

Revolutionizing shopping with Smart trolley intelligence

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ABSTRACT - In this modern world, people are more attracted to buy groceries from the Supermarket/Hypermarket but they need to wait in queue for long time for billing and paying. To overcome this issue, this project is developed. Trolley is attached with RFID reader, LCD, IR sensor, HC-SR 04, DC motor, ESP-8266 and Arduino UNO. RFID module detects the products using specified RFID tags of the particular product. After completion of the product selection the details of product we chosen and the total price is displayed on LCD display. Then, the total amount displayed on the LCD is forwarded to the bill counter. The customer can pay their bills in either online or offline Payment. This flexibility is not provided by existing trolley. By this project customers do not want to wait for long time to pay their bills and it is automatically movable. The main aim to reduce the long queues and make the whole process hassle-free for the customers in efficient shopping experience through smart trolley with RF Reader.

Index Terms: Smart trolley Integration, Self-Shopping, Queue free shopping Sensor Control, Real-time Implementation, Blynk Platform, Innovation.

I. INTRODUCTION

In this era of multiplexes and malls, normally we face huge rushes and crowds while we go shopping. The purpose of this innovation is to improve upon the conventional method of shopping by making it simple and fast. People generally spend much of their time shopping. So, we need to make this shopping process simpler and more efficient. A shopping complex is a place where we can find everything from household groceries to heavy machinery, and so on. Nowadays, everyone is busy. People don't want to waste their precious time queuing behind the billing counters; instead, they want to utilize this time on some other important work. While shopping, the trolley plays an important role in carrying all the items. After selecting all the items, we go to the billing counter and have to wait in a long queue for our turn. Shopping Nowadays, shopping can be done in two ways: online shopping and offline shopping. Online shopping does not require us to go to the shopping complex. We just tap 2 or 3 buttons on our mobile, and it is done. In offline shopping, we have to go to a shopping complex and collect all the items we need. At shopping complexes, we see a huge crowd at the counter, and it is one of the reasons why people prefer online shopping more. To reduce or eliminate this problem, we need an electric trolley. which is similar to the regular trolley but with a more advanced function embedded in it. A smart trolley, also known as an electric shopping cart or electric grocery cart, can be controlled using an ESP-8266 and an Arduino microcontroller. RFID readers are utilized for scanning the products. and to read the amount and other details of the product. The total amount calculated by the RFID reader and the product chosen were displayed on the LCD. Customers can search for product details. by using the QR code in the trolley. In this trolley, hand-free moving with the sense of customer is possible with an ultrasonic sensor, IR sensor, and servo motor for 360 degrees of movement. The product added by the customer which is indicated by a green light, and products are removed from the trolley with the indication of a red light. By using this smart trolley, the queue timing of the customers was reduced, and it also minimized the billing process of the shopping malls. The smart trolley is a more efficient and cost-effective solution for both customers and retailers, which allows them to reduce costs associated with traditional shopping.

II. LITERATURE SURVEY

Technological developments in smart trolley systems have prompted the creation of novel solutions aimed at tackling particular issues in the retail industry. Dhiraj Thote, Dr. Punit Fulzele, Rajas Nimishe, Manjeet Thakur, Shantanu Khasale, Parth Chinchalkar- Modern E-Trolley For Goods Purchase With Inventory Management Using Android Application ,2022. While conventional retail will always be popular, one issue that consumers will always have to standing in long lines. Customers lose a great deal of time as a result, which prompts innovation to be added to the current system. The current shopping system will be enhanced by this suggested paradigm. An Android application and Arduino have built a Bluetooth connection in this E-trolley. The user can scan a product's barcode with an Arduino-connected barcode scanner, and the application will display the product's data. Further, this data will be shared in the database and after that user will be able to make payment through any online payment mode. Following a successful payment, the stock data that is currently stored in the database will be updated. The primary goal of

the suggested solution is to shorten lengthy lines and simplify the procedure for clients, both of which would increase the store's profitability.

Jaishree.M, Lakshmi prabha.K.R, Jeyaprabha.S Mohan.K,- Smart Shopping Trolley Using IOT,January-2021.With the improvement of wi-fi generation there are numerous fields in which we are able to utilize the generation and utilize of wi-fi generation is beneficial right now. In this article, we share our thoughts on an automated shopping cart that combines an LCD, a bar code scanner, and a Raspberry Pi. Since we all know that during income and vacation seasons, we tend to shop at supermarkets in a rush, which makes billing more time-consuming and makes it impossible for customers to wait in line for too long. In this situation, we can use an automated shopping cart that has an LCD, a Raspberry Pi device, and a barcode reader. With the help of this trolley, the customer will assemble the invoice and conduct a self-experiment with the product. As a result, there might not be a long line at the grocery store's billing counter for billing reasons. Keywords: load cell, LCD, barcode scanner, smart trolley, and Raspberry Pi tool.

