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IoT Based Smart Cart with Automatic Billing and Anti-Theft

Vudimudi Lakshmi Satyanjali Devi [1], Shaik Saif ahmed [2], Syed Anasuddin Khadri [3]

Assistant professor Mr. Najeemulla Baig

Student,Department of Electronics and Communication Engineering, Lords Institute of Engineering and Technology

Assistant professor,Department of Electronics and Communication Engineering, Lords Institute of Engineering and Technology,Hyderabad,Telangana,India-500091.

Abstract

Shopping involves getting tired due to standing in a long queue for the bill and payment process. Hence, Automatic Shopping Cart is designed with Instant Billing and Theft Protection. The main goal is to provide a technology oriented, low-cost, easy and rugged system for aiding shopping in person. The automatic shopping cart will reduce the time and effort of the customer there by helping the customers walk straight away into the shop, purchase products and walkout of the shop. We call it “IOT BASED SMART CART WITH AUTOMATIC BILLING AND ANTI-THEFT”

Introduction

The Internet of Things (IoT) based Smart Cart with Automatic Billing and Anti-Theft is a technological solution that integrates smart technologies with traditional shopping cart. In order to realize this, a RFID reader and an LCD screen are attached to the cart. The RFID reader scans the RFID tag on the item when it is placed near the RFID reader where the item details will be displayed on the LCD screen. In this way the cost and weight of the item gets added to the bill. A weight sensor is installed on the smart cart weighing the items. At the time of checkout, if the added weight to fall items is equal to total weight to the cart, then it is concluded that no theft is detected and the shopper can proceed with the final checkout. In case of theft, extra unaccounted weight will be detected and a buzzer is activated.

In this way, a security check is implemented. In case, if a customer changes their mind and does not want any product added in the cart, they can remove it and the price added will be deducted automatically. When a customer finishes shopping, they pay at the checkout point using the generated billing information and the bill is sent as a Telegram message to the customer's phone number.

Hence this system is suitable for use in places such as supermarkets, where it can help reducing work force and increasing better shopping experience for customers. The IoT based

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Smart Cart with Automatic Billing and Anti-Theft is a revolutionary technology that can improve the shopping experience, prevent theft, and provide valuable insights to retailers.

Literature Review

Janhvi Iyer et al. [1] proposed a system where each and every product has an RFID tag instead of a barcode scanner. The smart trolley will contain RFID reader, LCD display and Zigbee transmitter. When a person put any product in a trolley it will scan the product and the cost and name of the product will be displayed. RFID (radio frequency identification) automatically identifies and track tags attached to the objects. All the products have to be connected with RFID tags. The tags are read in any orientation and accuracy of the reading is more. It reads many tags at a time and the precision is more. In the shopping, trolley items can be read without a necessity to maintain a clear line of sight.

P. Chandrasekar et al. [2] the authors have presented their idea in which each commodity in a mall will be attached with an RFID tag and each trolley will be attached with an RFID reader which would be working on the ZigBee wireless module. A centralized system is present for any help and queries and for the billing transaction of the products by the customers. Even the exit gates of the mall are laced up with the RFID readers for detecting any theft. However, there is no user interface and hence it is not a user-friendly system.

Ankush Yewatkar et al. [3] proposed Smart Cart with Automatic Billing, Product Information, Product recommendation Using RFID & Zigbee with Anti- Theft system This smart shopping cart system keeps the track of all purchased products using RFID & Zigbee. For final billing, online transactions are recommended. The system also gives suggestions to the shopper with the help of the centralized system about offers/discounts based on the purchase history of a shopper with the help of a centralized system. One of the important feature this system introduced for anti-theft by attaching an RFID reader at the exit door.

Sainath et al. [4] proposed the automated shopping trolley for a supermarket billing system with barcode for billing of products, where customer scans the product using barcode technology.

The bill will be forwarded to the central billing system where the customer will pay them by showing a unique id. The limitation of barcode scanning requires line of sight for scanning and it should be fixed within its boundary.

Raju Kumar et al. [5] proposed an Intelligent Shopping Cart system. It consists of three modules- Server Communication Component for connection of the shopping cart with the main server, User Interface and Display Component to provide the user interface, and Automatic Billing Component handles billing section.

Udita Gangwal et al. [6] proposed a Smart Shopping Cart for Automated Billing Purpose using Wireless Sensor Networks. This system used WSN combined with a highly reliable Image Processing technique to automate the entire billing process and to reduce the entire

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communication requires only one Passive sensor (load-cell) is used.

G.S.Rajagopal et al. [7] proposed a Smart Intelligent System for Shopping and Billing. In this paper smart shopping cart equipped with RFID tags is considered, to verify the purchase details. Centralized billing system to automatically bill the shopper for the purchases.

Anjali Verma et al. [8] proposed RFID based Smart Multitasking Shopping Trolley System. The proposed system evaluates many strategies to assist shopper to minimize the overall shopping time required in the mall. This system also provides real-time updates based on the inventory to the store management.

