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Human Following Smart Shopping Trolley

Niteeshkumar H V[1], Nitesh R[2], Padmaj U Naik[3], Pavan Kumar M[4]

[1][2][3][4] UG Students, DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, BMS College of Engineering, Bangalore, India.

Abstract

Shopping at big malls is becoming an everyday practice. On weekends and holidays, these malls have heavy traffic. People buy various goods and load them onto trolleys and trolleys must be moved by applying energy. To make it even more convenient to the users this trolley automatically avoids obstacle, and follows particular person until he/she is inside the shopping premises. After finishing shopping, one must proceed to the billing counter to make payments. A long queue forms at the billing counter because the cashier must create the bill using a bar code scanner, which takes a lot of time. Therefore, the major goal of this project is to create a system that can be utilized to address customer problems and conserve customers' valuable time and energy. This paper provides a glimpse of a smart human following trolley and automatic billing system using RFID and payment can be paid directly from the user's mobile phone. This model also includes recommendation system to assist users in their purchase.

Keywords **-** shopping malls, smart trolley, RFID scanner, Barcode scanner, Arduino UNO, recommendation system.

1.INTRODUCTION

Every super market provides shopping trolley to help customers to select and store the products. The customers have to move the trolley by applying their own physical energy and they have to drop the products which they wish to purchase and then proceed to checkout. At present in every super market, once the customer is entered into the mall, he/she has to select the trolley and select the items user wishes to purchase and then drop into the trolley. Once all the items have to be selected, he/she needs to move the shopping cart to the billing counter by pushing it and consumer can make the payment. Especially in order to make a payment it takes a lot of time so the waiting time of the consumer is more which makes the customer to hesitate the visit the shopping mall again. This is the common procedure followed in almost every shopping mall where the employee of super market will scan all the products using barcode on the commodity which leads to waiting in a long queue.

In general, a barcode is a parallel-printed, machine-readable strip of data that can be used to represent a variety of data. Retailers typically utilize a bar-code scanner to manage inventory and expedite data entry. Barcode scanning applications are product-centric we want to create an application that is consumer-centric. There are many different barcodes type that exist for various purposes. We can split them into 1D and 2D barcodes. Each type of barcode is called a symbology and there is a corresponding standard that defines a symbol and how to encode and decode the symbol.

The drawbacks of the present procedure are each customer has to wait in the queue of the checkout and need to push trolley by applying their energy. So, we need to develop a project for following human movement and automated shopping trolley using RFID tags and RFID reader which aims to reduce the effort involved in moving trolley and total waiting time of customers, also total man power requirement for markets in order to improve efficiency of shopping malls. More automated devices provide promise for the retail sector in a world where technology is transforming the ways we go about our daily lives. The present world demands convenience and ease of using a product or enhancing the experience, keeping all these in mind this model has been developed which offers comfort to the consumers and drastically reduces the waiting time.

2.LITERATURE REVIEW

1. Rahul Sonawane, Abhishek Pandey, Chetan Gorivale "SMART TROLLEY WITH HUMAN FOLLOWER" trolley is made to follow the human movements and avoiding obstacles, also the total amount of the purchase is calculated and sent to billing counter for payment.

2. Yen Leng Ng, Cheng Siong Lim "Automatic Human Guided shopping Trolley with Smart Shopping System" uses image processing technique to follow the human movements.

3. Sayali N Joshi, Vaishnavi K Patkim Priyanka S Dixit "Desing and Development of Human Following Trolley" uses Raspberry pim Ultrasonic sensor and Pi camera to detect and follow human movement by avoiding obstacles.

4. Muhammad Sarmad Hassanm Mafaz Wali Khan, Ali Fahim Khan "Design of Human following Robot" automatically follows the particular person as a unique tag is placed on the person that should be followed by a robot.

5. L.S.Y. Dehigaspege, M.K.C. Liyanagem N.A.M. Liyanage "Follow Me Multifunctional Automated Trolley" a trolley follows the human with carrying good with it also the barcode reader is placed in a trolley to save the time of billing.

