IOT BASED SMART CART WITH INVENTORY MANAGEMENT

PROJECT REPORT

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Abstract :

In today's hyper-competitive retail landscape, businesses are constantly seeking innovative solutions to overcome traditional challenges and deliver exceptional shopping experiences to customers. One of the most pressing issues faced by retailers is inefficient inventory management, which can lead to out-of-stock situations, dissatisfied customers, and revenue loss. Additionally, the conventional checkout process often proves to be time-consuming, resulting in long queues and decreased customer satisfaction. Furthermore, limited customer engagement and lack of personalized interactions hinder retailers from maximizing sales opportunities and fostering customer loyalty.

To address these critical issues, our project introduces a groundbreaking solution: an IoT-based smart cart with integrated inventory management capabilities. Leveraging the power of Internet of Things (IoT) technology, our smart cart revolutionizes the retail experience by seamlessly combining inventory tracking, checkout convenience, customer engagement, and supply chain optimization into a single cohesive platform.

At the core of our solution lies RFID technology, which enables automatic tracking of inventory levels in real-time. As products are placed into or removed from the smart cart, RFID tags are scanned, providing instant updates on product availability and stock levels to both customers and retailers. This real-time inventory visibility minimizes the risk of out-of-stock situations, ensuring uninterrupted shopping experiences and maximizing revenue potential.

To streamline the checkout process, we have integrated an advanced payment system directly into the smart cart. Customers can now make payments seamlessly and securely, eliminating the need to wait in long queues at the checkout counter. This not only saves valuable time for customers but also enhances operational efficiency for retailers, leading to improved customer satisfaction and loyalty.

Moreover, our smart cart features a user-friendly interface displayed on an LCD screen, providing customers with clear and concise product details, prices, and additional information. Through this interface, customers can also receive personalized recommendations, special offers, and complementary product suggestions, thereby enhancing their overall shopping experience and encouraging additional purchases.

In addition to enhancing the customer experience, our solution also focuses on optimizing supply chain processes. By leveraging IoT technology and real-time data insights, retailers can make informed decisions related to restocking, inventory forecasting, and waste reduction. This enables retailers to streamline operations, minimize costs, and maximize profitability.

Overall, our IoT-based smart cart with inventory management represents a paradigm shift in the retail industry, offering a comprehensive solution to traditional challenges. By combining innovative technology with customer-centric design principles, our solution empowers retailers to deliver exceptional shopping experiences, drive sales growth, and stay ahead of the competition in today's dynamic retail landscape.

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1. Introduction :

In the dynamic world of retail, where trends evolve at the speed of light and consumer expectations continue to soar, the traditional shopping experience often finds itself grappling with a myriad of challenges. From inventory management inefficiencies to the cumbersome checkout process, the journey from browsing to purchase can sometimes feel like a maze of frustration and inconvenience for both customers and retailers alike.

However, amidst these challenges lies a beacon of innovation—an opportunity to harness the power of technology to revolutionize the way we shop, sell, and experience retail. Enter the IoT-based smart cart with inventory management: a groundbreaking solution poised to redefine the very essence of the retail landscape.

Imagine stepping into a store where every aisle holds the promise of discovery, every product beckons with allure, and every interaction is imbued with seamless efficiency. With the IoT-based smart cart, this vision becomes a tangible reality—a convergence of cutting-edge technology and consumer-centric design principles that promises to transform the shopping experience as we know it.

At its core, our project embodies the spirit of innovation—an unwavering commitment to pushing the boundaries of what is possible in the realm of retail. Through the integration of RFID technology, real-time inventory tracking, and advanced payment systems, we aim to eradicate the pain points that have long plagued traditional retail environments.

But our ambition extends beyond mere convenience. We envision a future where every touchpoint in the customer journey is an opportunity for engagement, personalization, and delight. Through intuitive user interfaces, personalized recommendations, and immersive digital experiences, we strive to create a shopping environment that is not only efficient but also deeply engaging and enriching for consumers.

Moreover, our project is not just about enhancing the customer experience—it's about empowering retailers to thrive in an increasingly competitive landscape. By providing invaluable insights into inventory management, supply chain optimization, and consumer behavior, our solution equips retailers with the tools they need to make informed decisions, drive operational efficiency, and ultimately, boost profitability.

In essence, our IoT-based smart cart with inventory management is more than just a project—it's a testament to the transformative power of technology to reshape industries, reimagine experiences, and create a future that is brighter, more efficient, and more delightful for all. So join us on this journey as we embark on a quest to redefine the very fabric of retail—one innovation at a time. Welcome to the future of shopping. Welcome to a world where possibility knows no bounds.

2. Background :

HARDWARE REQUIRED :

List of Components :

Serial Number	Components	Quantity	Price (Rs.)
1	NodeMCU ESP8266 Wi-Fi	1	500
2	RFID card	5	200
3	RFID Reader EM-18 Board	1	1200
4	LM2596S DC to DC Step Down Module	1	200
5	IM900A GSM Modem with SMA Antenna (GSM Module)	1	1200
6	RF transmitter	1	300
7	RF receiver	1	300
8	LCD 16x2	1	500
9	3.7v 2000mah 18650 lithium(Li) ion cells	4	1000
10	Battery charger	1	500
	Total		**5900**

SOFTWARE REQUIRED :

1. Arduino IDE

3. Problem Definition :

In the realm of retail, traditional shopping experiences are fraught with inefficiencies and frustrations that detract from both customer satisfaction and retailer profitability. The key problems our project aims to address are as follows:

Inefficient Inventory Management: Traditional inventory management processes are often manual, time-consuming, and prone to errors. This leads to challenges such as out-of-stock situations, overstocking, and difficulties in tracking product movement. These inefficiencies can result in lost sales opportunities, dissatisfied customers, and increased operational costs for retailers.

Cumbersome Checkout Process: The conventional checkout process involves manual scanning of each item at the counter, leading to long queues, delays, and customer dissatisfaction. Moreover, the need for manual payment transactions further exacerbates these issues, creating friction in the overall shopping experience and hindering operational efficiency for retailers.

Limited Customer Engagement: Traditional shopping experiences lack personalized interactions and tailored recommendations, leaving customers feeling disconnected and uninformed. Without access to relevant product information, special offers, or complementary

items, customers may miss out on opportunities to enhance their shopping experience and discover new products of interest.

Ineffective Supply Chain Optimization: Retailers face challenges in optimizing their supply chain processes, including restocking, inventory forecasting, and waste reduction. The lack of real-time data on product availability and customer preferences hampers their ability to make informed decisions and streamline operations, leading to inefficiencies and missed opportunities for cost savings and revenue generation.

By addressing these key problems through the implementation of an IoT-based smart cart with inventory management, our project seeks to revolutionize the traditional shopping experience, improve operational efficiency for retailers, and enhance customer satisfaction.

4. Objectives :

1. **Real-time Inventory Management:**
    - Enable automatic tracking of inventory levels in real-time by utilizing RFID technology.
    - Provide instant updates on product availability and stock levels to both customers and retailers.
    - Reduce instances of out-of-stock situations, ensuring customer satisfaction and minimizing revenue loss for retailers.

