Smart Shopping Trolley with Chatbot

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Abstract **- The initiative known as "Smart Shopping Trolley with Chatbot" is an innovative project that aims to transform supermarket shopping. This project aims to introduce intelligence and innovation into the custom of grocery and other product shopping in an era where technological advancements are changing many aspects of our daily lives. Essentially, the "Smart Shopping Trolley with Chatbot" project presents a clever way to improve the grocery store shopping experience. With its many clever features, this state-of-the-art shopping trolley aims to simplify and improve the entire shopping experience. The ability of this cutting-edge trolley to automatically scan items as they are placed within it is one of itsmain features.**

Keywords - R F I D, ChatBot, Raspberry Pi Pico, LCD Display,Keyboard.

I. INTRODUCTION

In today's fast-paced world, where convenience and efficiency are paramount, the traditional shopping experiencehas been ripe for innovation. The project "Smart Shopping Trolley with Chatbot" introduces a cutting-edge solution designed to transform the way we shop in supermarkets. This innovative approach leverages modern technology to enhance every aspect of the shopping journey, from item selection to payment. Our Smart Shopping Trolley is not just a means to transport groceries; it's a sophisticated tool that seamlessly integrates intelligent features to elevate the overall shopping experience. Through this project, we aim to revolutionize the way consumers interact with supermarkets, making it more convenient, efficient, and enjoyable.

Key elements of this innovative trolley include the ability to scan items as they are placed inside, automatic bill generation, and streamlined payment facilities. These features eliminate the need for conventional checkout lines and offer shoppers a hassle-free and time-saving alternative. Customers can now enjoy a smoother, more efficient shopping experience, allowing them to focus on selecting the products they need while reducing the time spent waiting in line.

In this introduction, we will delve further into the details of the Smart Shopping Trolley project, exploring the technology behind it, the benefits it brings to both shoppers and retailers the potential it holds to shape the future of supermarket shopping. Additionally, we are interfacingchatbot in this project to enhance the interaction between users.

II. LITERATURE REVIEW

The smart trolley system, with its intricately designed components, seamlessly combines RFID technology, an advanced RFID reader, a user-friendly LCD screen, and wireless communication through a Wi-Fi module to create an efficient and versatile solution for real-time identification and tracking of items[2].

The RFID reader utilized in this system is specifically chosen for its compatibility with passive RFID tags, providing a cost-effective alternative to active tags. Passive tags do not require an internal power source and rely on the energy transmitted by the RFID reader for communication. This makes them ideal for applications where cost and power efficiency are paramount. The RFID reader is adept at initiating communication with tags within its coverage range, making it a reliable tool for identifying articles placed within the smart trolley[3].

Notably, the bidirectional communication capability of the RFID reader allows it not only to retrieve information from the RFID tags but also to write data back to the tags. This feature adds a layer of flexibility

to the system, enabling dynamic interactions with the RFID-tagged items. Forinstance, product details or status updates can be modified and updated directly on the tags, facilitating real-time data management[7].

To enhance the user interface and provide immediate feedback to users, a 16×2 LCD screen is integratedinto the system.

Connected to the Input/Output port of the ATMEGA328P chip, the LCD screen serves as a visual display for conveying information about the scanned RFID tags[8].

Furthermore, the user-friendly design of the LCD screen extends its utility beyond a mere display interface. With the ability to present graphics, the screen can enhance the shopping experience by providing visual aids such as product images, promotional content, or even a dynamic map of the store layout. This graphical feature adds an extra layer of engagement and convenience for users navigating through the shopping environment[1].

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The integration of a Wi-Fi module for communication between the RFID scanner and the Arduino Uno represents a technological leap in the smart trolley system. The wireless solution not only eliminates the constraints of physical cables but also allows for a more flexible and dynamic deployment of the system. Shoppers can move freely with their smart trolleys without being restricted by wired connections, enhancing the overall mobility and convenience of the system[4].

Real-time updates on inventory levels can be displayed on the LCD screen, providing both shoppers and store staff with accurate information. This functionality streamlines the checkout process, minimizes errors, and contributes to an optimized supply chain[5]. In conclusion, the smart trolley system, with its integration of RFID technology, bidirectional communication, LCD screen for user interaction, and wireless connectivity is positioned as a sophisticated and innovative solution. Beyond simplifying traditional shopping experiences, it offers a range of functionalities applicable to modern retail and logistics scenarios. The adaptability and efficiency of this system showcase its potential to revolutionize the way products are managed, tracked, and interacted with in various environments[10].