M.Kabil Dev, R.Kannan, M.Agarshan, S.Karthik, Dr. K.Lakshmi- Automated Billing Smart Trolley and Stock Monitoring,March-2021.All individuals in the present world like using high-tech gadgets. Individuals prefer not to squander time and effort by employing traditional methods. Instead, they favor cutting-edge, intelligent technology that are automated and quick to complete tasks. One of these cutting-edge tools is the smart trolley, which offers greater flexibility and a fast, hassle-free shopping experience. Consumers don't want to have to wait around for a long period to pay their bills. Depending on the customer, payment is made either offline or online after the purchase is completed. The Smart trolley is recommended as a solution to this. The RFID reader and tag, Wi-Fi module, Arduino UNO, and newly built smart trolley are all included. In addition to this payment function, the admin can see stock details using the smart trolley. Without requiring any additional manual labor, the supply of each product may be tracked and scheduled appropriately.

S.K. Shankar, S Balasubramani, S Akbar Basha, Sd Ariz Ahamed, N Suneel Kumar Reddy- Smart Trolley for Smart Shopping with an Advance Billing System using IoT, April-2021.Currently, supermarkets and hypermarkets are the places where consumers are most drawn to purchase groceries. In this scenario, it takes longer to locate a customer's basic needs at a supermarket, and once those needs are met, the customer must wait in line to finish the payment process for the item they have chosen. Customers are currently severely urged to keep social distance owing to the COVID-19 epidemic, but in practice this is impossible, particularly during the invoicing process.

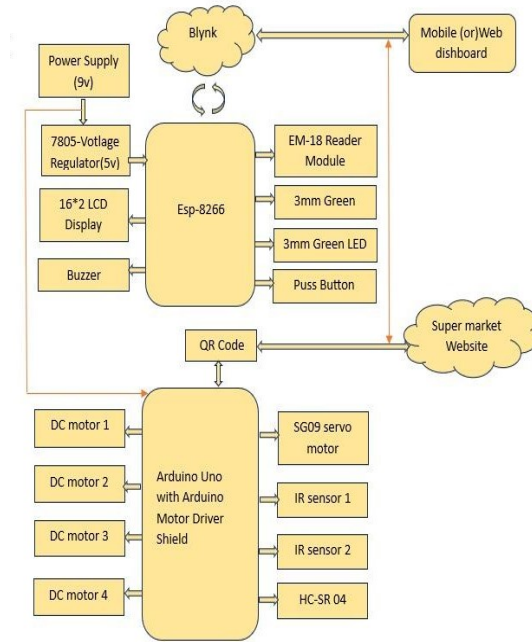
III. EXISTING SYSTEM

The system includes RFID readers in all the trolley and RFID tags in all product in the mall. As a customer adds product to their trolley, the product details and price are automatically added to the bill stored in the trolley's memory. If a product is removed, the cost is deducted from the bill. The total number of items and cost are displayed on an LCD screen. The system also sends the bill and product details to a local server for inventory management purposes, which can be accessed through an app using Wi-Fi.

IV. PROPOSED SYSTEM

A smart trolley is an automated system used in the supermarkets or shopping centers to help customers carry their groceries while they shop. It typically consists of a trolley equipped with an RFID (Radio Frequency Identification) reader and microcontroller that controls the system. RFID technology allows for the wireless identification of objects using electromagnetic fields. Each item in the supermarket is tagged with a small RFID tag that contains a unique identifier. When a customer places an item in the e-trolley, the RFID reader scans the tag and sends the information to the Arduino board. The ESP-8266 processes the data and keeps track of the items in the trolley. It also calculates the total cost of the items and displays it on an LCD screen. The customer can easily see the total cost and make adjustments to their shopping as needed. One of the advantages of using an RFID-based smart trolley system is that it reduces the need for manual scanning and checkout, saving time and reducing errors. Additionally, the system can provide valuable data on shopping patterns and item popularity, which can be used for inventory management and marketing purposes.

SYSTEM ARCHITECTURE



A.Arduino UNO

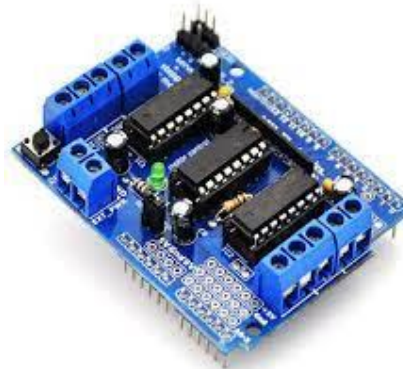


Figure 1. Arduino UNO

The Arduino Motor Shield is based on the L298 ([datasheet](#)), which is a dual full-bridge driver designed to drive inductive loads such as relays, solenoids, and DC stepping motors. It let you drive two DC motors with your Arduino board, controlling the speed and direction of each one independently. You can also measure the motor current absorption of each motor, among other features. The shield is TinkerKitt compatible, which means you can quickly create projects by plugging the TinkerKit modules board.

A. ESP-8266



Figure 2. ESP-8266

The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking and the form of software, and microcontroller capability, produced by Espressif systems in Shanghai, China. The chip was popularized in

the English-speaking maker community in August 2014 via the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allow microcontroller to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

B.LCD



Figure 3. LCD

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. Those display are mainly preferred for multi-segments light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simple programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc. A 16x2 LCD has two registers like data register and a command register. The RS (register select) is mainly used to change one register to another. When the register set is '0', then it is known as a command register. Similarly, when the register set is '1', then it is known as a data register.

