

A Smart Trolley System using RFID

Amruta Pokale¹, Kajal Pilane², Prakash D. Kshirsagar³

^{1,2}Student, Department of Computer Engineering, Zeal College of Engineering and Research, Pune, India

³Assistant Professor, Dept. of Computer Engineering, Zeal College of Engineering and Research, Pune, India

Abstract: A supermarket is a form where wide variety of product items is available. These product items can be food, beverages or any household product. The main purpose of supermarkets is to provide availability of all the products and save the time of the customers, but sometimes customer gets frustrated while waiting in the queue at billing counter and sometimes, they get confused while comparing the total price of all the products with the budget in the pocket before billing. To overcome these problems, we have designed a smart trolley using a smart phone and Arduino. With this system, there is no need for customer to wait in the queue for the scanning of the product items for billing purpose. Supermarkets provide this facility to customers through an application. The customers will be allotted the trolley with the help of the application. Otherwise, it can also work as a normal trolley. This can also help the supermarkets and hypermarkets to increase the number of customers.

Keywords: RFID, Bluetooth, Shopping Trolley, Arduino.

1. Introduction

Shopping mall is a place where people get their daily necessities ranging from food products, clothing, electrical appliances etc. Sometimes customers have problems regarding the incomplete information about the product on sale and waste of un-necessary time at the billing counters. Continuous improvement is required in the traditional billing system to improve the quality of shopping experience to the customers.

Now a day's numbers of large as well as small shopping malls has increased throughout the globe due to increasing public demand and spending. At the time of festivals, special discounts, holidays, etc. there is a huge rush in shopping malls. The use of bar-code reading technique in such situations always results in waste of time since customer has to wait till all the items get scanned. These disadvantages can be avoided by using IoT based intelligent trolley.

This system uses RFID technique instead of barcode. Proposed system uses separate RFID reader for each trolley and RFID Tag for each product. When customer buys any product RFID reader reads the tag which is present on the product. The cost of the product and the total bill of shopping items can be displayed in the application.

IoT based intelligent trolley presented here is easy to use and does not requires the special training to customers. RFID technique has many advantages over barcode systems. RFID reader reads the tag from a distance of 300 feet whereas barcode can read the information at distance not greater than 15 feet. Also the barcode need one site of propagation. Reading

frequency of barcode reads is only two tags whereas reading frequency of RFID is 40 tags. So the use of RFID is more useful than traditional barcode reading technique. Here use of RFID is helpful for customer.

2. Literature review

Smart Shopping Cart with Automatic Billing System through RFID and ZigBee proposed Chandrasekar and Sangeetha which states each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, an RFID reader, EEPROM, and ZigBee module.

Human-Following Mobile Robot in a Distribute Intelligent Sensor Network proposed Kazuyuki. M., Lee, J-H. and Hideki solves that the robots that will be needed in the near future are human-friendly robots that are able to coexist with humans and support humans effectively.

RFID Based Automatic Shopping Cart by Aggarwal AA discuss an innovative concept of the Automatic shopping cart in which the customer need not have to wait in the queue for billing for hours in shopping malls. Billing will be done automatically as and when the product is added to the cart by using RFID and Arduino. Automatically amount will be deducted in case the customer chooses cancel/ remove the product from the cart.

Intelligent wireless transmission ordering system for dishes based on ZigBee from Shen FK, Tsai FH, Lin HC, Zeng HD Design of Zigbee Based Wireless Order System for Restaurants. wireless self - service order management for intelligent. which has many advantages such as data transmission Research of ZigBee wireless order system for dishes. Future impacts of RFID on e-supply chains in grocery retailing Supply Chain Management proposed by Edmund Prater and Gregory V. Frazier Automating inventory replenishment decisions would result in significant cost savings to the stores, by freeing up time that department managers spend walking the floor Figure Market leakage analysis Figure The enabling steps of item level supply chain management Future impacts of RFID on e-supply chains in grocery.

3. Proposed system

A. RFID Scanner

Scans the RFID tag which is attached to the product. After

scanning the details of the product like name of the product, price etc. are displayed on the screen which is mounted on the trolley.

B. Display Screen

It shows details of the scanned product in the software application. It displays whole product list purchased by the customer and its total billing amount.

C. Motor controlling unit

A motor controller is a device or group of devices that serves to govern in some predetermined manner the performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed.