3.EXISTING SYSTEM

In the current system, the customers are uninformed of the product discounts offered by the supermarket. The product discounts are occasionally listed on the product shelves, but they are expressed as percentages, making it difficult to calculate the discount.

The following issues result from using the current system: Calculating discounts on things is difficult. It's frantic pushing a cart through the supermarket. The customer loses significant time by waiting in the billing queue. If the amount at the counter exceeds the customer's budget, they must remove the merchandise, which can be awkward. All of these issues can be resolved in this project, specifically through the use of a smart trolley and a human follower. The consumer will learn about the product discount with ease, the cart will follow the user, and the amount of time spent in line is minimized.

4.PROPOSED SYSTEM

A trolley is equipped with an RFID reader thanks to the Smart Shopping Trolley technology. It enables the user to independently scan the RFID tags on the acquired goods that he intends to buy. A wireless transmission smart gadget links to the supermarket's backend database, which holds information about the products such Cost Price, and records all the scanned items in the specific trolley (with allocation number). The things that have been carefully examined are automatically billed on the wireless smart device for their purchases, drastically cutting down on overall waiting time.

Information is encoded on an RFID tag in a way that a machine can interpret the visual pattern. On their trolley, customers will have an RFID reader. When an RFID tag is in close proximity to an RFID reader, the scanner scans the product's RFID tag and sends the information to an Arduino uno, which decodes the tag and stores it in memory. Each tag has an own identification and provides comprehensive data about the product-related information. Compared to barcodes, RFID tags are more trustworthy and secure. Therefore, when there are numerous products in a supermarket or hypermarket, it is better to work using RFID tags.

The smart human following Trolley has the ability to follow specific customer movements by avoiding obstacles. It has separate Arduino UNO board which constantly detects the movements of the user and obstacles. The two IR sensors placed on either side of the cart tracks the movements and corresponding data is sent to Arduino UNO, an Ultrasonic sensor which is mounted onto the Servo motor calculates the distance between the cart and the user (the distance between the user and the cart can be varied), and Servo motor can rotate up to 180 degrees which in turn rotates the Ultrasonic sensor. Thus covers the maximum area while calculating the distance. And makes sure that Trolley is in the close vicinity of the user.

In this project, we use RFID tags that are connected to the products and include an encoded description of the product. RFID tags are merely referred to as modern barcodes. A reader receives a serial number from the tiny transponder. RFID is a specific kind of wireless card that has a loop antenna and an embedded chip. The 12-digit card number is represented by the built-in integrated chip. The circuit that produces the 125 KHz magnetic signal is the RFID reader. The loop antenna connected to this circuit, which is used to read the RFID card number, transmits this magnetic signal. RFID cards are employed as security access cards in this project. Consequently, each product has its own RFID card.

