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Smart Shopping Trolley with Automated Billing Using Arduino

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ABSTRACT

The Smart Shopping Trolley with Automated Billing using Arduino is an innovative system designed [1] to enhance the shopping experience by reducing checkout time and efficiency improving. This project integrates RFID technology, load sensors, and Arduino microcontrollers to automate the billing process within the trolley itself. Each product in the store is equipped with an RFID tag, and as customers place items in the trolley, an RFID reader detects and records the product details. A display screen on the trolley shows the total cost in real time, allowing customers [2] to monitor their expenses. Additionally, a load sensor helps verify product placement and prevents fraud. Upon completing the shopping, customers can directly pay through a mobile application or an integrated payment gateway, eliminating the need to wait in long checkout queues. This system enhances convenience, minimizes human errors in billing, and streamlines the retail experience. By integrating IoT [3] and automation, the smart shopping trolley offers a futuristic approach to retail management, reducing operational costs for stores and providing a seamless shopping experience for consumers.

Keywords— RFID module , Arduino , LCD display

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I.INTRODUCTION

Shopping at supermarkets often leads to long queues at the billing counters, causing inconvenience for customers. The traditional checkout process involves manually scanning each product, which is time-consuming and prone to human errors. To overcome these challenges, the Smart Shopping Trolley with Automated Billing using Arduino is designed [1] to simplify and speed up the shopping experience.

This system uses RFID (Radio Frequency Identification) technology and an Arduino microcontroller to enable automated product detection and billing. Each product in the store is equipped with an RFID tag, and as customers [2] place items into the trolley, an RFID reader scans and records the product details. A display screen on the trolley continuously updates and shows the total bill, allowing customers to monitor their purchases in real time. Once shopping is complete, the final bill can be generated instantly, reducing the need for manual scanning at checkout.

By integrating automation into the shopping process, the smart trolley improves efficiency for both customers and retailers while eliminating the need for complex IOT-based [3] connectivity

.II. PROBLEM STATEMENT

This solution significantly reduces waiting time at billing counters, minimizes human errors, and enhances the shopping experience. By integrating automation into the shopping process, the smart trolley improves efficiency for both customers and retailers while eliminating the need for complex IoT-based connectivity.

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1. Minimize customer wait time by automating the checkout process.
2. Increase accuracy in billing by automating theproduct identification and price calculation
3. Provide better security by integrating automatic detection systems that flag items not scanned correctly...

III. METHODOLOGY

The methodology for the Smart Shopping Trolley with Automated Billing involves using an Arduino [1] microcontroller to integrate various components like an RFID reader, LCD display, and a buzzer. The RFID reader scans the unique tags on products as they are placed in the trolley, transmitting the product data (such as ID and price) to the Arduino. The Arduino processes this information and updates the total bill, which is displayed on the LCD

screen in real time. Additionally, the system provides audible alerts via the buzzer for unscanned items or errors. This automated process eliminates the need for manual scanning, offering an efficient and seamless shopping experience.

BLOCK DIAGRAM

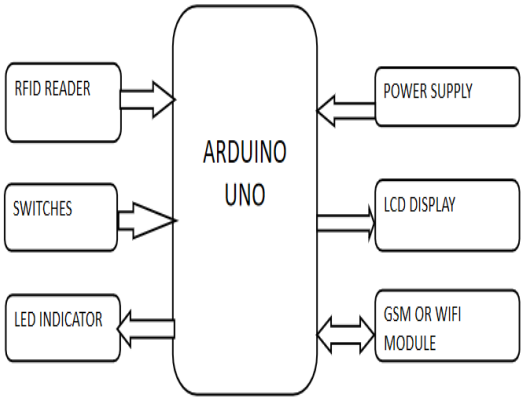

Fig-1: Block Diagram

IV. COMPONENTS USED

A.ARDUINO UNO:

The Arduino UNO is a widely used open-source microcontroller board based on the Microchip AT mega 328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/ output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board features 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a type BUS B cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases.

