Design and Implementation of Smart Shopping Trolley with Mobile Cart Application

[1] Fiza Mariam, [2] Niharika Nandi S P, [3] B S Ganavi, [4] Prof Gowrishankar B S

[1] [2] [3] [4] Department of Information science and Engineering, Vidyavardhaka college of Engineering, Mysuru, Karnataka, India.
Corresponding Author Email: [1] fizamariam22@gmail.com

Abstract- *As there is a lot of advancement in the field of technology there are many eye-catching inventions in the domains of machine learning, artificial intelligence, internet of things and so on, due to these advancements, with the customer point of view people start expecting a lot. Nowadays people go to shopping on a daily basis. Customers have very little time to spare for standing in queues for billing purpose. In this paper, we are presenting a smart shopping cart with mobile cart application which is a prominent solution for the above-mentioned problem. this smart shopping cart comes with raspberry Pi controller, RFID Reader, RFID Tags, L298N Motor Drivers, Pi Camera, Load Cell and a Mobile Cart application. The customer needs scan the product using RFID reader which is attached to the cart, the load cell will get the weight of the items in cart and all the price details will be reflected in the online application. After all the items are scanned the final bill will be displayed on the application and the bill payment can be done using the same application.*

Keywords- RFID, Smart shopping, Internet of things, Raspberry Pi, L298N Motor Drivers.

I. INTRODUCTION

The invention on smart objects and smart things is trending in the field of IOT. Every object is connected to every other object making our day-to-day life easier. Even though there are lot of advancements in the technology people still prefer to go for shopping and get the items themselves. On the other hand going to a mall and shopping has its own benefits and limitations as well. The major benefit is that customers get to[1] analyze and can choose the best products. whereas the downfall of this is that customers need to stand and wait in long queues to get the bill and also pay the bill. The[13][14][15] proposed model of the smart shopping cart eliminates these drawbacks and also has some added features which will make the customers shopping experience a great one.

This smart cart helps the customers by reducing the amount of time spent on shopping. The technologies which play a main [2] [10][11][12]role in this process are (1) Raspberry Pi which helps in achieving wireless communication with server (2) RFID Reader and Tags which help in scanning and identifying the products with unique RFID's (3) Load cell in getting the weight of products (4)L298N Motor Drivers which helps in the movement of the cart (5) Pi Camera for live surveillance (6) Web Application for getting the information of items and paying the bill. The smart shopping process with Smart Cart and Smart cart Application has a prospective of making Shopping very easy and fast with convenience to the customers.

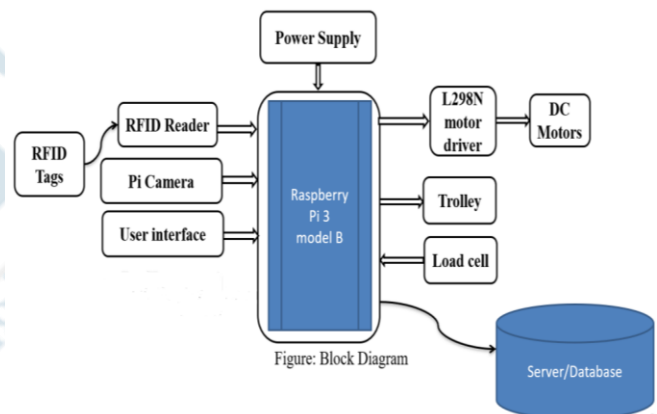## II. WORKING PRINCIPLE OF THE PROPOSED SYSTEM

**Figure 1.** Architecture diagram of Proposed system

A power supply of 3v is given to the Raspberry Pi. Also an additional power supply of 5v is given to the L298N Motor Drivers. By using an already existing Blue Dot application we can move the cart without any external force. The Blue Dot application and the Raspberry Pi is connected using inbuilt Raspberry Pi [3] Bluetooth. By navigating on the Blue Dot application the cart can be moved to any direction with ease. With the addition of this application the customers need not move the cart on their own.