5.PROPOSED FLOWCHART

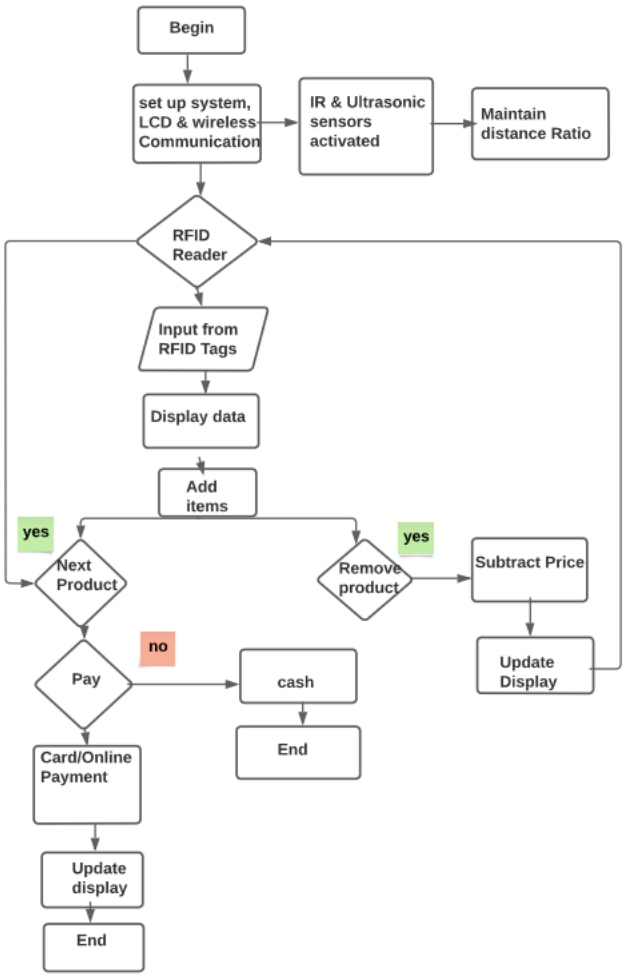

FIGURE 1. Flow Chart for Human following Smart Shopping Trolley.

5A. ALGORITHM

Each Trolley is associated with a RFID reader. When consumers with the cart press “start button” the system will be activated initializing IR and ultrasonic sensor. Every product has an RFID tag that contains unique ID. These IDs fed in the database assigned to the corresponding products.

Step 1: start the system (Initialize sensors, activate microcontroller, RFID reader, Motor Driver).

Step 2: Scan each products using RFID tags present on the products.

Step 3: Place products in the trolley

Step 4: Display price of the product purchased.

Step 5: Add the amount to the total bill.

Step 6: If user do not need the product, it can be taken out from the trolley

Step 7: Subtract the price of the product removed from total amount.

Step 8: After completing shopping, press finish button to proceed to payment.

Step 9: Message with link is sent to user mobile number for making payment.

Step 10: Displaying information on LCD screen.

Step 11: End.

6. BLOCK DIAGRAM

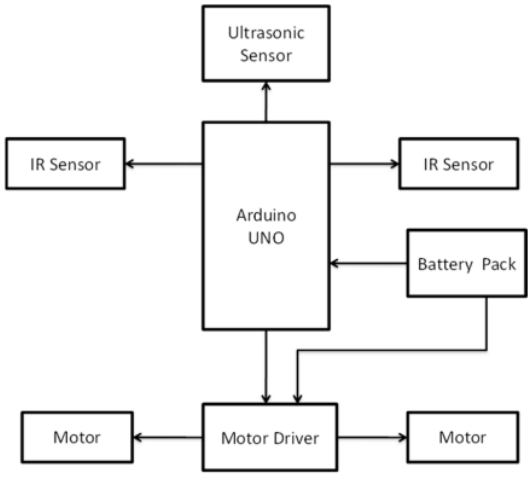

FIGURE 2. Block diagram.

Explanation:

The ultrasonic sensor placed at the front of the cart constantly detects the distance between the trolley and the user, and the corresponding data is sent to the Arduino UNO. If the distance is less than the pre-set distance, the

cart remains stationary; otherwise, it moves depending on the input from the motor driver. The IR sensors, which are mounted on either side of the cart, detect the motion (movement) of the user and sends the data to the microcontroller, which in turn commands the motor driver. As a result, the motor spins in such a way as to follow the movements of the user. The battery pack provides energy to all the components present.

7 SOFTWARE REQUIREMENT

Arduino integrated development environment (IDE)

The integrated development environment (IDE) for the Wiring and Processing projects served as the foundation for the cross-platform Arduino IDE, which is developed in Java. It is intended to acquaint artists and other newcomers who are not familiar with software development with programming. It has a code editor with tools like syntax highlighting, brace matching, and automatic indentation. With just one click, programs may also be compiled and uploaded to the board.

For burning the Smart Trolley program into the controller, we use an Arduino board. It is simple to utilize the Arduino integrated development environment (IDE) since C or C++ can be used to write programs.