The proposed smart trolley in this paper evaluate the ability to integrate all components (reader + antennas + user interface) to the shopping cart itself at a lower cost and communicate through low-power Bluetooth (only uses 1/4 of power in contrast to Zigbee, hence increase battery life for the same cost) with kiosk[9].

III. PROPOSED METHODOLOGY

The "Smart Shopping Trolley with Chatbot" project introduces a groundbreaking shopping cart system leveraging the power of the Raspberry Pi Pico microcontroller to revolutionize the shopping experience. At the heart of the system, the Raspberry Pi Pico functions as the central processing unit, ensuring rapid and efficient data processing to facilitate a responsive and user-friendly interface.

Enhancing user interaction, the shopping cart is equipped with an LCD screen that displays crucial informationto the shopper. This interactive display not only provides real- time updates on selected items but also features an innovative "Chatbot" functionality. The Chatbot serves as an additional layer of communication, allowing users to interact with the cart, seek information about products, receive personalized recommendations, and address queries efficiently. This feature adds a unique and dynamic element to the shopping experience, elevating it beyond traditional cart functionalities.

To streamline the shopping process, the cart incorporates RFID readers and RFID tags. This technology allows customers to effortlessly scan items, keeping track of their selections as they navigate through the store. The RFID system not only enhances the speed of item identification but also contributes to a more convenient checkout process, reducing waiting times for customers. The amalgamation of technology and security features in this innovative shopping trolley presents a promising solution for modern retail environments. By combining efficient data processing, user-friendly interaction through the LCD screen and Chatbot, and advanced security measures, this smart trolley is

designed to provide shoppers with a seamless, efficient, and safe shopping experience. It reflects a forward-thinking approach to retail technology, showcasing the potential for enhanced customer engagement and security in the rapidly evolving landscape of modern retail.

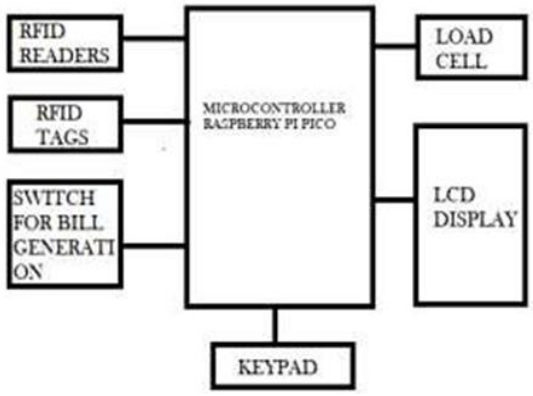

Figure 1. Schematic Diagram of The Smart Shopping Trolley with Chatbot

Raspberry Pi Pico

The Raspberry Pi Pico is a microcontroller board developed by the Raspberry Pi Foundation, known for its popular single-board computers. Launched in January 2021, the Pico stands out as a versatile and cost-effective entryinto the world of microcontrollers. At its core is the Raspberry Pi-designed RP2040 microcontroller chip, featuring a dual-core ARM Cortex-M0+ processor clocked at 133MHz. This powerful yet energy-efficient chip makes the Pico suitable for a wide range of embedded applications.

With a focus on accessibility, the Raspberry Pi Pico is priced competitively, making it an attractive option for both beginners and experienced developers. It boasts 26 GPIO (General Purpose Input/Output) pins, enabling a myriad of digital and analog interfacing possibilities. The Pico supports MicroPython and C programming languages, providing flexibility for developers to choose their preferred coding environment.

One of the notable features of the Raspberry Pi Pico is its Programmable Input/Output (PIO) subsystem, allowing for high-speed parallel I/O operations. This capability makes it particularly suitable for applications requiring precise timing and control, such as motor control and communication protocols.

The Pico is equipped with USB connectivity for both power and data transfer, making it easy to integrate into various projects. Its compact form factor and availability of a software development kit (SDK) contribute to its versatility in creating projects ranging from simple LED blinkers to complex embedded systems.

In summary, the Raspberry Pi Pico is a powerful yet affordable microcontroller, offering a gateway for enthusiasts and professionals to explore and create a diverse range of embedded projects with ease.

A. Keypad

A matrix keypad is a user input device that consistsof a set of keys arranged in rows and columns, forming a grid or matrix. It is commonly used in electronic devices and embedded systems where manual input is required. Each key on the matrix is uniquely identified by its intersection point between a specific row and column.