Mohit Kumar et al. [9] proposed a Smart Trolley with Instant Billing to Ease Queues at Shopping Malls using ARM7 LPC2148: A review. It is smart & faster-embedded billing system by interfacing RFID and ZIGBEE module with themicrocontroller.

Mr.Yathisha L et al. [10] proposed "Automation of Shopping Cart To Ease Queue in Malls By Using RFID". In the proposed system RFID tags are used instead of barcode readers to scan product price and that is displayed on the LCD. For communication Zigbee transmitter & receiver is used at trolley & central computer respectively.

Proposed System

In the proposed system, the main objective of this project is to reduce and eliminate time taken in billing counter in super markets by designing a project called “Smart shopping with automated billing and theft detection”. The innovative project consists of an automated billing system which can be placed within the shopping trolley. This automated payment system consists of a RFID reader which is controlled by Microcontroller which is ESP32. So, whenever the shopper puts any product in trolley it is detected by the RFID module and is displayed on LCD along with the price of the product. To avoid the theft we are using weight sensor for detecting any theft which solves problem of shop lifters.

Block Diagram

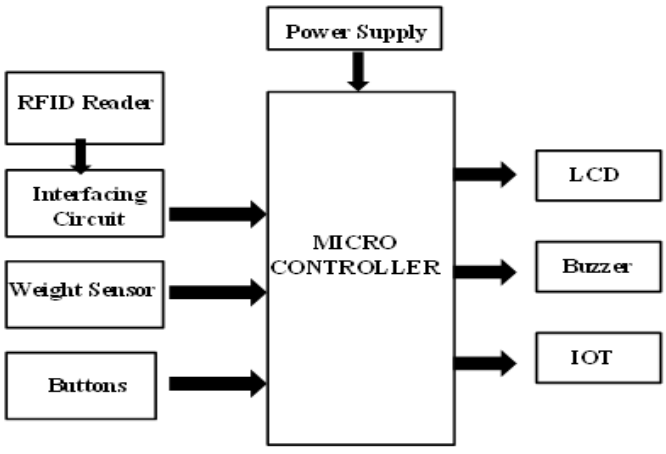

Figure 1.Block Daigram of IOT based smart cart with automatic billing and anti-theft.

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Hardware Components

Power Supply

The power supply section is the section which provides +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.The ac voltage, typically 220V, is connected to a transformer, which steps down the ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

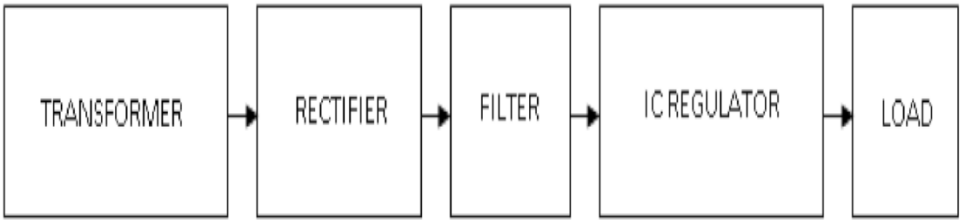

Figure 2. Block diagram of power supply

Esp32 Module

The ESP32 module is a low-cost, low-power system-on-chip (SoC) microcontroller with integrated Wi-Fi and Bluetooth capabilities. It is manufactured by Espressif Systems, and is designed for use in a variety of applications, including Internet of Things (IoT) devices, wearable electronics, and other embedded systems. The ESP32 module features dual-core processors running at up to 240 MHz, as well as a variety of built-in peripherals, including touch sensors, analog-to-digital converters, and pulse width modulation (PWM) controllers. It also includes support for a wide range of communication protocols, including Wi-Fi, Bluetooth, and Ethernet.

Figure 3. Esp32 Module

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RFID Reader

An RFID (Radio Frequency Identification) reader is a device that is used to read and write RFID tags. RFID technology uses radio waves to communicate between the reader and the tag, which contains a small integrated circuit and an antenna. The RFID reader sends a radio signal to the tag, which powers the tag and allows it to transmit its unique identification number back to the reader.

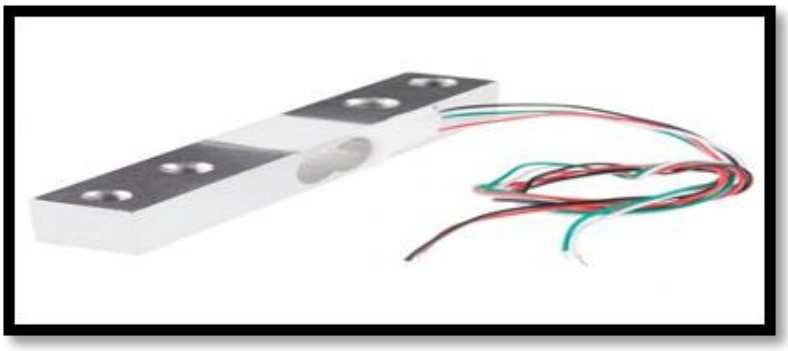

Figure 4. RFID Reader

LCD (liquid crysal display)

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 charachers, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers. Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

Figure 4.LCD type HD44780 pin diagram

Weight Sensor

Weight sensors, also known as load cells, are electronic devices that measure the weight or force of an object.The principle of operation of weight sensors is based on the deformation of a material, usually a metal, when a load is applied to it. The deformation results in a

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change in resistance, capacitance, or another electrical property of the sensor, which can be measured and converted into a weight value.