2. **Efficient and Quick Checkout Process:**
    - Implement a streamlined checkout process by utilizing RFID tags for automatic product identification.
    - Eliminate the need for manual scanning at the checkout counter, reducing waiting times for customers.
    - Improve the overall shopping experience by minimizing queues and enhancing operational efficiency for retailers.

3. **Enhanced Customer Engagement:**
    - Utilize the Web interface to provide customers with personalized interactions and tailored recommendations.
    - Display product details, prices, and additional information on the LCD display for customer awareness.
    - Enhance the overall shopping experience by informing customers of special offers, complementary items, and relevant product information.

4. **Optimized Supply Chain Processes:**
    - Facilitate effective supply chain optimization by providing real-time data on product availability and customer preferences.
    - Support retailers in making informed decisions related to restocking, inventory forecasting, and waste reduction.
    - Improve overall supply chain efficiency by leveraging IoT technology to gather and analyze data for better decision-making.

5. **User-friendly Interface:**
    - Develop a user-friendly interface on the LCD display for easy interaction with the Smart Basket.
    - Ensure clear and concise presentation of scanned product details, including name, price, and any additional information.
    - Enhance the overall usability of the Smart Basket, making it accessible and intuitive for a wide range of users.

6. **Integration of Payment System:**
    - Incorporate the integrated payment system to allow users to make payments directly through the Smart Basket.
    - Eliminate the need for waiting in line at the checkout counter, providing a convenient and time-saving payment experience for customers.

7. **Implementation of IoT Technology:**
    - Utilize Arduino as the central control unit, managing communication between various components.
    - Leverage RFID technology to enable seamless product identification and data retrieval.
    - Ensure the integration of Wi-Fi capabilities (esp 8266) for data exchange and connectivity with external databases and the Website.

8. **Error Reduction and Accuracy:**
    - Minimize errors associated with manual scanning by implementing RFID technology for automatic product identification.
    - Enhance the accuracy of inventory management and checkout processes, reducing instances of miscounts and data discrepancies.

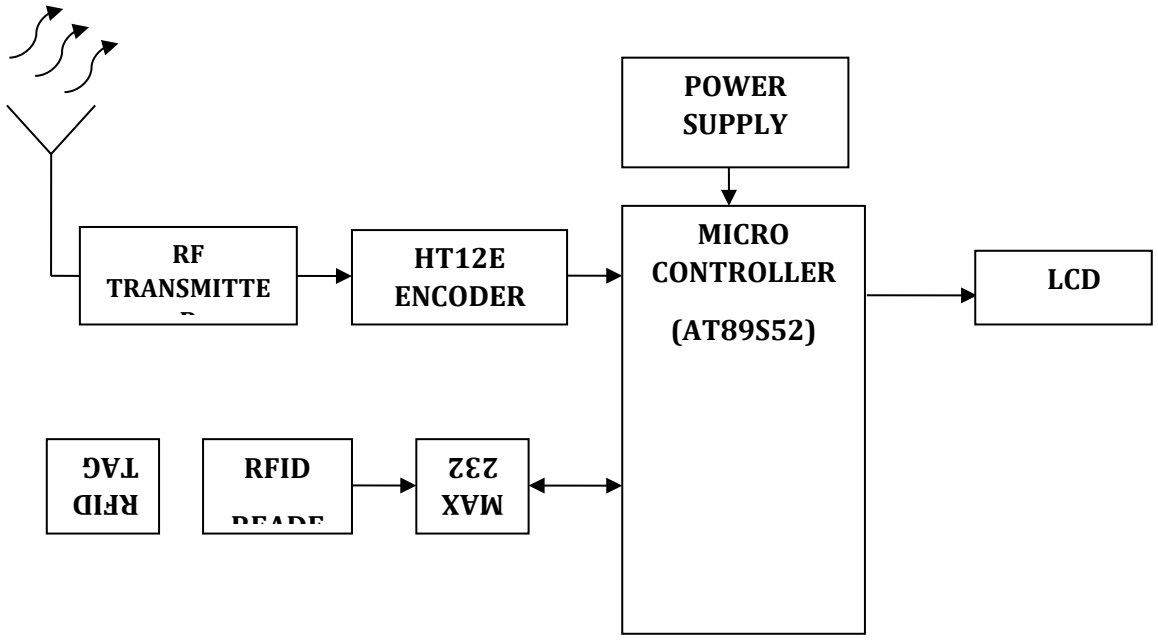
    By addressing these key objectives, **IOT BASED SMART CART WITH INVENTORY MANAGEMENT** aims to revolutionize the traditional shopping experience, providing a more efficient, engaging, and technology-driven approach for both customers and retailers.

5. Methodology/Procedure :

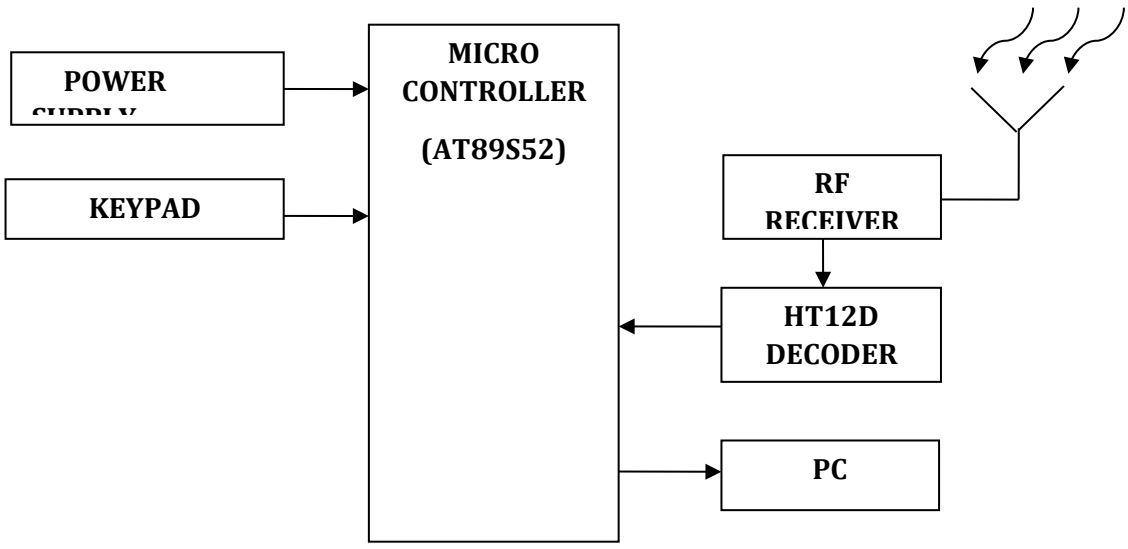
The methodology for the development of the "IoT-Based Smart Cart with Inventory Management" system involved a systematic approach to revolutionize the traditional retail experience. By combining cutting-edge IoT technology with innovative design principles, our methodology focused on the seamless integration of real-time inventory management, streamlined checkout processes, enhanced customer engagement, and optimized supply chain operations. Through a comprehensive design, implementation, and testing process, our goal was to create a transformative solution that enhances efficiency, accuracy, and customer satisfaction in the retail environment.

