DESIGN AND APPLICATION OF ZIGBEE TECHNOLOGY-BASED SMART SHOPPING CART SYSTEM USING RFID AND IOT

[1]Dr G Sairam, [2]Dr Tejawath Rama Krishna, [3]Sujatha Kaipa, [4]Rasagnya
[1,2]Professor, [3]Assistant Professor, [4]UG Student [1,2,3,4]Department of Electronics and Communication Engineering, Rishi MS Institute of Engineering and Technlogy for Women, Kukatpally, Hyderabad.

ABSTRACT
On weekends, holidays, and during sales events, there is a sizable crowd at supermarkets and shopping centres nowadays. People make a variety of purchases and load them into a cart. He or she must go to the billing counter for invoicing and payment after making their entire buy. At the moment, only the billing counters in supermarkets use barcode scanners to process payments. Customers occasionally complain about insufficient product information and wasted time at the cash registers. An RFID-based smart shopping system is suggested as a solution to this problem. Each product in this system has an integrated RFID tag. When a product is added to the cart, the cart's integrated technology with the help of RFID reader immediately reads the product information and after this, each product information is showed Mobile application. Hence, billing is made from the mobile itself preventing customers from waiting in a long queue atcheckout.
Keywords: Arduino UNO, RFID Reader Module, RFID Cards, Buzzer, Mobile Application.

1. INTRODUCTION

Customers go to supermarkets to get the items they need on a daily basis and pay for them. After finishing their shopping, customers must wait in line at the billing terminals until the merchandise is billed, creating lengthy lines. The barcode approach is currently used in malls. Each product in this system has a barcode label that can be read by a barcode reader that has been specifically created for the purpose. Long lines are a result of the time-consuming barcode method.

The emergence of new technology like radio frequency identification devices (RFID) and wireless networks has sped up, made transparent, and improved old retail operations. RFID plays an integral role in the applications of IoT. Datais distributed and received with a system consisting of RFID tags, an antenna, an RFID reader, and a transceiver. They are heavily used to track items in production environments and to label items in supermarkets. They are usually thought of as anadvanced barcode.

2. LITERATURE SURVEY

In the paper entitled “electronic shopping using barcode scanner”, consists of barcode scanner for product identification and an LCD display that informs consumer about product details, when the customer is done with shopping, he can just press the End shopping button and the details are sent to the server [1]. M. A. Lambay [2] developed “Automated Billing Cart”, this model has a cart which consists of a barcode scanner by which customer can scan the product and automatically the product details stored in the database will be displayed on androidapplication. The barcode scanner system is a slow process. The efficiency of RFID is better than the barcode system [3], when the electronic tags come in range of reader it reads the stored data wirelessly which is known as RFID technology [4], A. Wani [5] proposed “RFID based intelligent trolley system using Zigbee”, this systemuses RFID technology when the consumer put any product in trolley tag will be detected as the products are added costs will be added to total bill and data will be transferred to computer via zigbee module.

3. PROPOSED METHODOLOGY

In this system we have a shopping trolley which is integrated with a RFID reader, Arduino uno, Bluetooth module and products are tagged with RFID tags. When thecustomer drops an item into the trolley the item is automatically read by the RFID reader that get the details of the products and sends it to the android mobile application via Bluetooth module. Customers can easily know the product details onmobile application and they can pay bill directly in the mobile app and complete their shopping in the mean time.

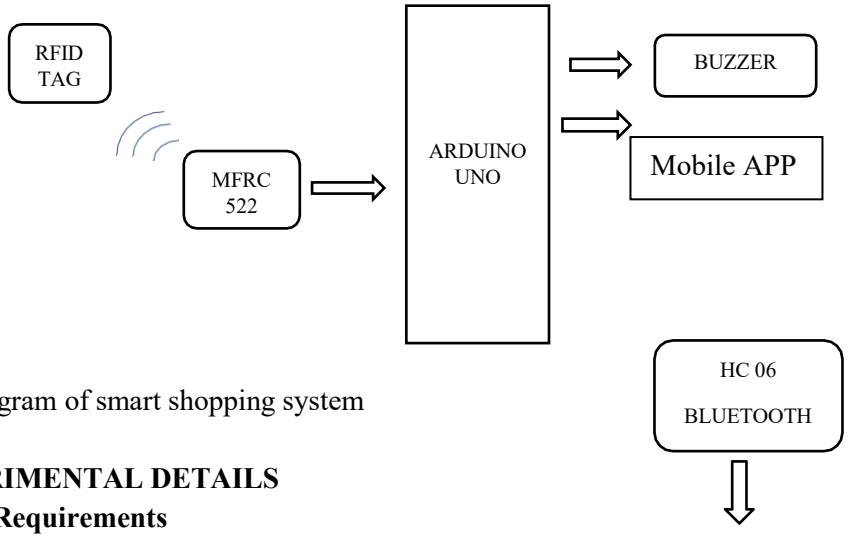

Fig 1: Block diagram of smart shopping system

4. EXPERIMENTAL DETAILS

Hardware Requirements

RFID READER:

RFID modules can read and write tags. MFRC522 is a device that uses radio- frequency waves to transfer data between itself and a RFID tag in order to identify, categorize and track assets in a specific range of 0-60mm. The RC522 RFID Reader module uses 13.56MHz electromagnetic field to communicate with the RFID tags.

Fig 2: RFID Reader MFRC522

RFID TAG

These tags provide the storage to store data. We use passive RFID tags that have nointernal power source and instead are powered by the electromagnetic energy transmitted from an RFID reader.