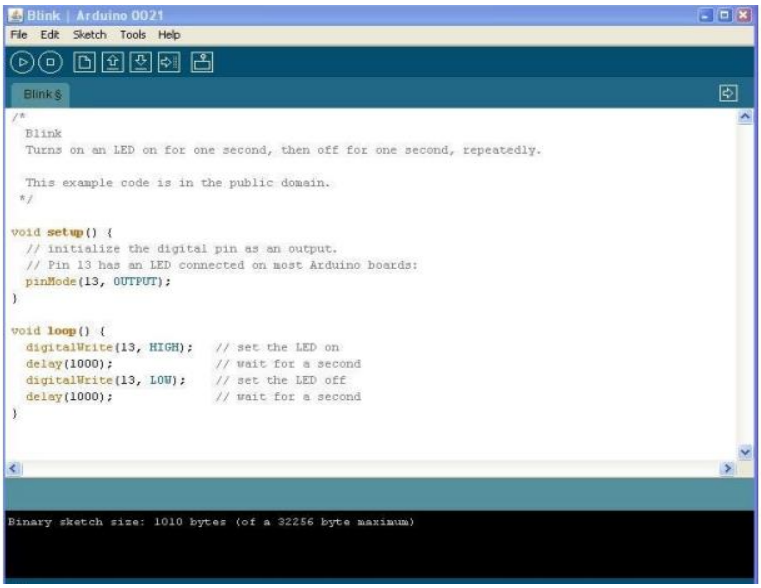

FIGURE 3. Arduino integrated development environment (IDE) Window

8 WORKING OF SYSTEM

These are the functionalities of the Smart Trolley

1) Scan the goods.

2) Following the User movements.

A smart trolley will begin to follow the passenger no matter which direction they are walking in and will also detect any impediments in its route when a client approaches it and turns it on. This system uses an Arduino Uno, an ultrasonic sensor, and an infrared sensor. To identify persons, the model employs an ultrasonic sensor. with a prototype having a range of 30 to 100 cm. A left-side IR sensor and a right-side IR sensor are used by the model to steer the tram.

The RFID Reader in the cart will assist the user in scanning the RFID tags on the things that they like to purchase. The data is sent to the Arduino uno, which processes it, once the user scans the tags. With the use of an RFID reader, multiple things can be scanned at once. The things that were scanned are kept in memory and will be referred to as a list. The consumer can press a specific button to remove an item from the cart. This will cause the system to do so.

The processor, or Arduino Uno, processes the received list. On the trolley's LCD screen, the List is visible. The transmitter (nrf24l01 transmitter) receives the product list. The receiver module will process the invoicing of the products after receiving the list from the transmitter (nrf24l01 transmitter). The product list will be received by the receiver (nrf24l01 receiver), processed by computer, and sent to the billing counter for billing.

An ultrasonic sensor in the trolley recognizes a person in front of it when it is turned on. In the prototype, when the user moves, the sensor starts to follow them and keeps a 30 cm distance between them and the trolley. The microcontroller will receive the sensor output and use it to send a suitable command to the motor driver, enabling the motor to move in accordance with the given instruction. Based on the output of the line sensor, the microcontroller will be programmed to move the robot in any direction. Consequently, a robot can move along the indicated line or path. This circuit uses the 555 in a stable mode to produce a 5 Hz clock pulse. A left-side IR sensor also allows the tram to turn to the left when a person turns to the left. Similar to how a person moves to the right, the tram turns to the right when an IR sensor on the right side is activated. If the passenger stops

moving, the tram stops immediately. When the person in front of the prototype trolley advances past the range of 30 cm to 100 cm, the trolley also stops.

The system creates a final bill when the user has finished shopping based on the items that have been added to the virtual cart. The customer's registered mobile number can now receive a message using a GSM800 module. Payment alternatives such as cash, cards, or internet payments would be listed in the message. The system identifies the transaction as complete and resets the trolley for the following client after the customer chooses a payment option and completes the transaction. The system can also include a recommendation system that suggests the most recent discounts and offers based on data analysis and client preferences, assisting customers in making wise selections and selecting the finest products.