Initially the customers need to add the desired products into the smart cart by scanning the items using the RFID scanner. The RFID scanner identifies the products and collects all the details [4] of the specific products like product id, product price, product weight, product manufacture and expiry date from the database and update these into the web application.

After scanning each item concurrently the weight of the item can be checked using the Load Cell. If the item weight from the database and [5] the item weight in the load cell doesn't match then the Camera attached to the cart can be used for live [18]surveillance. This feature gives a sense of security for the customers and also due to this feature the smart cart cannot be used for any wrongdoing.

All the details of the scanned products will be updated in the web application and if customers want to make any changes in the purchased items, [6] they can alter it. After all the final bill will be calculated and the [17]customer gets to pay the bill. The bill can be paid using net banking, mobile wallets, upi and debit/credit card using this application. This feature is a big advantage where customers need not wait in long queue to pay the bill instead shop and pay instantly.

III. PIN DIAGRAM
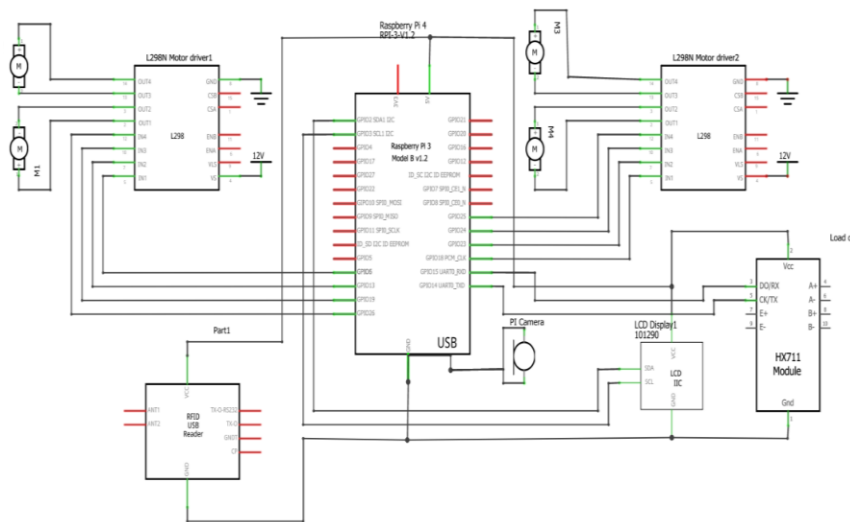
The Raspberry Pi board (Pi3) operates on 3V which is supplied through USB from PC. Input Power Pins 1 ,17 of LCD is connected to 1,17 [7] pins of Pi which are 3V, Positive Input power Pins 2,4 of LCD are connected to 2,4 Pins of Pins which are 5V, Pins 6,9,14,20,25 of LCD are connected to Ground pins of Pi. Pins 11,18,19,21,22,23,24,26 of LCD are connected to GPIO17,24, MOSI, MISO, GPIO25, SCLK, CS0, CS1 of Pi and Pins 3,5,7,8,10,12,13,15,16 of LCD[19] are connected to SDA, SCL, GPIO4, UART0 TX, UART0. RX, GPIO's 18,27,22,23 respectively. 2,3 Pins of two USB ports are connected to TXD and RXD of Reader and Zigbee respectively.[20]
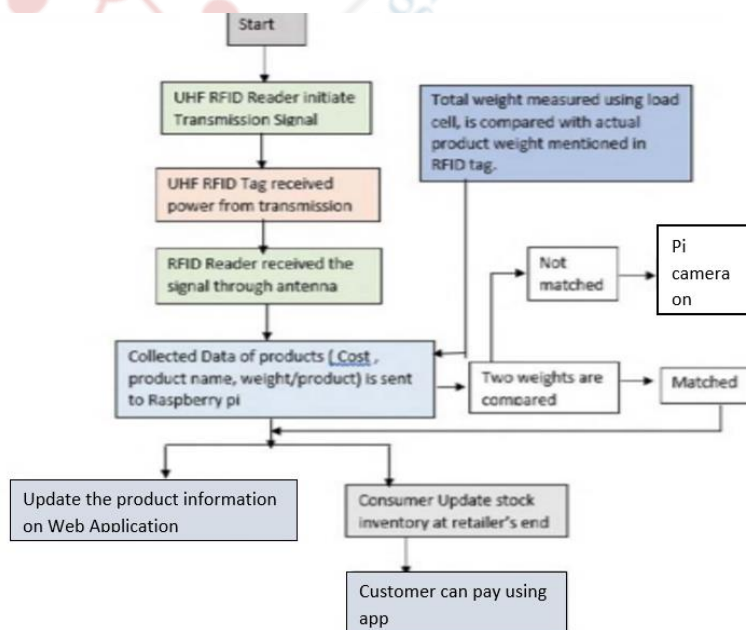
IV. FLOW DIAGRAM