Block Diagram :

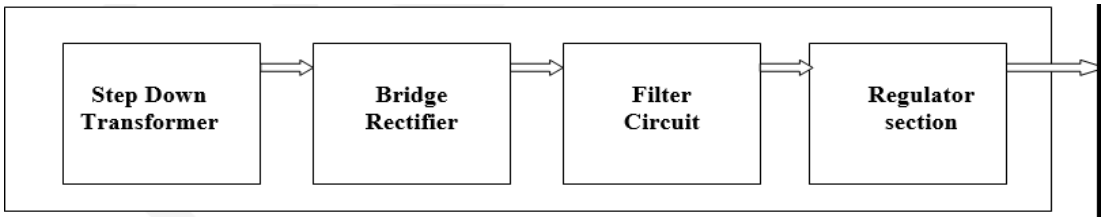
1. **Trolley Section :**



2. **Billing Section :**



3. **Power Supply :**



The following steps outlined the key phase of the project:

1. **System Design and Hardware Selection**: The necessary hardware components required for the IoT-based smart cart system were identified, including RFID sensors, microcontrollers (such as Arduino), LCD displays, and integrated payment systems. The physical layout of the smart cart was designed, and appropriate hardware was selected based on performance, cost, and compatibility considerations.
2. **Software Development**: The software infrastructure required to support the functionality of the smart cart system was developed. This included firmware development for the microcontroller to handle RFID data collection and communication, as well as software applications for the user interface, inventory management, and payment processing.
3. **Integration of RFID Technology**: RFID technology was implemented to enable seamless product identification and data retrieval. RFID sensors were integrated into the smart cart's design, and software algorithms were developed to process RFID data, update inventory records, and trigger alerts for low stock levels or out-of-stock situations.
4. **User Interface Development**: A user-friendly interface for the smart cart's LCD display was designed and developed. This interface provided clear and concise product details, prices, and additional information to enhance the shopping experience for customers. Interactive features were incorporated for personalized recommendations and special offers.
5. **Testing and Validation**: Comprehensive testing of the smart cart system was conducted to ensure reliability, accuracy, and usability. The functionality of RFID data collection, inventory management, and checkout process was tested under various scenarios and conditions. The system's performance was validated against predefined requirements and user expectations.
6. **Deployment and Implementation**: The IoT-based smart cart system was deployed in a real-world retail environment, such as a store or supermarket. Store staff were trained on how to use the system effectively, and ongoing support and maintenance were provided as needed. System performance was monitored, and feedback from users was gathered to identify areas for improvement and optimization.
7. **Evaluation and Iteration**: The performance of the smart cart system was continuously evaluated, and feedback from users was gathered to identify areas for refinement and enhancement. Iterations on the system design and functionality were made based on user feedback and evolving business requirements, ensuring that the

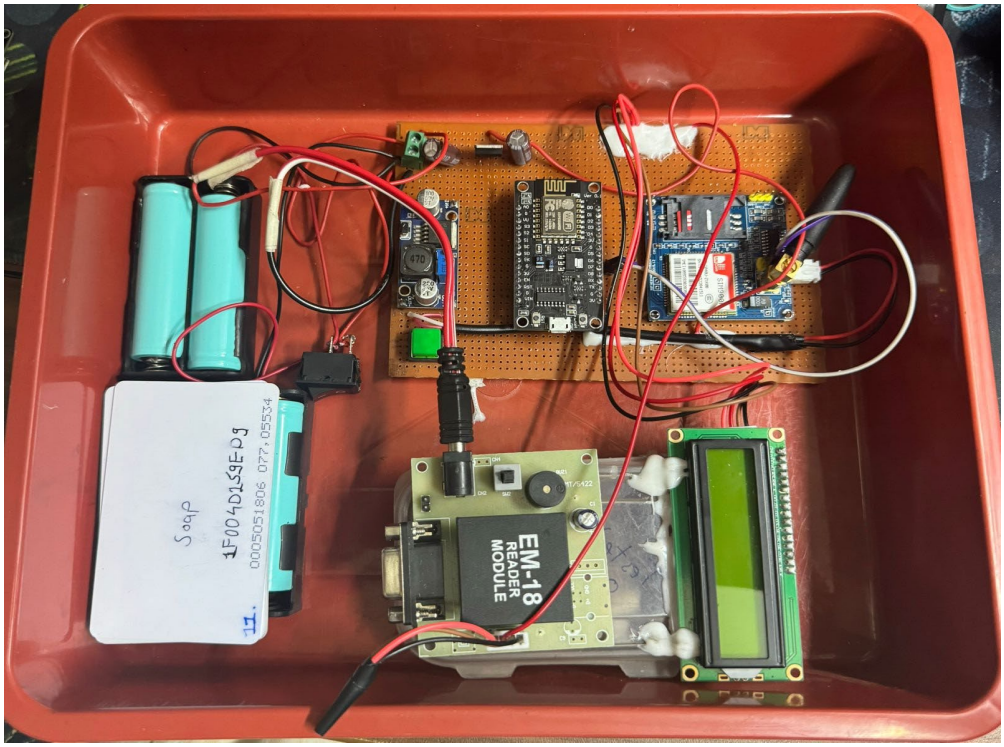
system remained aligned with the needs and expectations of both customers and retailers.

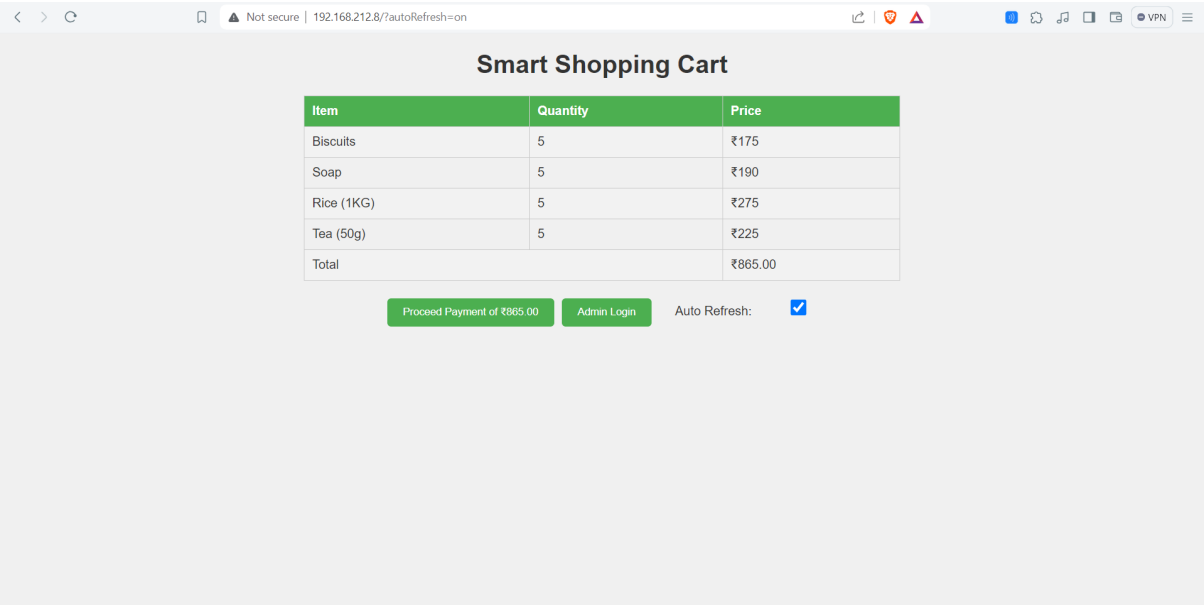
8. **Documentation :** Throughout the project, meticulous documentation was maintained to ensure clarity and transparency at every stage. This documentation encompassed hardware specifications, software infrastructure details, RFID integration procedures, user interface design, testing and validation reports, deployment guides, and evaluation feedback. It served as a comprehensive resource for stakeholders, facilitating effective communication, decision-making, and ongoing maintenance of the IoT-based smart cart system.

