SMART SHOPPING CART USING ESP

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Abstract - The Smart Shopping Cart is an innovative project that leverages the capabilities of the ESP32 microcontroller, along with various sensors and displays, to create a convenient and intelligent shopping experience. The system is designed to streamline the process of in-store shopping by automatically tracking and managing products as they are placed in the cart.
ESP32-CAM: The heart of the system, responsible for controlling other components and performing QR code scanning. Ultrasonic Sensor: Used for object detection, triggering the camera to scan QR codes on products when they are placed in the cart. Buzzer: Provides audible feedback to indicate successful QR code scans and other system events.
128x64 OLED Display: Displays product information, scan status, and other relevant data to the shopper.

Initialization: Upon starting, the ESP32-CAM connects to Wi-Fi and initializes the ultrasonic sensor, buzzer, and OLED display.
Object Detection: The ultrasonic sensor continuously measures the distance between the sensor and objects. When a product is placed in the cart, the sensor triggers the camera. QR Code Scanning: The ESP32-CAM camera scans the QR code on the product, extracting its information such as name, price, and other details.
Feedback: Upon successful QR code scanning, the buzzer provides an audible confirmation, and the OLED display shows product information and total cost.

Key Words: *Buzzer,ESP-32CAM, Ultrasonic Sensor, 128*64 OLED Display*

1.INTRODUCTION

The concept of a "Smart Shopping Cart" has gained significant attention in recent years, as it offers a potential solution to enhance the traditional shopping experience through automation and advanced technologies. This literature review explores relevant studies and developments in the field of smart shopping carts, with a focus on key components such as ESP 32 microcontrollers, sensors for human detection and tracking, RFID technology for product identification, and load cells for weight monitoring.

In a time marked by swift technological progress and a growing focus on convenience, the "Smart Shopping Cart" concept emerges as a novel solution to enhance the conventional shopping experience. This project signifies the amalgamation of advanced technologies and automation to create a shopping cart that actively trails customers, presenting a seamless and engaging shopping adventure. With ESP32 serving as the microcontroller and a suite of sensors, actuators, and display modules in its toolkit, this Smart Shopping Cart is poised to transform the shopping landscape.

The fundamental components of this endeavor comprise a DC motor for cart movement, IR and ultrasonic sensors to detect and follow humans, a motor driver IC for precise DC motor control, an RFID receiver for product recognition and automatic pricing, and a load cell for tracking cart weight. To ensure user-friendliness, the system integrates a display module that offers real-time feedback and information about the cart's status.

This introduction provides an overview of the Smart Shopping Cart project, shedding light on its pivotal features and functions. It outlines how each element contributes to an enhanced, efficient, and enjoyable shopping experience. From autonomous cart navigation to automated pricing and overload alerts, this project encompasses a wide range of capabilities, poised to redefine modern retail shopping.

2. LITERATURE REVIEW

• Title: Follow Me Smart Shopping Trolley
Authors: L.S.Y. Dehigaspege, A.S.M.A.P.B. Disanayake, D.M.A.S.C. Dissanayake, I.M.N.S. Iresha (2022)
Description: This paper presents a smart shopping cart that can follow the customer automatically using ultrasonic and IR sensors. The cart is equipped with two ultrasonic sensors at the front and two IR sensors at the back. The ultrasonic sensors are used to detect the

distance between the cart and the customer, while the IR sensors are used to detect the direction of the customer. The cart is controlled by an Arduino Uno microcontroller, which uses the sensor data to calculate the speed and direction of the cart.

• **Title: Smart Shopping Cart with Customer-oriented Service**

Authors: M.D.R. Abdeen, M.S. Islam, M.M.R. Khan, M.D.R. Islam, M.D.H.Bhuyan (2023)

Description: This paper describes a smart shopping cart that uses RFID tags and ZigBee communication to provide customer-oriented services. The cart is equipped with an RFID reader and a ZigBee module. When a customer places an item with an RFID tag in the cart, the RFID reader reads the tag and identifies the item. The cart then uses the ZigBee module to send the item information to the store's central billing system. This allows the customer to view their bill and pay for their items without having to go to a checkout counter.

• **Title: Development of Smart Shopping Carts with Arduino**

Authors: H.R. Patel, B.R. Patel, M.S. Patel (2022)

Description: This paper presents the development of smart shopping carts using Arduino. The cart is equipped with two DC motors, two IR sensors, and an ultrasonic sensor. The IR sensors are used to detect the direction of the customer, while the ultrasonic sensor is used to detect the distance between the cart and the customer. The cart is controlled by an Arduino Uno microcontroller, which uses the sensor data to calculate the speed and direction of the cart.