The matrix keypad employs a scanning technique to detect key presses. When a key is pressed, it creates a connection between the corresponding row and column. The microcontroller or embedded system connected to the keypad uses a scanning algorithm to identify the activated key by sequentially scanning each row and column pair.

Matrix keypads are popular for their compact design, cost-effectiveness, and simplicity. They find applications in a variety of electronic devices, such as security systems, electronic door locks, calculators, and industrial control panels. Their versatility makes them suitable for projects where a limited number of input options are required, and their matrix configuration enables the implementation of a wide range of functions within a compact form factor.

B. LCD Display

An LCD (Liquid Crystal Display) is a flat-panel technology that uses liquid crystals to modulate light and produce images or text. LCDs have become ubiquitous in various electronic devices, ranging from computer monitors and televisions to digital clocks, appliances, and handheld devices. LCDs consist of multiple layers, including two layers of glass with a liquid crystal solution sandwiched in between. The liquid crystals can be manipulated to control the passage of light through the layers. The display is divided into pixels, and each pixel comprises three subpixels, typically representing red, green, and blue

colors. By adjusting the alignment of liquid crystals in each subpixel, the display can produce a wide spectrum of colors.

One of the key advantages of LCD technology is its ability to create sharp and clear images with high resolution. Additionally, LCDs are known for their energy efficiency, especially in comparison to older display technologies like cathode-ray tube (CRT) displays. LCDs find extensive use in consumer electronics due to their lightweight design, thin profile, and versatility. They offer excellent viewing angles and are capable of displaying content in various lighting conditions. Touchscreen functionality is often integrated into LCDs, enhancing their usability in smartphones, tablets, and interactive devices.

In summary, LCDs have become the cornerstone of modern visual technology, providing crisp and vibrant visuals across a wide array of electronic devices and serving as a fundamental component in our daily interactions withtechnology.

C. RFID Scanner and Tags

An RFID (Radio-Frequency Identification) scanner and tags constitute a wireless technology for identifying, tracking, and managing objects

The scanner emits radio-frequency waves, and when an RFID tag, is embedded with a unique identifier and enters its range, it responds by transmitting information back to the scanner.

The tags come in different forms, including passive (drawing power from the scanner) and active (containing their power source), catering to diverse operational requirements.

D. Load Cell

A load cell is a transducer that converts force or load into an electrical signal. It is a critical component in measuring weight, force, or tension in various applications. Load cells are commonly used in industrial settings, scales, and weighing systems.

The device typically consists of a metal structure with strain gauges that deform under applied force, causinga change in electrical resistance. This change is then converted into an electrical signal proportional to the applied force. Load cells provide accurate and reliable measurements, playing a pivotal role in diverse fields, including manufacturing, logistics, and research, where precise weight or force measurements are essential.

E. Raspberry Pi OS

The Raspberry Pi OS, formerly known as Raspbian, is the official operating system developed for the Raspberry Pi single-board computers. Designed to optimize the capabilities of Raspberry Pi hardware, the OS is based on the Debian Linux distribution. It offers a user-friendly interface and comes pre-loaded with essential applications, making it accessible for beginners while providing flexibility for advanced users.

Raspberry Pi OS supports a wide range of programming languages, making it an ideal platform for educational purposes and DIY projects.

It includes a desktop environment, web browser, office suite, and programming tools, ensuring a comprehensive computing experience. The OS is regularly updated to incorporate improvements and security patches.

The OS's compatibility with a vast array of software and peripherals, coupled with its continuous development and community support makes it a versatile and robust choice for various applications, including home automation, media centers, and educational projects, harnessing the full potential of Raspberry Pi hardware.

IV. RESULT

An RFID scanner reads product tags to generate a bill, and a keyboard interacts with the trolley. A load cell prevents theft by displaying the total weight and bill on an LCD. The Raspberry Pi Pico controls the entire system.

Figure 4. RFID Scanner Output

V. CONCLUSION

The "Smart Shopping Trolley with Chatbot" project utilizes RFID scanning to track products, a keyboard for user interaction, and a load cell to prevent theft by displaying weight and bills on an LCD. Controlled by a Raspberry Pi Pico, it efficiently streamlines shopping experiences, enhancing convenience and security for users.

ACKNOWLEDGMENT

We would like to show our gratitude to the Department of ECE, Paavai Engineering College, and thank our guide for hersupport and contribution and we sincerely thank our parents.

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