Fig 3: passive RFID tags

ARDUINO UNO

The Arduino Uno is an open-source microcontroller programming board supportedby the microchip

ATmega328P microcontroller. The board has 14 digital I/O pins, 6 analog I/O pins, and is programmable with the Arduino IDE via a USB cable. It will be powered by a USB cable or by an external battery. It's operating voltage is 5V, with an input voltage of 7 to 12V.

Fig 4: Arduino uno

BLUETOOTH

The HC 06 is a Bluetooth module designed for transparent wireless serial communication. When it is paired to a Bluetooth device such as PC, smart phones, It's operation becomes transparent to the user. The operating frequency is 2.4GHz and operating voltage is 3.3 to 5V.

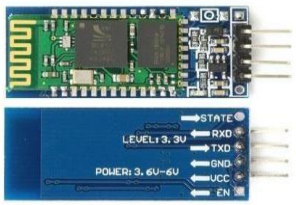

Fig. 5: Bluetooth HC-06

BUZZER:

Piezo buzzer is electronic device which consists of two pins ground and power. Here the buzzer is used to produce sound when consumer scan the product. It produces sound on the basis of piezoelectric effect.

Fig.6: Piezo buzzer

Software

ANDROID APPLICATION: An android application for smartphone or tablet is developed. That application is installed in the android supported device, which embedded with electronic circuit of the shopping cart.

5. FLOWCHART OF PROPOSED SYSTEM

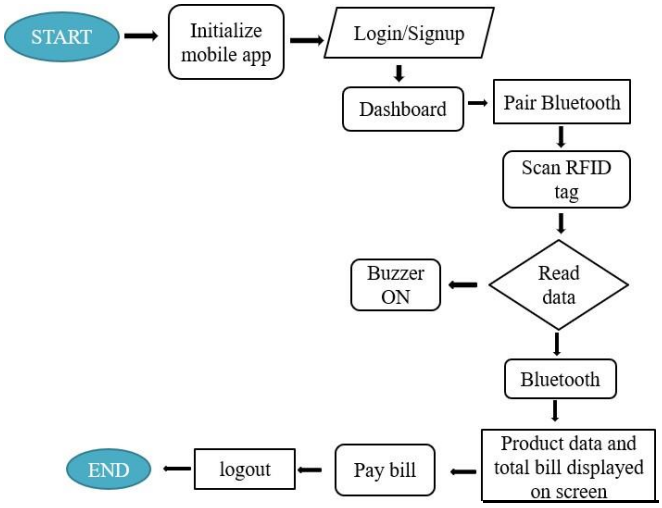

Fig 6: Flowchart of smart shopping system

6. RESULTS

The overall interfacing of Arduino uno, RFID reader, Bluetooth module is shownin fig. 7

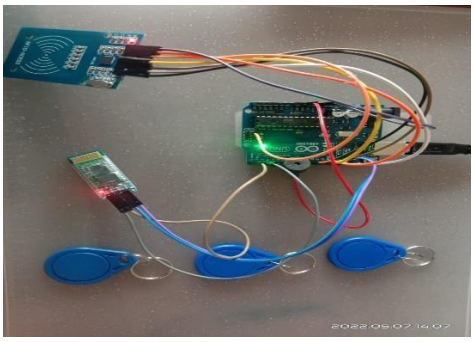

Fig.7: Hardware implementation

When the customer logins to the mobile app, it directs to the dashboard, and he/sheneed to pair the Bluetooth of respective cart to their mobile phone and when the product is scanned, the buzzer will on and the product details will display on the screen along with total bill as shown in fig.8(a) and 8(b). After total purchase, he/she can pay the total bill in the app using payment option as shown in fig.8(c).

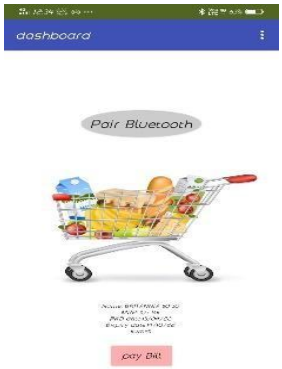

Fig.8(a)

Fig.8(b)

Fig.8(c)

CONCLUSION AND FUTURE SCOPE:

The Smart Shopping Cart is set up such that when an item is scanned by a client for purchase, the customer can automatically pay the bill within the mobile application. Due of the lack of lengthy lines, this programme facilitates efficient customer management while also attracting customers. When compared to barcode systems, this system is more advantageous, and users may shop more effectively by implementing RFID technology. Future improvements could include automating the cart and making an effort to lower the overall cost.

REFERENCES

1. M. R. Mane, N. G. Amane, S. D. Patil, and A. L. Lakesar, ‘‘Electronic shopping using barcode scanner,’’ Int. Res. J. Eng. Technol., vol. 3, no. 4, pp. 1–5, 2016.
2. M. A. Lambay, A. Shinde, A. Tiwari, and V. Sharma, ‘‘Automated billing cart,’’ Int. J. Comput. Sci. Trends Technol., vol. 5, pp. 148–151, Mar./Apr. 2017.
3. S. B. Miles and S. E. Sarma, and J. R. Williams, RFID Technology and Applications. 2008, doi: 10.1017/CBO9780511541155.
4. V. Rajaraman, ‘‘Radio frequency identification,’’ Resonance, vol. 22, no. 6, pp.549–575, Jun. 2017, doi: 10.1007/s12045-017-0498-6.
5. A. Wani, K. Thakur, N. Vaze, M. Vadhel, and P. R. Advirkar, ‘‘RFID based intelligent trolley system using ZigBee,’’ Int. J. Eng. Comput. Sci., vol. 4, no. 3, pp.10886–10889, 2015.