IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, April 2025
Impact Factor: 7.67

Smart Shopping Trolley

Dr. S. M. Gulhane[1], Vaishnavi Rokade[2], Pallavi Shinde[3] and Harshal Jadhav[4]
Professor, Department of Electronics & Telecommunications Engineering[1]
Student, Department of Electronics & Telecommunications Engineering[2,3,4]
Pravara Rural Engineering College, Loni, India

Abstract: *The Smart Shopping trolley design represents a slice- edge result aimed at revolutionizing the traditional shopping experience through the integration of advanced technologies. concentrated on the ESP32 microcontroller, this innovative shopping wain incorporates a sophisticated array of detectors, including IR and ultrasonic detectors for mortal discovery and shadowing, RFID technology for product identification and automatic pricing, and cargo cells for precise weight monitoring. A DC motor, coupled with a motor motorist IC, ensures flawless wain movement, while a stoner-friendly display module provides real- time feedback on the trolley status. This design not only showcases independent wain navigation but also introduces features like automated pricing and load cautions, promising to review and elevate the effectiveness and enjoyment of ultramodern retail shopping*

Keywords: Shopping wain, ESP32, Sensor Integration, RFID Technology, Automated Pricing

I. INTRODUCTION

With the birth of huge supermarkets and shopping promenades, manually arranging and handing of products to guests as well as homemade bill computation sounded impracticable and insolvable. therefore, bar law- grounded shopping came into actuality. But it too, has its own limitations and there's compass for development. In the period of smart, we need to up the game for shopping as well and switch to smart shopping. Allowing of making robots, you might come up with ideas similar as line shadowing, handicap avoider, anti-drop Robot, terrain monitoring Robots, etc. But what we're going to make moment, is a robotic trolley that follows an object, bus billing and cargo checking relentlessly. The introductory function of this robotics is simple; it simply follows you. It goes forward as you go forward; when you stop moving, it stops as well. We used ultrasonic detectors to identify the moving direction of the object. Then we created an algorithm which will move the robot forward when the object is moving forward within the programmed range and backwards in the same manner. This design shall affect into a new shopping experience and shall reduce the sweats made and the time spent by an average paperback to a considerable extent. This design might also compliment the emergence of a smart shopping trolley

II. LITERATURE REVIEW

Smart Shopping Trolley using QR Code and ESP32Cam [1]

This system end to save the time consumption, veritably dependable, low cost and fluently manageable that are enforced with rearmost technologies like Esp32 and QR law. It makes shopping briskly by snappily relating product and billing them. This model can be mounted on all shopping trolley.

Shopping Trolley with Automated Billing Using Arduino [2]

This design is cost effective and friendly for the guests to avoid the billing by standing in the long ranges for a longer time. It can made guests can themselves overlook the products without any help of homemade billing. The total price of the products is displayed consequently. It has comported of RFID, Arduino Nano, Node MCU esp8266, GSM module and TV screen.

DOI: 10.48175/IJARSCT-25306

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, April 2025
Impact Factor: 7.67

Follow Me Smart Shopping Trolley [3]

This paper presents a smart shopping wain that can follow the client automatically using ultrasonic and IR detectors. The wain is equipped with two ultrasonic detectors at the front and two IR detectors at the reverse. The ultrasonic detectors are used to descry the distance between the wain and the client, while the IR detectors are used to descry the direction of the client. The wain is controlled by an Arduino Uno microcontroller, which uses the detector data to calculate the speed and direction of the wain.

Automatic Human Follower Trolley with Smart Billing [4]

This paper proposes an automatic mobile trolley, a wheeled robotic shopping wain equipped with ultrasonic detectors and an RFID detector for smart billing. It autonomously follows mortal movement without homemade control, enhancing shopping convenience. The trolley operates via a microcontroller unit for effective robotization.

Smart Shopping wain with Automated Billing Using Arduino [5]