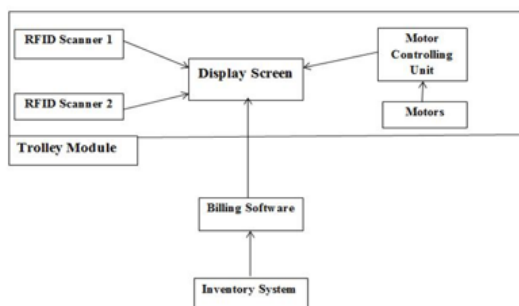


Fig. 1. Block diagram of the system

D. Arduino

Arduino is open source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers



Fig. 2. Arduino board

E. RFID

Mifare RC522 is the high integrated RFID card reader which works on non-contact 13.56 MHz communication, is designed by NXP as low power consumption, low cost and compact size read and write chip, is the best choice in the development of

smart meters and portable hand-held devices.

This module can't directly in hand held devices for mass production. Module use 3.3V power supply, and can communicate directly with any CPU board by connecting through SPI protocol, which ensure reliable work, good reading distance

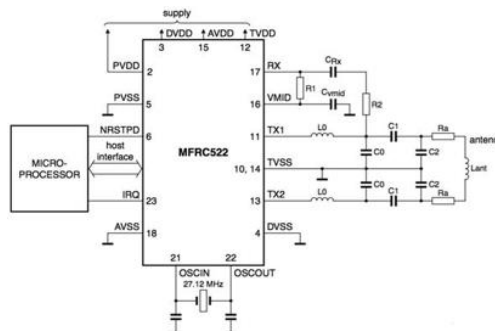


Fig. 3. Block diagram of RFID

4. Working

The trolley is first connected with the mobile application of the customer. After that the customer can start scanning the products. The RFID reader is attached to the trolley which reads the tags on the product. The list of the scanned products will be displayed in the application. Also the amount of the products and total bill will also be shown. The payment can be done through various payment options provided or it can be done on the cash counter also.

The other advantage of this trolley is that it can be controlled through the application i.e. the movement of the trolley is controllable. Trolley can be moved throughout the mall through the application, it need not to be pushed manually. With the help of a Bluetooth module the connection between the trolley and mobile/smart phone will be established. After all the process is done the trolley will be disconnected.

5. Conclusion

In this paper, we have designed and developed Smart Trolley System. Now there is no need for the customers to wait in the queue and wait for his/her turn for the scanning of the product items. Especially during weekends or festivals season, there will be no time wastage in waiting in the queue. The customer can do billing directly through the application or even at the billing counter. So, supermarkets or hypermarkets can use this concept, which will attract a greater number of customers and also make the shopping effortless for the customers.

References

- [1] P. Chandrasekar and T. Sangeetha, "Smart shopping cart with automatic billing system through RFID and ZigBee," *International Conference on Information Communication and Embedded Systems (ICICES2014)*, Chennai, 2014, pp. 1-4.
- [2] K. Morioka, Joo-Ho Lee and H. Hashimoto, "Human-following mobile robot in a distributed intelligent sensor network," in *IEEE Transactions on Industrial Electronics*, vol. 51, no. 1, pp. 229-237, Feb. 2004.

- [3] Aggarwal A. A, "RFID based Automatic Shopping Cart," The International Institute for Science. Technology and Education Journal on Control Theory and Informatics, vol. 1, no. 1, 2011.
- [4] J. M. E. Gómez, A. F. J. Álvarez and J. B. Rodríguez, "Supermarket costumers routes-and-times identifier," *2012 IEEE Colombian Communications Conference (COLCOM)*, Cali, 2012, pp. 1-5.
- [5] F. Shen, F. Tsai, H. Lin and H. Zheng, "Intelligent wireless transmission ordering system for dishes based on ZigBee," *2015 IEEE International Conference on Consumer Electronics - Taiwan*, Taipei, 2015, pp. 356-357.
- [6] T. Rajaganapathi, S. Gowtham, E. Muthu Abinaya, B. Kavipriya, V. Dhivya, "Automated Shopping Trolley," in International Journal of Advanced Research in Biology Engineering Science and Technology, vol. 2, Special issue 10, pp. 1442-1449, March 2016.
- [7] Thiyagarajan, Manikandan, Aejaz, Mohammed and Kumar Mohan, "RFID based Advanced Shopping Trolley for Super Market," 2017.
- [8] M. L. Vinutha, Harshitha P. Bale, R. Sushma and M. Suchitra, "Shopping and Automatic Billing Using RFID Technology," in Proceedings of the 2nd International Conference on Current Trends in Engineering and Management, International Journal of electronics and communication engineering and technology, vol. 5, no. 8, pp. 132-138, August 2014.