Overall, this integrated system improves consumer satisfaction and operational effectiveness in retail contexts by automating product scanning, streamlining payment methods, and offering personalized recommendations.

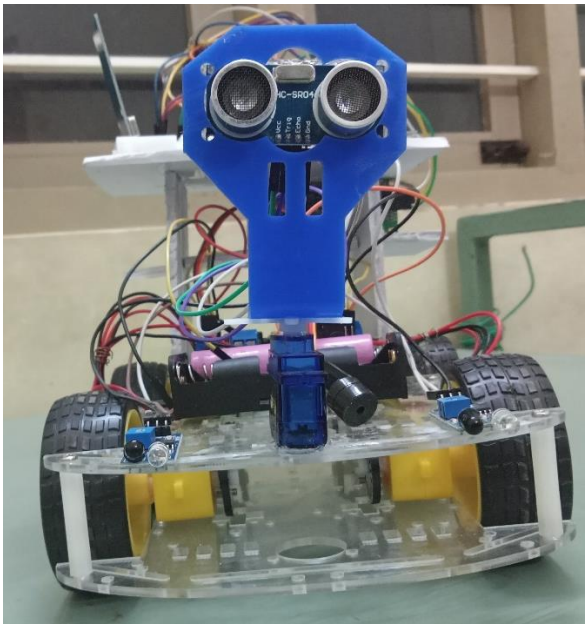

FIGURE 4. Hardware setup for Human following

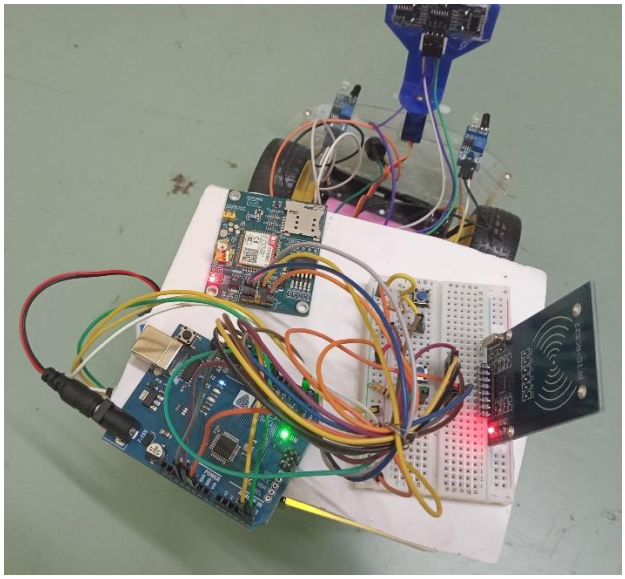

FIGURE 5. Hardware setup for billing process

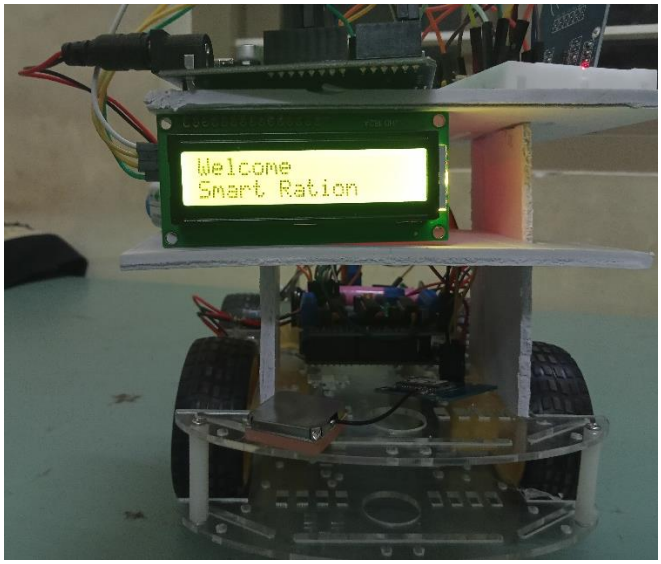

FIGURE 6. Setup to display total amount

9 ADVANTAGES

1. Smart Trolleys streamline billing, eliminating the need for individual item scanning and allowing direct payment at the counter.
2. RFID technology provides instant visibility of discounts, simplifying cost calculations for customers.
3. Trolleys equipped with RFID tags follow customers, reducing the need for manual pushing.