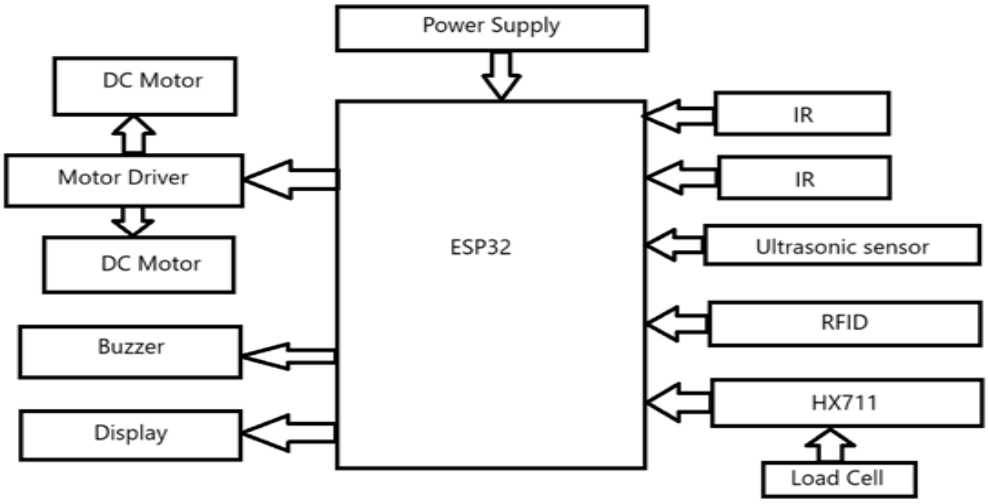
This paper presents the development of a smart shopping wain with an automated billing system using an Arduino microcontroller. It integrates RFID for product identification, weight detectors for force operation, and a stoner-friendly interface to enhance shopping effectiveness. The system enables real- time cost computation, reducing checkout time and streamlining the process. Experimental results punctuate its effectiveness in optimizing the shopping experience and advancing retail robotization technologies.

2.1 Objectives

1.The main ideal of proposed system is to make offline shopping further intriguing and futuristic.
2. Give a technology acquainted result at low cost.
3. Ameliorate the speed of purchase.
4. To make another strong option for Online Shopping in future also

III. Materials and Method

3.1 Block Diagram



ESP32 Microcontroller

The ESP32 serves as the brain of the trolley, managing inputs from sensors, controlling the motors, and processing data for the display and billing system. Its Wi-Fi and Bluetooth capabilities allow for potential connectivity with mobile apps or cloud systems for enhanced functionalities, such as tracking shopping lists or bill payment.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, April 2025
Impact Factor: 7.67

16x2 LCD Display

The 16x2 LCD provides real-time feedback to the shopper by displaying essential information such as the total weight of the items in the trolley, scanned product names, prices, and the total bill amount. This ensures transparency and assists the shopper in monitoring their purchases.

DC Gear Motors (x2)

These motors drive the trolley forward, backward, and allow for turning based on the input from the human-following system. The gear motors provide sufficient torque to move the trolley smoothly, even when fully loaded with groceries.

Ultrasonic Sensor

The ultrasonic sensor is responsible for maintaining a safe distance between the trolley and the shopper. It detects the distance and sends data to the ESP32, which adjusts the speed and direction of the motors to follow the shopper accurately.

IR Sensors (x2)

These sensors enhance the human-following system by detecting obstacles in the trolley's path, ensuring that it avoids collisions. They are also used for fine-tuning the movement to track the shopper more precisely by differentiating between the user and surrounding objects.

Load Cell + HX711 Module

The load cell measures the weight of items placed in the trolley, and the HX711 module amplifies this signal, converting it into data that the ESP32 can read. This system allows the trolley to automatically calculate the total load, which is crucial for generating accurate billing.

RFID Reader

The RFID reader is used for product scanning. When an item is placed in the trolley, the RFID reader scans its tag and adds it to the bill. This eliminates the need for manual scanning at checkout, speeding up the shopping process. The product information is displayed on the LCD, and the bill is updated in real-time.

Buzzer

The buzzer provides audio feedback during various operations, such as confirming a successful product scan, alerting when the load is too high, or warning the shopper of an obstacle. This improves the interaction between the shopper and the trolley.

Motor Driver Module (L298N or Similar)

The motor driver controls the DC motors based on commands from the ESP32. It regulates the speed, direction, and braking of the motors, enabling the trolley to follow the shopper accurately and smoothly.

12V Battery

The 12V rechargeable battery provides power to the entire system, ensuring that the trolley can operate autonomously for extended periods without needing frequent recharges. It powers the motors, sensors, and microcontroller.

.

3.2 Working of System

When a client approaches a smart trolley and turns it on, the trolley will start to follow the stoner no matter which direction they're walking in and will also descry any obstacles in its path. The Arduino Uno, ultrasonic detector, and infrared detector used in this system. The model uses an ultrasonic detector to descry people. With a range in the prototype of between 10 cm. The model uses two IR detectors to direct(turn) the trolley a left- side IR detector and a right- side IR detector.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 6, April 2025 Impact Factor: 7.67

When the trolley turns on, an ultrasonic detector detects a person in front of it. When that person moves, the detector begins to follow that person while maintaining a 10 cm space between the stoner and the trolley in the prototype. also, the trolley rotates to the left when a mortal turns to the left, thanks to an IR detector on the left side. In a analogous manner, when a person turns to the right, an IR detector on the right side activates, turning the trolley to the right. The trolley automatically stops if the person stops moving. The prototype trolley's range is from 10 cm, so when the person in front of it moves past that distance, the trolley likewise stops automatically.