• **Title: Smart Shopping Cart with Automatic Billing System**

Authors: A.M. Patel, M.M. Patel, J.J. Patel (2022)

Description: This paper describes a smart shopping cart with an automatic billing system. The cart is equipped with an RFID reader and a barcode scanner. When a customer places an item with an RFID tag or barcode in the cart, the RFID reader or barcode scanner reads the tag or barcode and identifies the item. The cart then calculates the price of the item and adds it to the customer's bill. When the customer is ready to checkout, they can simply tap their credit card on the cart's payment terminal to pay for their items.

• **Title: Design and Implementation of a Smart Shopping Cart with Arduino**

Authors: S.S. Jadhav, S.S. Patil, S.A. Patil (2023)

Description: This paper presents the design and implementation of a smart shopping cart using Arduino. The cart is equipped with two DC motors, two IR sensors, and an ultrasonic sensor. The IR sensors are used to detect the direction of the customer, while the ultrasonic sensor is used to detect the distance between the cart and the customer.

The cart is also equipped with an RFID reader and a load cell. The RFID reader is used to identify the items placed in the cart, while the load cell is used to calculate the weight of the items in the cart. The cart is controlled by an Arduino Uno microcontroller, which uses the sensor data to calculate the speed and direction of the cart, as well as to keep track of the items in the cart and their prices.

3. SYSTEM ARCHITECTURE

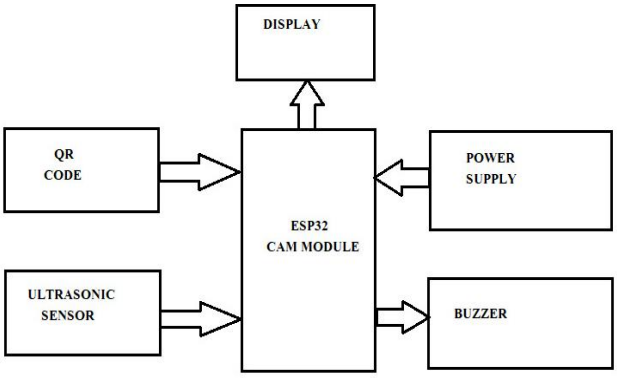


Fig:- System Architecture

4. PROCESS OF PROJECT

1. **Making qr for every product using Google sheets**

- Create a Google Sheet with a list of products. Each product should have its own unique QR code, which can be generated using the product's details such as product ID, name, and other necessary information.
- The QR codes can be generated within the Google Sheet using a QR code generator tool or a script.

2. **After turning on the system it will connect to the wifi**

- When the system (ESP32) is turned on, it will automatically connect to the Wi-Fi network using pre-configured credentials.
- Connecting to Wi-Fi allows the ESP32 to communicate with online resources and cloud-based data.

3. **When the qr show in front of esp cam the ultrasonic read the distance value nd enable camera**

- An ultrasonic sensor is used to read the distance between the sensor and any object (e.g., a product).
- When a product with a QR code comes within a certain distance of the ultrasonic sensor, the sensor will trigger the ESP32 camera.

4. Camera will scan QR and show acknowledgement on display.

- Once the ESP32 camera is enabled by the ultrasonic sensor, it will scan the QR code on the product.
- The QR code is read by the camera and interpreted to extract information about the product.

5. Similarly it will add product in product list which is available on a link and link is provided when the esp32 is connected to wifi.

- After the QR code is scanned and the product information is recognized, the system provides an acknowledgment, such as a visual or audible signal.
- The system may also display information about the product on a connected display for user confirmation.

5.COMPONENTS

1. Esp32 - cam

- The ESP32-CAM is a development board that combines an ESP32 microcontroller with a camera module.
- It can connect to Wi-Fi and perform tasks such as scanning QR codes using its camera.
- The board can also be programmed to handle the logic for the entire system, including controlling other components like the ultrasonic sensor, buzzer, and OLED display.

2. Ultrasonic sensor

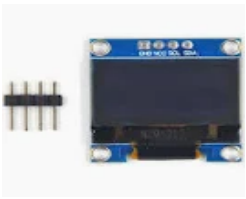
- The ultrasonic sensor measures the distance between itself and an object (e.g., a product with a QR code).
- When an object comes within a certain range (defined by your system), the sensor can trigger an action, such as activating the ESP32-CAM camera to scan a QR code.
- The sensor's readings are processed by the ESP32-CAM.

