, push buttons, and buzzer. Customers can scan products to add or remove items, while the reset mode clears the entire cart. The bill amount is calculated in real time and displayed on the LCD. An IR sensor with a servo lid mechanism ensures items are properly placed inside the cart. This solution enhances the shopping experience by saving time and reducing dependency on manual billing counters. Future improvements include cashless payments, mobile app integration, and cloud billing systems.

Introduction

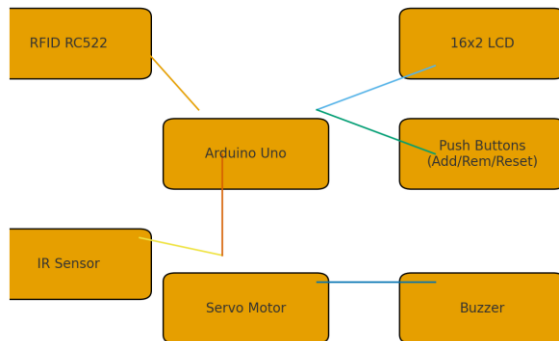
In traditional shopping malls and supermarkets, manual billing is slow and prone to human error. RFID-based solutions provide contactless, quick, and reliable product identification. The Smart Shopping Cart reduces human effort, avoids long queues, and enables customers to monitor their expenses instantly.

Objectives

1. To design an automated billing system using RFID.
2. To provide three modes: Add, Remove, and Reset for flexible shopping.
3. To display real-time bill amount on an LCD.
4. To improve customer experience by avoiding long queues.
5. To prepare the system for future cashless payment integration.

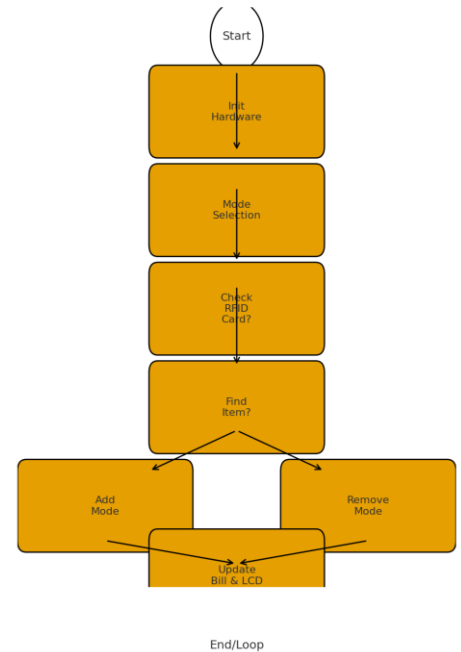
Circuit Diagram and Flowchart

Circuit Diagram (Schematic View)



The system consists of RFID Reader, Arduino Uno, LCD Display, Push Buttons, IR Sensor, Servo Motor, and Buzzer. Products with RFID tags are scanned, Arduino processes the data, updates bill amount, and displays on LCD. IR sensor triggers servo motor for lid mechanism.

Flowchart: Working Logic



Components Used

1. Arduino Uno – Main controller.
2. RFID RC522 Reader – Reads RFID tags.
3. RFID Tags – Unique IDs for products.
4. 16x2 LCD Display – Shows total bill and mode.
5. Push Buttons – Mode selection (Add, Remove, Reset).
6. IR Sensor – Detects object near cart.
7. Servo Motor (SG90) – Opens and closes cart lid.
8. Buzzer – Beep sound for feedback.
9. Breadboard, Jumper Wires, Power Supply.

Working Principle

1. Initialization: LCD welcomes user and system initializes.
2. Mode Selection: Customer selects Add / Remove / Reset using push buttons.
 - Add Mode → Scanned product price is added to bill.
 - Remove Mode → Product is removed from cart if present.
 - Reset Mode → Clears entire bill and cart data.
3. RFID Operation: Each item has a unique RFID tag. The RFID reader reads the tag and Arduino matches it with the stored database (item name + price).
4. IR + Servo Mechanism: If IR sensor detects an object, the servo opens the lid, allowing product placement.

5. LCD Display: Shows total bill amount and current mode.
6. Buzzer Feedback: Beep sound confirms actions (Add/Remove/Reset).

Software Used

- Arduino IDE (for coding and uploading program).
- C/C++ language (embedded programming).
- Serial Monitor (for debugging and UID detection).

Results

- Successfully demonstrated real-time billing system.
- LCD correctly displayed Total amount & Mode.
- Add/Remove/Reset functions worked as expected.
- Servo lid automatically operated on IR sensor detection.
- Buzzer provided effective feedback.

Applications

- Supermarkets
- Shopping malls
- Self-checkout kiosks
- Libraries (book management)

Future Scope

1. Cashless Payment Integration → UPI, Paytm, Google Pay.
2. Mobile App Interface → Customers can see live bill on mobile.
3. Cloud Storage → Store purchase history for analytics.
4. Barcode + RFID Hybrid System → Support all product types.
5. IoT Integration → Smart carts connected to central servers for monitoring.

Conclusion

This project successfully implements a Smart Shopping Cart using Arduino and RFID technology to eliminate long queues in supermarkets. The system provides real-time billing, flexible modes, and automated cart operations. With future enhancements like online payments and IoT connectivity, the system can be scaled into a commercial smart retail solution.