Figure 2. Flow Diagram of Proposed System

STEP 1: RFID Reader initiate transmission
STEP 2: RFID Tag receives the transmission signal
STEP 3: RFID Reader identifies the product
STEP 4: Weight of the product is measured using Load Cell

STEP 5: If weight matches update the details in web application
STEP 6: Weight mismatch switch on Pi camera
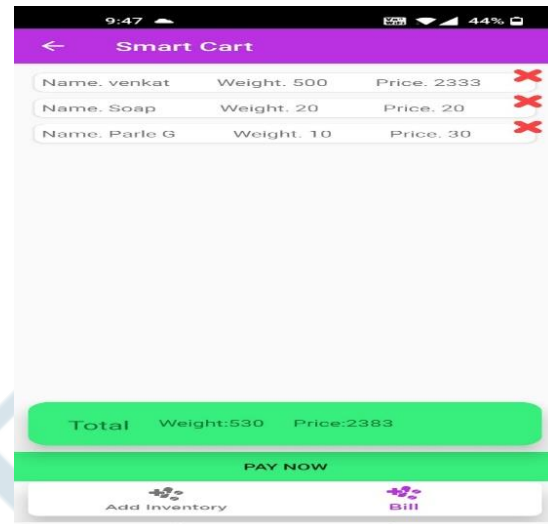STEP 7: Bill generated and payment on web application

V. RESULTS

Figure 3. Implementation of Proposed Smart Cart and Web Application

The smart shopping cart is implemented with all the mentioned features which can make the shopping process much easy in customers day to day life. The Application is developed using Android[7][8][9] Studio, and this application is compatible with all the devices. This feature allows the customers to use the app and pay conviently at their fingertips. The customers can move the cart by using Blue Dot application without any hassle. With the implementation of this cart it can be said that customers need not wait in long queues to pay the bill instead can shop anything at a go without any problem.

VI. CONCLUSION

The smart shopping cart and application provides customers a fast and easy shopping experience. With the implementation of features like driverless and web application it is very convenient for customers to shop anything at a faster rate. The smart shopping cart and mobile cart application can be easily operated and managed by customers. This prototype is user-friendly and simple to use and understand. With this the customers need not wait in long queues to pay bill. With the simple mobile cart application customers need not cross verify the bill amount as done in traditional shopping. Instead, the bill is automatically computed in the application after the items are scanned. It also helps for people who are unable to read as they won't require any additional assistance during shopping. They just have to scan the products and pay the bill using the application. This smart cart is a unique and user-friendly solution for easy and fast shopping.

REFERENCES

[1] Machike K, Golait M, Rathod R, Petkar R, Goche P. (2017). A new technology of smart trolley using RFID and ZIGBEE. International Journal on Recent and Innovation Trends in Computing and Communication 5(2): 256-259.