4. Accurate data collection improves inventory management and optimizes employee time.
5. Maintenance of the RFID system is straightforward.
6. Overall, Smart Trolleys make shopping easier and more efficient, offering convenience, faster transactions, and personalized discounts.
7. The automatic tracking of items in the trolley reduces the risk of errors in billing and enhances transaction accuracy.
8. With the integration of a GSM800 module, customers receive payment options via SMS, allowing for convenient cash, card, or online payments.
9. The recommendation system suggests discounts and offers based on customer preferences, enabling them to choose the best products and maximize savings.
10. The system resets the trolley after each transaction, ensuring a fresh start for the next customer and maintaining a smooth shopping process.
11. Smart Trolleys optimize operational efficiency in supermarkets, reducing labor costs and freeing up staff to focus on other customer service tasks.

CONLUSION

Considering the evolving retail shopping trend. We conclude that the Intelligent Shopping Basket is definitely required for quick billing in the retail marketing sector. Anytime a person goes in a straight path, it can follow them. The project's goal is to create a smart shopping system-equipped autonomous human-guided shopping cart. This shopping cart can direct the user to the items locations in the grocery store, and the user can access the items' locations via a shopping map. The user can follow it. Accuracy: As IR technology advances, accuracy also improves. Using the portable robot's automatic line-following and human-leading features, store operators just need to buy the device and can easily install it under trolleys. consumers can enjoy shopping without pushing the trolleys themselves. Additionally, these human following trolleys can also be used in various places such as Airports, Railway Platforms etc.

REFERENCES

[1] Rahul Sonawane, Abhishek Pandey, Chetan Gorivale, Hrushikesh Surve, Prof. Minal Hardas, "Smart Trolley with Human Follower", B.E Student, Department of Electronics and Telecommunication Engineering, Shivajirao S. Jondhale College of Engineering, Maharastra. Volume 8, 01 January 2021.

[2] Cheng Siong Lim, Michael Loong Peng Tan, "Automatic Human Guided Shopping Trolley with Smart shopping system", Article in Journal Teknology, March 2015.

[3] Akshay Chalke, Ashwini Bhor, Pradnya Bhoite, Uddhav Jadhav, "Follower robotic cart using an ultrasonic sensor", Published in (IJESC), 2017.

[4] L.S.Y. Dehigaspege, M.K.C. Liyanage, N.A.M. Liyanage, M.I. Marzook and Dilshan Dhammearatchi, "Follow Me Multifunctional Automated Trolley", published in International Journal of Engineering Research & Technology (IJERT) Vol. 6 Issue 07, July – 2017.

[5] Raju Kumar, k. Gopalakrishna, K. Ramesha on "Intelligent Shopping Cart" in International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, July 2013

[6] Nikhil Raman, Kartik Sanghi, Rohan Singh, on Smart Cart-An Enhanced Shopping Experience

[7] International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887 Volume 5 Issue X, October 2017

[8] International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 3, March 2017

[9] K. Lalitha, M. Ismail, Sasi Kumar Gurumurthy, A. Tejaswi Sree Vidyanikethan Engineering College, Tirupathi, India Automatic Trolley Human Follower Vikas, Vikash Kumar, Vikram Kumar, Umesh Nath, Dr. Prateek Singhal - Associate Professor Department of Electrical Engineering SKIT, Jaipur, Rajasthan

[10] International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887 Volume 5 Issue X, October 2017