C.7805-Voltage Regulator

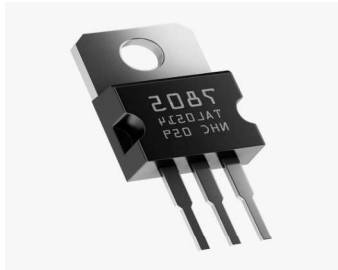


Figure 4. 7805-Voltage Regulator

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for varied input voltage. In our case, the 7805 IC is an iconic regulator IC that find its application in most of the projects. The name 7805 signifies two meanings, "78" means that it is a positive voltage regulator, and, "05" means that it provides 5V as output. So our 7805 will provide a +5V output voltage. The output current of this IC can go up to 1.5A. however, the IC suffers from heavy heat loss hence a heat sink is recommended for projects that consume more current. For example, if the input voltage is 12V and you are consuming 1A, then $(12-5) * 1 = 7W$. This 7 Watts will be dissipated as heat.

D.Buzzer



Figure 5. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, training, and confirmation of user input such as a mouse click. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, training, and confirmation of user input such as a mouse click or keystroke.

E.IR Sensor



Figure 6. IR Sensor

IR sensor is an electronic device, that emits light to sense some object at the surroundings. An IR sensor can measure the heat of an object as well as detect the motion. Usually, in the infrared spectrum, all objects radiate some form of thermal radiation. These types of radiation are invisible to our eyes, but infrared sensors can detect those radiation. IR sensor is an electronic device, that emits light to sense some object of the surroundings. An r can measure the heat of an object as well as detect the motion. Usually, in the infrared spectrum, all objects radiate some form of thermal radiation. These types of radiation are invisible to our eyes, but infrared sensors can detect these radiation.

A.SG90 Servo Motor



Figure 7. SG90 Servo Motor

A Servo motor is a type of motor that is powered by a DC source, either from an external supply or by a controller. A small and lightweight servo motor with high output power is called micro servo motor SG90. This means that SG90 micro servo motor will only work as hard as is required to complete the task at hand. A wide range of applications for SG90 servo motors exists, including cameras, telescopes, antennas, industrial automation, and robots. Most of the hobby Servo motors operate from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure that your project can live with the half circle if not, you can prefer a 0° to 360° motor or modify the motor to make a full circle.

B. HC-SR04



Figure 8. HC-SR04

The HC-SR04, or High-Conductance Ultrasonic Sensor, accurately measures distances using sound waves without physical contact. Emitting ultrasonic sound waves and detecting their reflections, it calculates distances based on the time interval between transmission and reception of pulses.

With a range of two to four centimeters, it's ideal for detecting nearby objects in robotic applications. Affordable and easy to use, it can detect objects up to 13 feet away, making it versatile for various projects. Its four-pin configuration efficiently processes signals for precise distance measurements, ensuring reliability in electronic systems.

C.L298N



Figure 9. L298N

Em-18 is used like any other sensor module. First, we choose the mode of communication between the em-18 module and the controller. Next, we will program the controller to receive data from module to display. Next power the system. When a tag is brought near the module it reads the id and sends the information to the controller. The controller receives the information and performs the action programmed by us. In the circuit, the buzzer is not compulsory. When a tag is read the buzzer turns on. As given in the circuit, tx is given to the controller which is to receive data.

VI. RESULT AND DISCUSSION

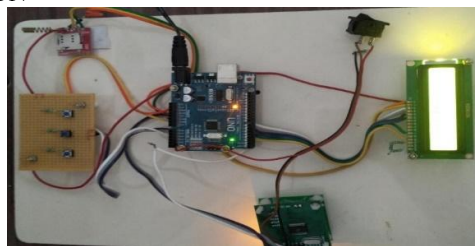


Figure 10. Hardware

Implementation

Trolley is attached with RFID reader and LCD which is controlled by Arduino board. RFID module detects the products using specified RFID tags of the particular product. After completion of the product selection the details of product we chosen and the total price of the products are displayed on LCD . The total amount varies by adding or removing any product to the list. Then, the total amount displayed on the LCD is forwarded by GSM module to the bill counter. The customer can pay their bills in either online or offline Payment.

VII. CONCLUSION

In conclusion, an e-trolley system that utilizes RFID technology and Arduino with simple coding can provide a convenient and efficient solution for managing shopping carts in a retail environment. By integrating RFID readers and tags, the system can accurately track the movement of the carts and provide real-time inventory

management. The Arduino platform provides a user-friendly and cost-effective option for implementing the system, allowing for easy customization and scalability. The system can also incorporate features such as automatic cart unlocking, theft prevention measures, and customer engagement through personalized offers and promotions. Overall, the smart trolley system using RFID and Arduino has the potential to streamline the shopping experience for customers while improving the efficiency of the retail environment.

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