[2] Thiyagarajan M, Aejaz M, Kumar M. (2017). RFID based advanced trolley for super market. Special Issue 8.

[3] Prasad JS, Kumar BOP, Roopa D, Arjun AK. (2011). A novel low-cost intelligent shopping cart. IEEE 2nd International Conference on Networked Embedded Systems for Enterprise Applications, pp. 1-4.

[4] Karpagam V, Balapriya S, Kalairubini G, Kalaivani A. (2017). Smart trolley with smart billing. |International Journal of Computer Systems 4(3): 55-58.

[5] Gade A, Bhatt N, Thakare N. (2018). Survey on energy efficient cloud: A novel approach towards green computing. Helix 5(5): 3976-3979. https://doi.org/10.29042/2018-3976 -3979

[6] Chandrasekar P, Sangeetha T. (2014). Smart shopping cart with automatic billing system through RFID and Zigbee. Information Communication and Embedded Systems (ICICES 2014), pp. 1–4. https://doi.org/10.1109/ICICES. 2014.7033996

[7] Ms. Rupali Sawant, Kripa Krishnan, Shweta Bhokre, Priyanka Bhosale (2015). The RFID based smart shopping cart. International Journal of Engineering Research and General Science 3(2): 275-280.

[8] Dawkhar K, Dhomase S, Mahabaleshwarkar S. (2015). Electronic shopping cart for effective shopping based on RFID. International Journal of Innovative Research in Electrical, Electronic, Instrumentation and Control Engineering 3(1): 84-86. https://doi.org/10.17148/IJIREEICE.2015.3117

[9] Ambekar K, Dhole V, Sharma S, Wadekar T. (2015). Smart shopping trolley using RFID. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) 4(10): 3875-3877.

[10] Shelke CJ, Karde P, Thakre VM. (2015). Study of various perspectives of android security. International Journal of Innovative Research in Computer and Communication Engineering 3(10): 9667-9672. https://doi.org/10.15680/IJIRCCE.2015. 0310116

[11] Balaji S, Balamuruguan S, Marimuthu R. (2017). Smart shopping cart. IEEE Internet of Things Journal.

[12] Bedi H, Goyal N, Kumar S, Gupta A. (2017). Smart trolley using Smart phone and Arduino. Journal of Electrical & Electronic Systems 2(12): 6. https://doi.org/10.4172/2332-0796.1000223

[13] Thiyagarajan M, Aejaz M, Kumar M. (2017). RFID based advanced shopping trolley for super market. Research Gate Journal 8.

[14] Berdaliyev Y, James AP. (2016). Smart shopping cart using Zigbee department of electrical and electronic engineering school of engineering. Nazarbayev University Astana, Kazakhstan.

[15] Saad SS, Nakad ZS. (2011). A standalone RFID indoor positioning system using passive tags. IEEE Transactions on Industrial Electronics 58(5): 1961-1970. https://doi.org/10. 1109/TIE.2010.2055774

[16] Chandra Babu DVS. (2012). Wireless intelligent billing trolley for supermarket. International Journal of Advanced Research in Technology 3(1).

[17] Yewatkara A, Inamdarb F, Singh R, Bandale AA. (2018). Smart billing trolley via application. International Journal of Advance Research in Engineering, Science & Technology 5(3).

[18] Larsan Aro Brian A, Arockiam L, Sheba Kezia Malarchelvi PD. (2014). An IOT based secured smart library system with NFC based book tracking. International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) 11(5): 1821.

[19] Priyanka S. Sahare, Anup Gade, Jayant Rohankar (2019). A Review on Automated Billing for Smart Shopping System Using IOT. Review of Computer Engineering Studies.

[20] Dr. Mary Cherian, Disha DH, Chaithra KB, Ankita, Aishwarya (2017). BillSmart a smart billing system using Raspberry Pi and RFID. International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE) Vol 5 Issue 5 May 2017.