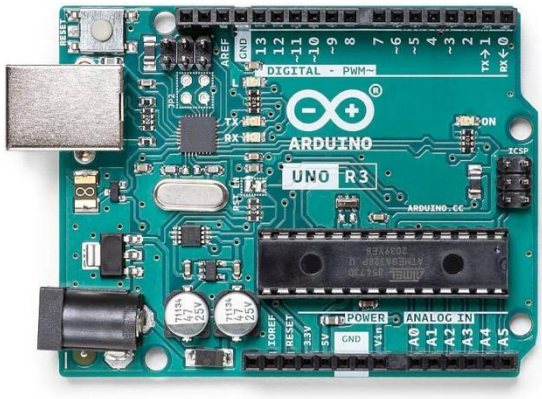

Fig-2: Arduino UNO

B.RFID READER

An RFID (Radio Frequency Identification) reader is a critical component in the smart shopping trolley system. It is responsible for scanning the RFID tags attached to products, which contain unique information such as product ID, price, and description. The RFID reader sends this information to the Arduino, which processes it to update the bill and display the details to the user.

In the context of the smart shopping trolley, the RFID reader allows products to be automatically scanned as they are added to the trolley, eliminating the need for manual barcode scanning.

Fig-3: RFID Reader

C.LCD DISPLAY

An LCD (Liquid Crystal Display) is a crucial component in a Smart Shopping Trolley system, providing real-time visual feedback to the user. It is used to display product information, pricing details, the running total of the bill, and any error alerts.

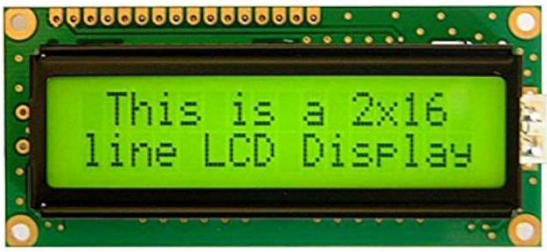

Fig-4: LCD Display

D.BUZZER

A buzzer in the smart shopping trolley with automated billing system is used to alert the user about certain events or errors, such as an unscanned item or weight mismatch. The buzzer provides an audible feedback signal that can inform customers about the status of the scanning process or when there's an issue with the system.

Fig-5: Buzzer

E.SERVO MOTOR:

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal representing the desired position of the output shaft. The motor is paired with some type of position encoder to provide position feedback. The controller compares the measured position with the desired position to generate an error signal, which when fed back causes the motor to rotate in the direction needed to bring the shaft to the desired position. The error signal reduces to zero as the desired position is approached, stopping the motor.

Fig-6: Servo Motor

CONCLUSION:

The methodology for developing a Smart Shopping Trolley with Automated Billing using Arduino [1] focuses on integrating various hardware components, software logic, and error detection systems to create an efficient and user-friendly shopping experience. Through rigorous testing and integration, the final system aims to streamline the shopping and checkout process, ultimately enhancing the customer experience and reducing human errors.

RESULT

The Smart Shopping Trolley with Automated Billing Using Arduino successfully streamlines the shopping process by using an RFID reader to automatically scan products, an Arduino to process the data, and an LCD display to show the real-time total bill. As products are added to the trolley, the RFID tags are scanned, the price is updated on the display, and the system provides immediate feedback to the user through both visual and audible alerts. This automation reduces manual errors, improves checkout efficiency, and enhances the overall user experience.

Despite challenges such as limited RFID range and potential interference from materials like metal, the system proves effective in simplifying the shopping process.

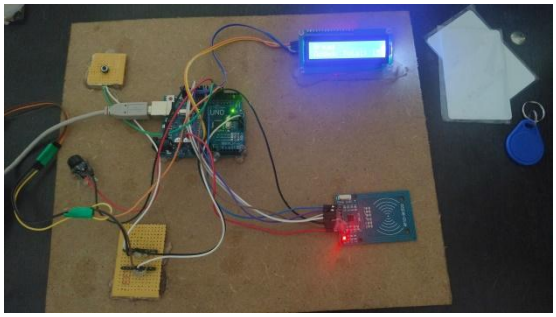

Fig-7: Complete Project kit

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