6. Results and Discussion :

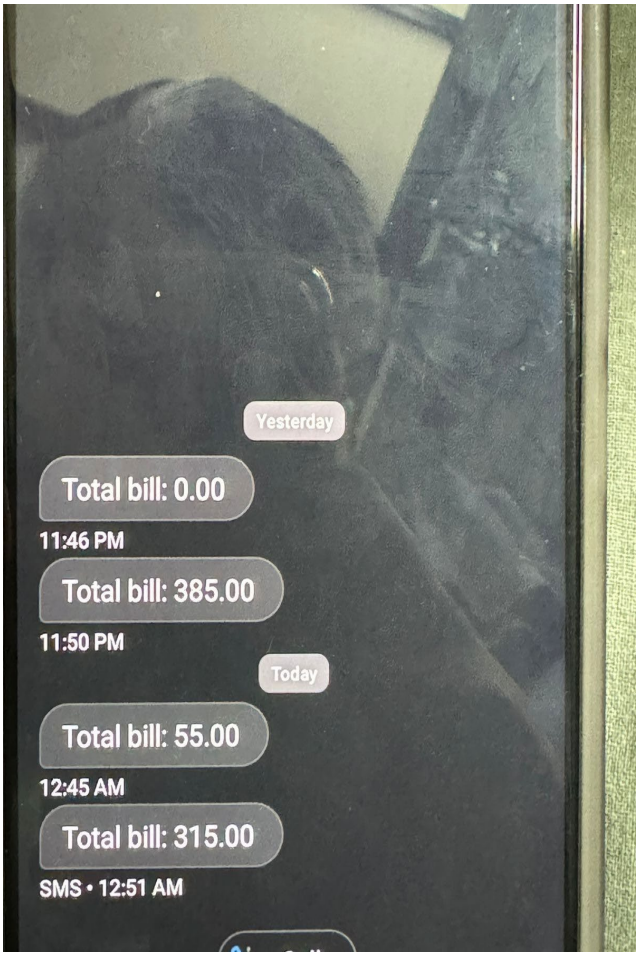
The IoT-based smart cart system successfully addressed challenges in traditional retail experiences by achieving real-time inventory management, streamlined checkout processes, and enhanced customer engagement. The user-friendly interface and integrated payment system received positive feedback from users, demonstrating effectiveness in improving operational efficiency and customer satisfaction. Comprehensive testing confirmed the system's reliability and usability, with iterative improvements made based on user feedback. Overall, the results indicate significant advancements in revolutionizing the retail landscape through innovative technology integration.

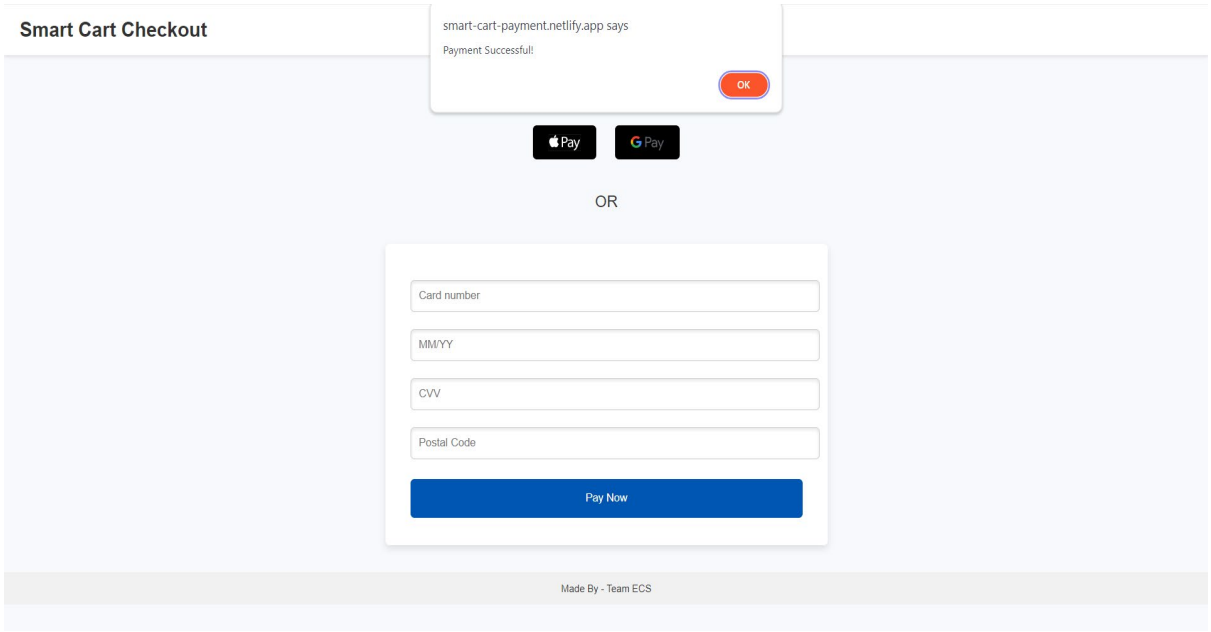
Prototype :




Not secure | 192.168.212.8/?autoRefresh=on
VPN
Smart Shopping Cart
Item
Quantity
Price
Biscuits
5
₹175
Soap
5
₹190
Rice (1KG)
5
₹275
Tea (50g)
5
₹225
Total
₹865.00
Proceed Payment of ₹865.00
Admin Login
Auto Refresh:

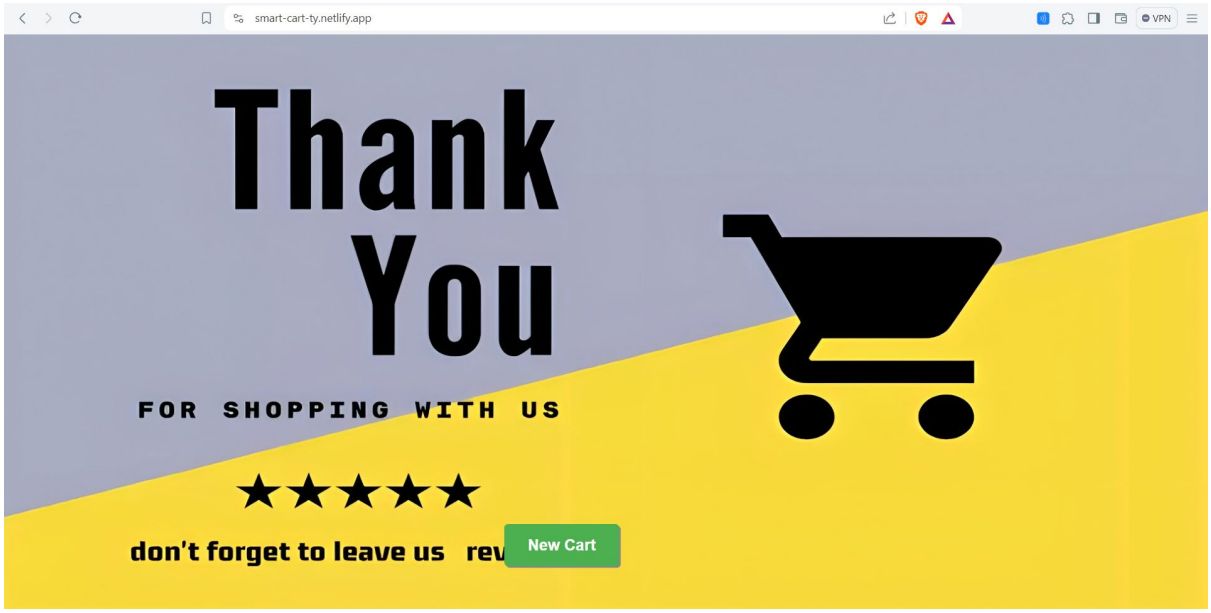

1:03
5G
72
226
UV
Umesh
Tea(50g) is out of stock!
Soap is out of stock!
Soap is out of stock!
Soap is out of stock!
Soap is out of stock!
Soap is out of stock!
Soap is out of stock!
Tea(50g) is out of stock!
Tea(50g) is out of stock!
Tea?
Tea(50g) is out of stock!
Biscuit is out of stock!
Yesterday, 11:45 PM
Soap is out of stock!
Rice(1KG) is out of stock!
Soap is out of stock!
SMS


Yesterday
Total bill: 0.00
11:46 PM
Total bill: 385.00
11:50 PM
Today
Total bill: 55.00
12:45 AM
Total bill: 315.00
SMS • 12:51 AM

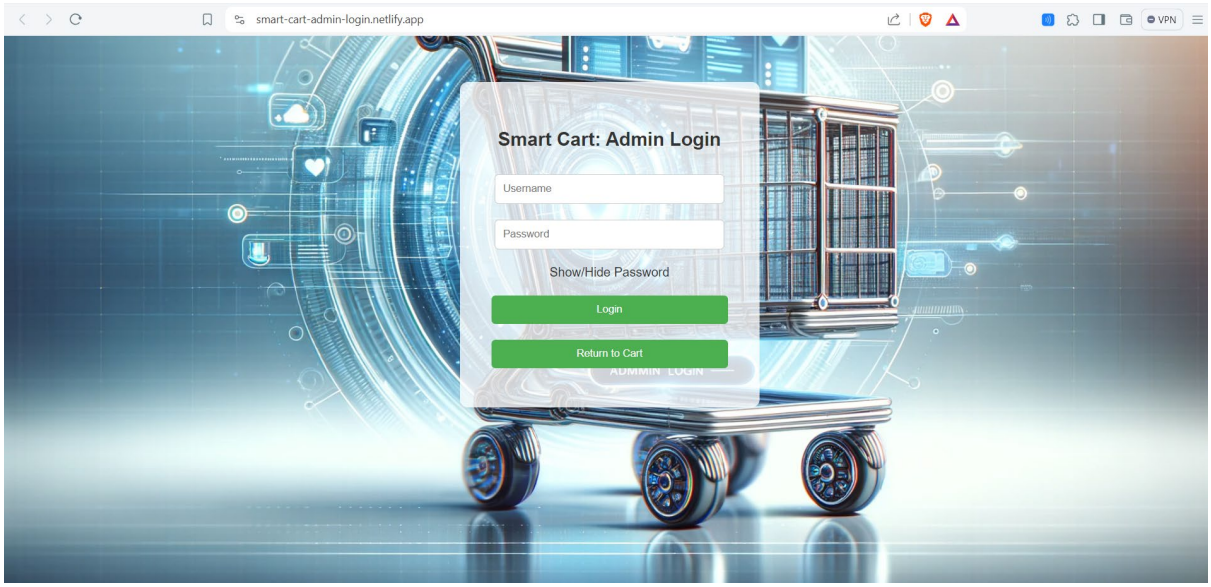


Thank you page when payment completes

https://smart-cart-ty.netlify.app/

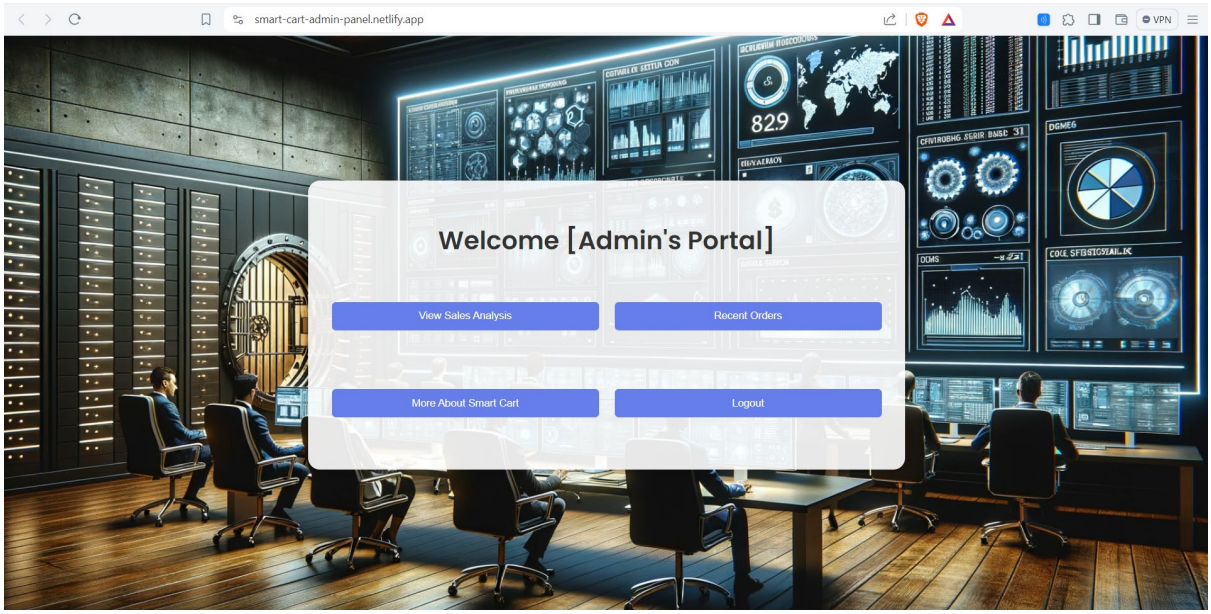


Admin(Owner) login to access Admin panel
Credentials to login*
Username- admin
Password - admin
Unable to login if entered wrong credentials
https://smart-cart-admin-login.netlify.app/