3.3 Expected Result

This prototype will provide the customers a user-friendly shopping cart that would enhance the shopping experience. And also, the customers don't have to wait in the long queue for paying the bill and push the trolley. The customers just have to scan the product and the product details are displayed which makes it reliable and convenient for the customer. The customer can also enjoy shopping without pushing the trolley themselves

IV. CONCLUSION

The project will be developed within low cost, low power consumption. With our project, customers can enjoy shopping without pushing shopping trolley themselves. We are using sensors on the trolley which will track the human and will move at the maintained distance. It will stop when the customer will stop and there is a RFID reader fixed on the trolley to keep the track for the total amount and it can be paid by smartphones. In this chapter we will discuss about some suggestions for future improvement of automatic trolley.

Acknowledgement

This endeavour, like any organisational work, bears the imprint of numerous individuals. We have the chance to convey our sincere gratitude for the same through this work. We received unending assistance from a large number of people while producing this research paper. If we didn't give all the people involved our warmest appreciation, this report wouldn't be complete.First and foremost, we would like to express our gratitude to the department of Electronics & Telecommunications engineering's esteemed head of department, Mr.V.A.Aher, for allowing us to submit our research and for her unwavering support. We are grateful to Dr.S.M.Gulhane, our project guide, for his invaluable advice and his time. Our Project Coordinator, Mr S.B.Mandlik, deserves special recognition for his tireless efforts, patience, and persistent commitment to quality, all of which have contributed to the project's successful completion.Finally, we would like to express our gratitude to our family and friends for their support, without which this project would not have been possible. Every job is the result of meticulous planning, consistenteffort, and organisation. All three of these elements are combined in this piece with sincerity.

REFERENCES

[1] Ranjith R and Soumya Latha, Naveen" Smart Shopping Trolley using QR Code and ESP32 Cam" Grenze transnational journal of Engineering and Technology June 2022.

[2] Sapana, Swapnali, Mohammad," Shopping Trolley with Automated Billing Using Arduino " International journal for ultramodern trends in wisdom and Technology Pune, 2021.

[3] L.S.Y. Dehigaspege, M. K. C. Liyanage, N. A. M. Liyanage, M. I. Marzook, and Dhishan Dhammearatchi "Follow Me Multifunctional Automated Trolley" International Journal of Engineering Research &Technology (IJERT) Issue 07, July – 2017.

[4] Vivek Sharma, Aditya Singhal, Akshat Joshi, Abhay Kumar Meena, Aditya Kumar" Automatic Human Follower Trolley with Smart Billing", International Journal of Emerging Technologies and Innovative exploration (www.jetir.org| UGC and issn Approved), ISSN2349- 5162, Vol. 10, Issue 3, runner no. ppa315- a322, March- 2023.

[5] Rutwij Kulkarni, Aditya Kumawat, Aman Jha MIT School of Engineering "Smart Shopping Cart with Automated Billing Using Arduino" International Journal of Creative Research studies (IJCRT) October 2023.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, April 2025
Impact Factor: 7.67

[6] Kavana G S1, Inchara P2, Gagana B S3, Mrs. Sangeetha V4 123UG scholars, Department of Electronics and Communication Engineering, K S Institute of Technol ogy, Bangalore, Karnataka, India "perpetration of Smart Shopping Trolley" International Journal for Multidisciplinary Research May- June 2024.

[7] Om Ravi Mhaskar, Aditya Sandip Benichetake, Arjun Amar Dalavi, Shrivardhan Rajesh Chavan, D. V. Patil Department of Electrical Engineering, Sharad Institute of Technology, Yadrav, India "Automatic Human Follower Shopping Trolley" International Journal of Research in Engineering, Science and Management March 2022.

[8] S. Kavitha, S. Aishwarya, Gopi Alekhya Sai Sri Rama, P. Ashwin, A. Ajay "Wireless Intelligent Billing Trolley for Shopping Malls" International Journal of Research in Engineering, Science and Management Feb-2020

[9] Charith Gundala, Vamsi Varun Yarramsetty, manikanta Bsrm Ap "Automatic Billing Trolley Using Rfid Grounded on Internet of effects" Journal of Engineering Science Sep2021.

[10] Satish Kamble, Sachin Meshram, Rahul Thokal, Roshan Gakre "Developing a Multitasking Shopping Trolley Grounded on RFID Technology" International Journal of Soft Computing and Engineersing (IJSCE) January 2014.