Figure 5. Weight Sensor

Buzzer

A buzzer is an electronic device that produces a sound or tone when an electrical current is passed through it. It consists of a small electromechanical component called a piezo buzzer that converts electrical energy into sound energy.

Figure 6.Buzzer

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Result

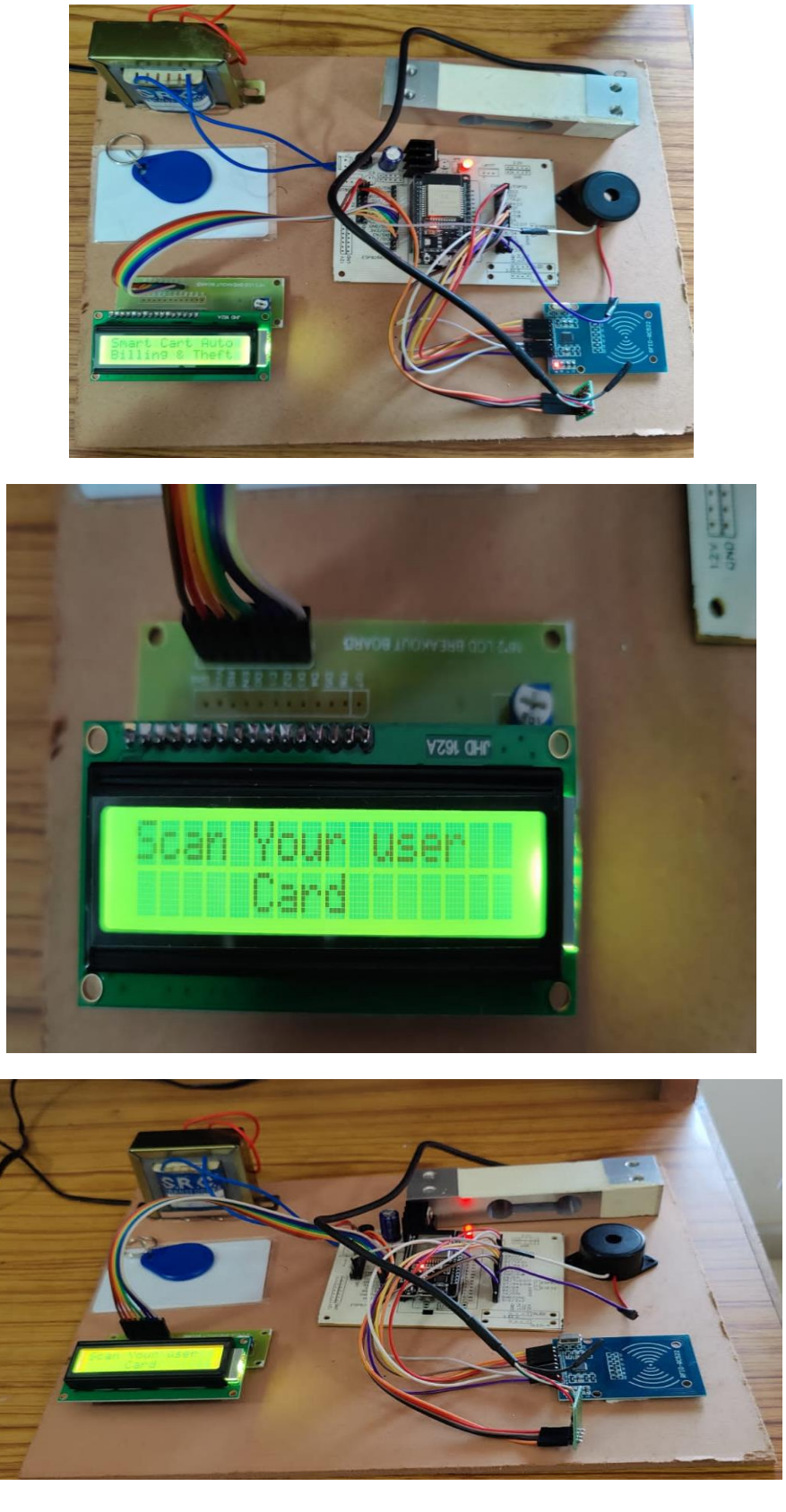

Figure 7. Hardware kit

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Conclusion and Future Scope

The project **"IOT BASED SMART CART WITH AUTOMATIC BILLING AND ANTI-THEFT"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

- Integration with artificial intelligence.
- Augmented Reality.
- Personalized marketing
- Mobile Payment Integration
- Machine learning for anti-theft:
- Block chain integration

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