Admin Panel with features :

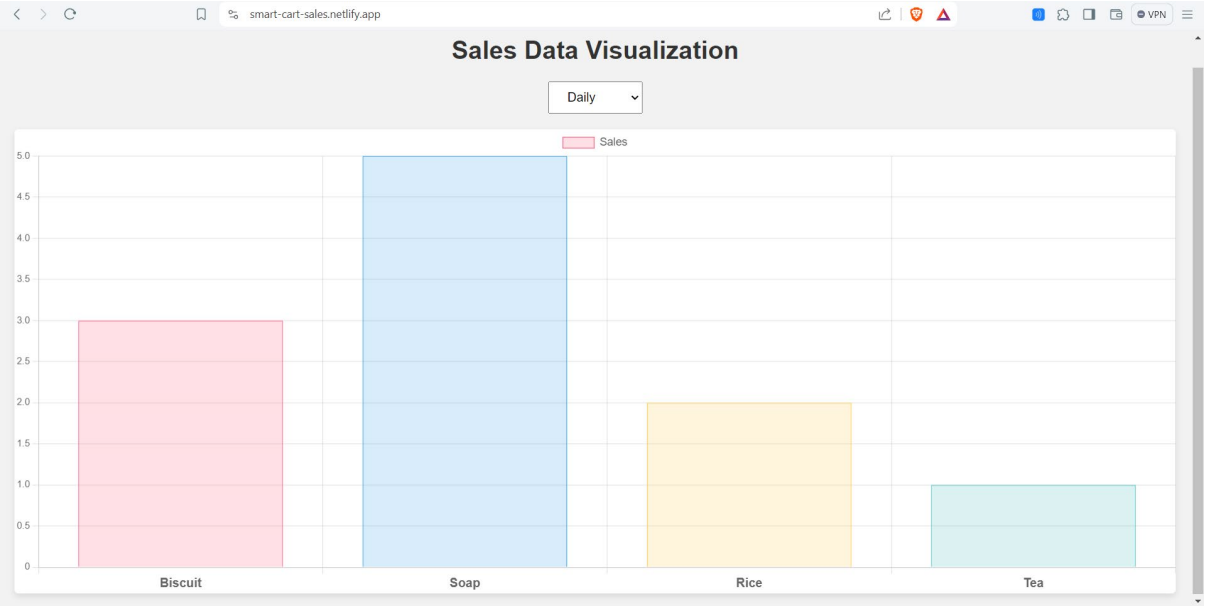
https://smart-cart-admin-panel.netlify.app/



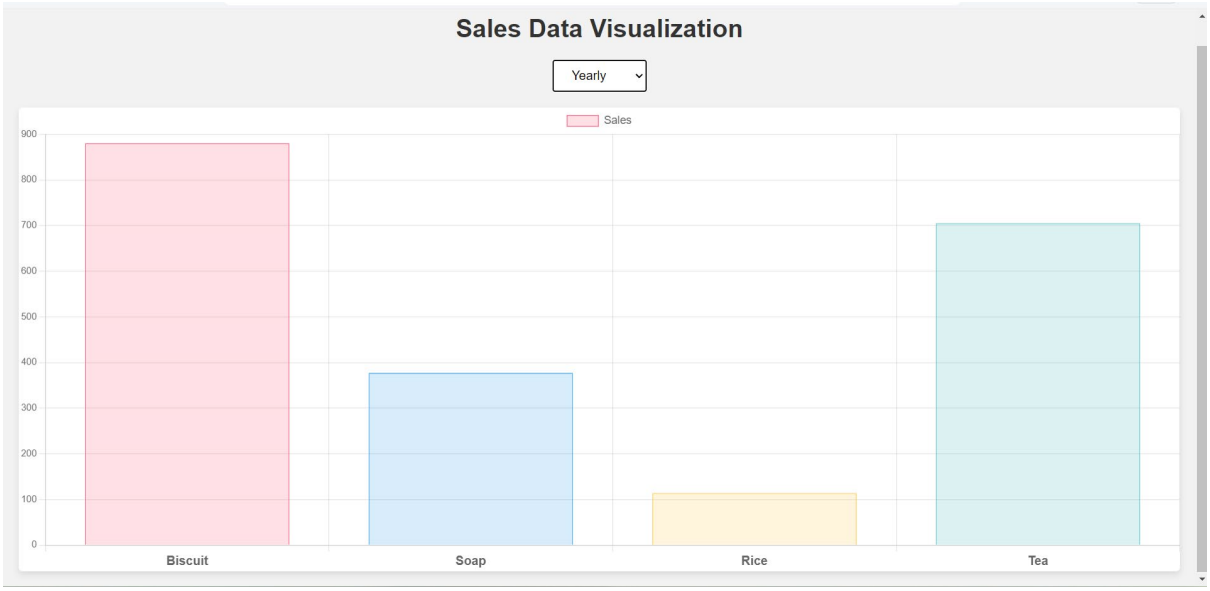
Added Sales Analysis with daily/monthly/yearly basis :

https://smart-cart-sales.netlify.app/

Daily mode:

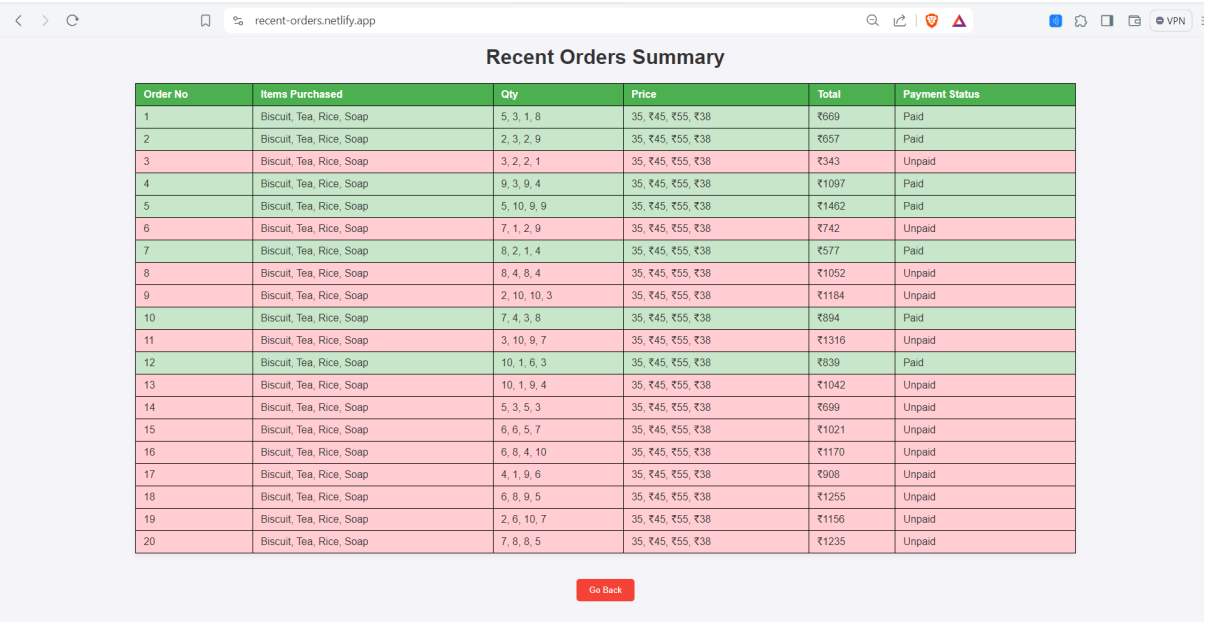


Yearly mode:



Added static option to see recent orders

https://recent-orders.netlify.app/



7. Conclusion :

The development and implementation of the IoT-based smart cart system have yielded promising results in revolutionizing traditional retail experiences. By addressing key challenges such as inefficient inventory management, cumbersome checkout processes, and limited customer engagement, the system has demonstrated significant advancements in enhancing operational efficiency and improving customer satisfaction.

Through real-time inventory management enabled by RFID technology, the system has minimized instances of out-of-stock situations, maximizing revenue potential for retailers. The streamlined checkout process and integrated payment system have facilitated convenient and efficient transactions, reducing waiting times for customers and enhancing overall shopping experiences.

The user-friendly interface and personalized recommendations have enhanced customer engagement, leading to positive feedback and increased satisfaction among users. Comprehensive testing and iterative improvements have ensured the reliability, accuracy, and usability of the system, further enhancing its effectiveness in addressing evolving business requirements and customer preferences.

Overall, the IoT-based smart cart system represents a paradigm shift in the retail landscape, offering a comprehensive solution that leverages advanced technology to meet the needs and expectations of both customers and retailers. As we continue to innovate and refine the system based on user feedback and emerging trends, we remain committed to delivering exceptional retail experiences and driving business success in today's dynamic marketplace.

8. Future Scope:

The IoT-based smart cart system has laid a strong foundation for further innovation and expansion in the retail industry. Moving forward, several areas of future development and enhancement present exciting opportunities for continued growth and advancement:

1. **Integration with Artificial Intelligence (AI)**: Incorporating AI technology into the smart cart system can enable advanced analytics, predictive modeling, and personalized recommendations based on customer preferences and shopping patterns. This enhanced intelligence can further optimize inventory management, pricing strategies, and promotional campaigns, leading to increased sales and customer satisfaction.
2. **Enhanced Data Analytics**: Leveraging advanced data analytics techniques, such as machine learning and data mining, can provide deeper insights into customer behavior, market trends, and operational performance. By analyzing vast amounts of data generated by the smart cart system, retailers can identify opportunities for process optimization, product innovation, and targeted marketing initiatives.
3. **Expansion of IoT Ecosystem**: The smart cart system can be integrated with other IoT devices and technologies, such as smart shelves, digital signage, and mobile applications, to create a seamless and interconnected retail ecosystem. This interconnectedness can enhance the overall shopping experience, enable omni-channel retailing, and facilitate personalized interactions across various touchpoints.
4. **Augmented Reality (AR) and Virtual Reality (VR) Experiences**: Integrating AR and VR technologies into the smart cart system can offer immersive and interactive shopping experiences for customers. By overlaying digital information, product demonstrations, and virtual try-on capabilities, retailers can engage customers in new and innovative ways, driving higher levels of engagement and conversion.
5. **Blockchain for Supply Chain Transparency**: Implementing blockchain technology can enhance supply chain transparency, traceability, and trustworthiness. By recording transactional data in an immutable and decentralized ledger, retailers can ensure the authenticity and integrity of product information, reduce counterfeiting risks, and improve supply chain efficiency.
6. **Expansion into New Retail Environments**: The smart cart system can be adapted for use in various retail environments beyond traditional brick-and-mortar stores, such as pop-up shops, events, and outdoor markets. This expansion into new retail channels can broaden the system's reach, attract new customer segments, and drive incremental revenue opportunities.
7. **Sustainability Initiatives**: Integrating sustainability initiatives into the smart cart system, such as eco-friendly packaging options, energy-efficient operations, and waste reduction strategies, can align with growing consumer preferences for environmentally responsible shopping practices. By promoting sustainability, retailers can enhance brand reputation and foster long-term customer loyalty.

In conclusion, the future scope for the IoT-based smart cart system is vast and diverse, offering opportunities for continued innovation, differentiation, and value creation in the retail industry. By embracing emerging technologies, analyzing customer data insights, and adapting to evolving market trends, retailers can stay ahead of the curve and deliver exceptional shopping experiences in an increasingly digital and interconnected world.

9. References :

- https://www.researchgate.net/publication/317932719_DESIGN_OF_AN_INTELLIGENT_SHOPPING_BASKET_USING_IoT
- https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9045336
- https://www.jetir.org/papers/JETIR1903933.pdf
- http://www.kresttechnology.com/krest-academic-projects/krest-major-projects/ECE/BTech%20MINI%20ECE%20EMBEDDED%202019/BTech%20MINI%20ECE%20EMBEDDED%20ABSTRACTS%202019/55.SMART%20SHOPPING%20CART%20INFO.docx
- https://www.youtube.com/watch?v=N8sdWydeZqs

10. Codes :

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <LiquidCrystal_I2C.h>
#include <Wire.h>
#include <SoftwareSerial.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);
SoftwareSerial SIM900(D6, D5); // RX, TX

const char* ssid = "SMART CART";
const char* password = "smart@cart123";

ESP8266WebServer server(80);

char input[12];
int count = 0;

int p1 = 0, p2 = 0, p3 = 0, p4 = 0;
int stock[4] = {5, 5, 5, 5}; // Initial stock levels for each product

double total = 0;
int count_prod = 0;

const String shopkeeperNumber = "+918905749182"; // Shopkeeper's phone number
const String customerNumber = "+916377474438";   // Customer's phone number

void setup() {
  pinMode(D3, INPUT_PULLUP);
  pinMode(D4, OUTPUT);

  Serial.begin(9600);
```

```
  SIM900.begin(9600);
  WiFi.begin(ssid, password);
  Wire.begin(D2, D1);
  lcd.begin();
  lcd.backlight();
  lcd.setCursor(0, 0);
  lcd.print("   WELCOME TO       ");
  lcd.setCursor(0, 1);
  lcd.print("   SMART CART       ");

  delay(2000);
  lcd.clear();