3. Buzzer

- A buzzer can provide audible feedback to indicate various system events, such as successful QR code scanning, errors, or other alerts.
- The ESP32-CAM can control the buzzer based on the system's logic, sounding the buzzer when certain conditions are met (e.g., when a QR code is successfully scanned).

4. 128*64 OLED display

- An OLED display with a resolution of 128x64 pixels can be used to show information such as QR code scan status, product details, or system status.
- The ESP32-CAM can send data to the OLED display to provide visual feedback to the user.
- For example, after scanning a QR code, the OLED display can show the product name, ID, or other relevant details.



System Workflow:

Initialization:

- The ESP32-CAM connects to the Wi-Fi network and initializes the components (ultrasonic sensor, buzzer, and OLED display).

Object Detection:

- The ultrasonic sensor continuously measures distance. When an object is detected within a predefined range, the system is alerted.

QR Code Scanning:

- The ESP32-CAM activates its camera to scan the QR code on the object.

- The ESP32-CAM processes the QR code and extracts product information.

Feedback and Display:

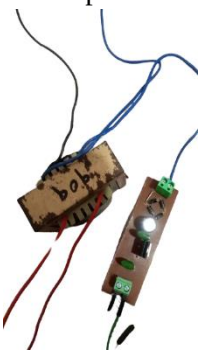
- If the QR code scan is successful, the system provides feedback through the buzzer and updates the OLED display with product information or system status.

Data Handling:

- The system can handle the scanned data as needed, such as sending it to an online database or updating a local list of products.

5Vpower supply

A 5V power supply is a common requirement for powering electronic devices and components such as microcontrollers, sensors, and displays. In the context of the Smart Shopping Cart project using ESP32, a reliable 5V power supply is essential for operating the system components effectively.



6.IMPLEMENTATION

Main Output

Implementing a smart shopping cart using ESP can be an exciting project that integrates various components such as an ESP32-CAM, ultrasonic sensor, buzzer, and OLED display. This project involves creating a shopping cart system that scans products using QR codes, provides user feedback through visual and audible cues, and tracks the products added to the cart.

Fig:- Output

Inventory Management

An inventory management system for a smart shopping cart using an ESP32 (or similar ESP device) can streamline the shopping process by providing real-time updates to the shopper and the store.

The system updates the inventory list as products are added or removed from the cart, keeping track of quantities and updating stock levels. the smart shopping cart system can streamline the shopping experience for customers, provide real-time inventory management, and potentially integrate with online shopping platforms for a unified retail experience.

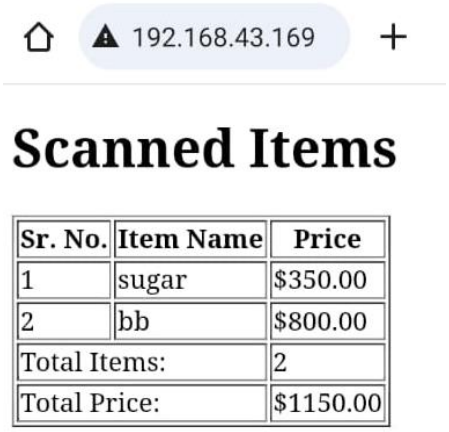


Fig:- Inventory Management

CONCLUSION

The Smart Shopping Cart using ESP technology presents an innovative and efficient approach to enhancing the shopping experience. By integrating components such as ESP32-CAM, ultrasonic sensors, buzzers, and OLED displays, the smart shopping cart streamlines various aspects of shopping and inventory management. This system offers several key benefits:

Automated Product Identification: The system's QR code scanning capability automates product identification, reducing the need for manual barcode scanning and improving checkout speed. Real-Time Inventory Management: By instantly capturing product data and updating inventory, the system provides accurate, real-time information for store owners and customers. Enhanced Shopping Experience: Visual and audible feedback through the OLED display and buzzer improves user interaction and provides a seamless shopping experience.

Improved Accuracy and Efficiency: Automated processes minimize human errors and improve efficiency in product tracking and inventory management. Scalability and Customization: The ESP32's flexibility and Wi-Fi connectivity allow for easy customization and scalability to suit various retail environments and business needs. Overall, the Smart Shopping Cart using ESP technology has the potential to revolutionize retail operations by offering a more streamlined, efficient, and user-friendly shopping experience. As the technology continues to evolve, smart shopping carts could become a standard feature in retail environments, offering both customers and retailers numerous advantages.

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