  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    lcd.setCursor(0, 0);
    lcd.print("WiFi Connecting...  ");
  }
  Serial.println(WiFi.localIP());
  lcd.setCursor(0, 0);
  lcd.print("WiFi Connected");
  lcd.setCursor(0, 1);
  lcd.print(WiFi.localIP());
  delay(1000);

  lcd.setCursor(0, 0);
  lcd.print(" PLZ ADD ITEMS     ");
  lcd.setCursor(0, 1);
  lcd.print("    TO CART          ");
```

```

  setupWebServer();

  server.begin();
}

void setupWebServer() {
  server.on("/", []() {
    bool autoRefresh = server.hasArg("autoRefresh") ? server.arg("autoRefresh") == "on" : false;
    String autoRefreshMetaTag = autoRefresh ? "<meta http-equiv='refresh' content='3'>" : "";
    String autoRefreshCheckbox = autoRefresh ? "checked" : "";

    String webpage = "<!DOCTYPE html><html lang='en'><head><meta charset='UTF-8'><title>Smart Shopping Cart</title>";
    webpage += autoRefreshMetaTag;
    webpage += "<style>body{font-family: 'Arial', sans-serif; background-color: #f0f0f0; color: #333;}";
    webpage += "table{width: 50%; margin: 20px auto; border-collapse: collapse;}";
    webpage += "th, td {border: 1px solid #ccc; padding: 10px; text-align: left;}";
    webpage += "th {background-color: #4CAF50; color: white;}";
    webpage += "tr:nth-child(even) {background-color: #f2f2f2;}";
    webpage += "button, .button {padding: 10px 20px; border: none; border-radius: 5px; cursor: pointer; display: inline-block;}";
    webpage += "button {background-color: #4CAF50; color: white; margin-right: 10px;}"; // Added margin for spacing between buttons
    webpage += ".slider {width: 40px; height: 20px; margin-left: 20px;}</style>"; // Added margin-left to space out the Auto Refresh checkbox
    webpage += "<script>function setAutoRefresh(checkbox) { var query = checkbox.checked ? '?autoRefresh=on' : '?autoRefresh=off'; window.location.search = query; }</script>";
    webpage += "</head><body>";
    webpage += "<h1 style='text-align:center;'>Smart Shopping Cart</h1>";
    webpage += "<table><tr><th>Item</th><th>Quantity</th><th>Price</th></tr>";
    webpage += "<tr><td>Biscuits</td><td>" + String(p1) + "</td><td>₹" + String(p1 * 35) + "</td></tr>";
    webpage += "<tr><td>Soap</td><td>" + String(p2) + "</td><td>₹" + String(p2 * 38) + "</td></tr>";
    webpage += "<tr><td>Rice (1KG)</td><td>" + String(p3) + "</td><td>₹" + String(p3 * 55) + "</td></tr>";
    webpage += "<tr><td>Tea (50g)</td><td>" + String(p4) + "</td><td>₹" + String(p4 * 45) + "</td></tr>";
```

```
  webpage += "<tr><td colspan='2'>Total</td><td>₹" + String(total) + "</td></tr></table>";
  webpage += "<div style='text-align:center;'>";
  webpage += "<button onclick=\"window.location.href='https://smart-cart-payment.netlify.app/'\">Proceed Payment of ₹" + String(total) + "</button>";
  webpage += "<button onclick=\"window.location.href='https://smart-cart-admin-login.netlify.app/'\">Admin Login</button>";
  webpage += "<label class='button' for='auto-refresh'>Auto Refresh:</label><input type='checkbox' id='auto-refresh' class='slider' " + autoRefreshCheckbox + " onclick='setAutoRefres
  webpage += "</div>";
  webpage += "</body></html>";
  server.send(200, "text/html", webpage);
 });
}

void loop() {
 int a = digitalRead(D3);
 if (Serial.available()) {
  count = 0;
  while (Serial.available() && count < 12) {
   input[count] = Serial.read();
   count++;
   delay(5);
  }
  if (count == 12) {
   if ((strncmp(input, "1F00500B4501", 12) == 0) && (a == 1)) {
    processItem("Biscuit", 35.00, 0, &p1);
   } else if ((strncmp(input, "1F004D159ED9", 12) == 0) && (a == 1)) {
    processItem("Soap", 38.00, 1, &p2);
   } else if ((strncmp(input, "1F004D5F2C21", 12) == 0) && (a == 1)) {
    processItem("Rice(1KG)", 55.00, 2, &p3);
   } else if ((strncmp(input, "1F004D542F29", 12) == 0) && (a == 1)) {
    processItem("Tea(50g)", 45.00, 3, &p4);
   } else if (strncmp(input, "54006DD99575", 12) == 0) {
    sendTotalSMSAndReset();
```

```
    }
   }
   updateCosts();
  }
  server.handleClient();
}

void processItem(String item, double price, int index, int *productCounter) {
  if (stock[index] > 0) {
   lcd.setCursor(0, 0);
   lcd.print(item + " Added");
   lcd.setCursor(0, 1);
   lcd.print("Price: Rs " + String(price));
   digitalWrite(D4, HIGH);
   delay(2000);
   (*productCounter)++;
   total += price;
   stock[index]--;
   digitalWrite(D4, LOW);
   lcd.clear();

   if (stock[index] == 0) {
    sendOutOfStockSMS(item);
   }
  } else {
   sendOutOfStockSMS(item);
```

```
  }
}

void sendOutOfStockSMS(String item) {
  sendSMS(shopkeeperNumber, item + " is out of stock!");
  lcd.setCursor(0, 0);
  lcd.print("   "+item.substring(0, 8)+"  ");
  lcd.setCursor(0, 1);
  lcd.print(" Out of Stock  ");
  delay(2000);
  lcd.clear();
}

void sendTotalSMSAndReset() {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Total Items: " + String(p1 + p2 + p3 + p4));
  delay(5000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("   Thank you        ");
  lcd.setCursor(0, 1);
  lcd.print("  for Shopping!        ");
  sendSMS(customerNumber, "Total bill: Rs" + String(total)); // Sending total bill to customer
  digitalWrite(D4, LOW);
  delay(2000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print(" PLZ ADD ITEMS     ");
  lcd.setCursor(0, 1);
```

```
  lcd.print("    TO CART          ");
  total = 0;
  stock[0] = stock[1] = stock[2] = stock[3] = 5;  // Resetting stock levels
  p1 = p2 = p3 = p4 = 0;  // Resetting product quantities
}

void updateCosts() {
  // Recalculating costs after any transaction
}

void sendSMS(String number, String message) {
  SIM900.print("AT+CMGF=1\r");
  delay(1000);
  SIM900.print("AT + CMGS = \"");
  SIM900.print(number);
  SIM900.println("\"");
  delay(1000);
  SIM900.println(message);
  delay(1000);
  SIM900.println((char)26);
  delay(1000);
  SIM900.println();
  delay(100);
}
```