
Low Cost Microcontroller Based Automatic Billing System with Protective Shielding from RF Waves

C. Suganthi Evangeline*, B. Daniel Prince Thiyagarajan**

*ECE Department of Karunya University, India

**UG Scholar in ECE of Karunya University, India

Article Info

Article history:

Received Jan 2, 2016

Revised Mar 23, 2016

Accepted Apr 11, 2016

Keyword:

RFID Reader and Tags

Shopping Malls

Smart Cart

ABSTRACT

Shopping Mall is a complex of shops representing various merchandisers that enables the customers to buy all their needed things. As it is easier for people to come and buy all their things in a common place, shopping malls are crowded. As people are coming in large numbers to buy the groceries and house hold products for the full month, the billing counters are flooded with people. In order to avoid such large queues at the billing counter, we are coming up with Smart Cart using newly evolved RFID Technology. In our proposed method, the bill is automatically generated in the trolley as the customer purchases the product.

Copyright © 2016 Institute of Advanced Engineering and Science.
All rights reserved.

Corresponding Author:

C. Suganthi Evangeline,

Assistant Professor in ECE Department of Karunya University, India

Email : evangelineme4@gmail.com

1. INTRODUCTION

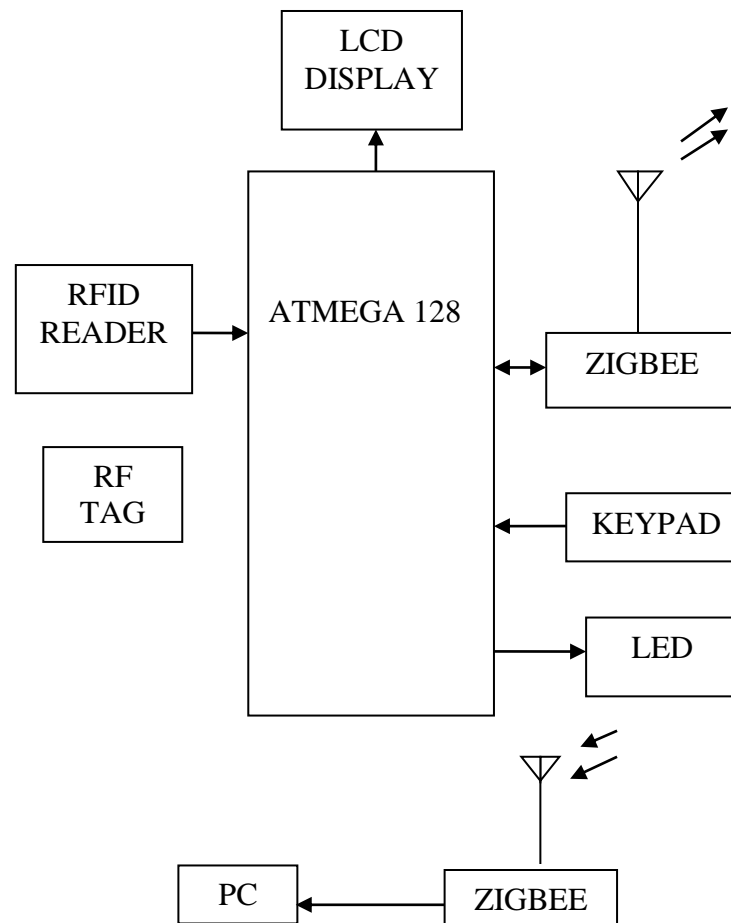
In ancient days people travel a long distance for getting a particular household thing. They travel from shop to shop in search of that product which they want to buy and finally return home after journeying quite a lot of places. But nowadays everything from all over the country is available under one roof (i.e.) Super markets and hyper markets. And these super markets experience heavy crowd every day. It tests the patience of the customers when they go all day around the mall for their purchase and even after that it makes them stand in a long queue for billing. The biller has to scan each and every product for every individual customer, which eats a lot of time.

To overcome the above mentioned problem, all the products in the mall have RFID tag attached to it and the cart have RFID reader in it which detects the product along with its price. The bill is automatically generated in the trolley as the customer purchases. After the shopping is over, the bill is transmitted to the counters near the exit. The customers have to just pay the total purchase amount in the counter and get their purchased products home.



Figure 1. Current scenario in shopping malls

2. BLOCK DIAGRAM



3. DESCRIPTION

Atmega 128 microcontroller is an 8 bit microcontroller which consist of

In the developed prototype LCD module interfaced with Atmega 128 microcontroller uses the port A for data pins connection and few pins of port B for control pins connection.

The LED module utilizes the Port C in Atmega 128 controller, which is used for indicating the condition of the trolley.

RFID Reader uses the Port D which consist of the transmitter and receiver pins used for serial communication with the Atmega 128 microcontroller.

The RFID tag is affixed with every product present in the Shopping mall.

The ZigBee module [9] utilizes the second set of transmitter and receiver pins available in Port E for serially communicating the bill. For serial transmission ZigBee needs to be interfaced with MAX 232 IC in order to be interfaced with the Atmega 128 microcontroller [3].

The keypad module is connected to the Port F of the Atmega 128 microcontroller.

The ZigBee receiver module is connected to the Computer present near the exit to receive the bill details along with the Trolley Number.

4. HARDWARE USED

Controller:

The trolley which we designed as a prototype, we use Atmega 128 microcontroller, which has two serial communication ports available, one is interfaced with RFID reader and the other with ZigBee for transmitting the bill.

The controller has predefined lookup table stored in a memory location as the RFID reader reads the RFID tag and sends the value to microcontroller. The microcontroller compares the obtained value with the value stored in the lookup table. If both matches then the product along with the price will be displayed in the LCD Display. After the shopping is over, the controller is used to transmit the purchased bill serially to the computer available in the using ZigBee.

LCD unit:

In this project we use 20X4 LCD Display for displaying the current scanned product, its price and the total amount for the items purchased.

RFID Reader and Tag:

Basically there are two kinds of RFID tags, they are active and passive tags [1]. The active tag has battery life. The passive tags has no battery life. In this project, we use passive tags which are affixed to every product in the mall. The tags used in shopping malls have antennas present inside which have a range of one meter. The RFID reader can detect any tag which comes in that particular range. The RFID reader reads the code in the form of hexadecimal numbers.

ZigBee:

ZigBee Module is a cost effective, low-power consuming module, which uses wireless mesh networking standard [3]. ZigBee is basically used for secure network transmission but it has slow transmission rate. ZigBee has a transmission rate of $250k\text{ bits/s}$, best suited for data transmissions from an input device.

In this project ZigBee Transmitter is used to transmit the bill to the PC available near the exit, after the bill is paid the PC used to send signal to controller in the trolley through ZigBee receiver, in order to turn the LED Green.

Keypad Unit:

In this unit we have three keys:

i) To Add or Remove product

The first two keys are used to select the type of mode whether to add or remove a particular product.

ii) To transmit the bill

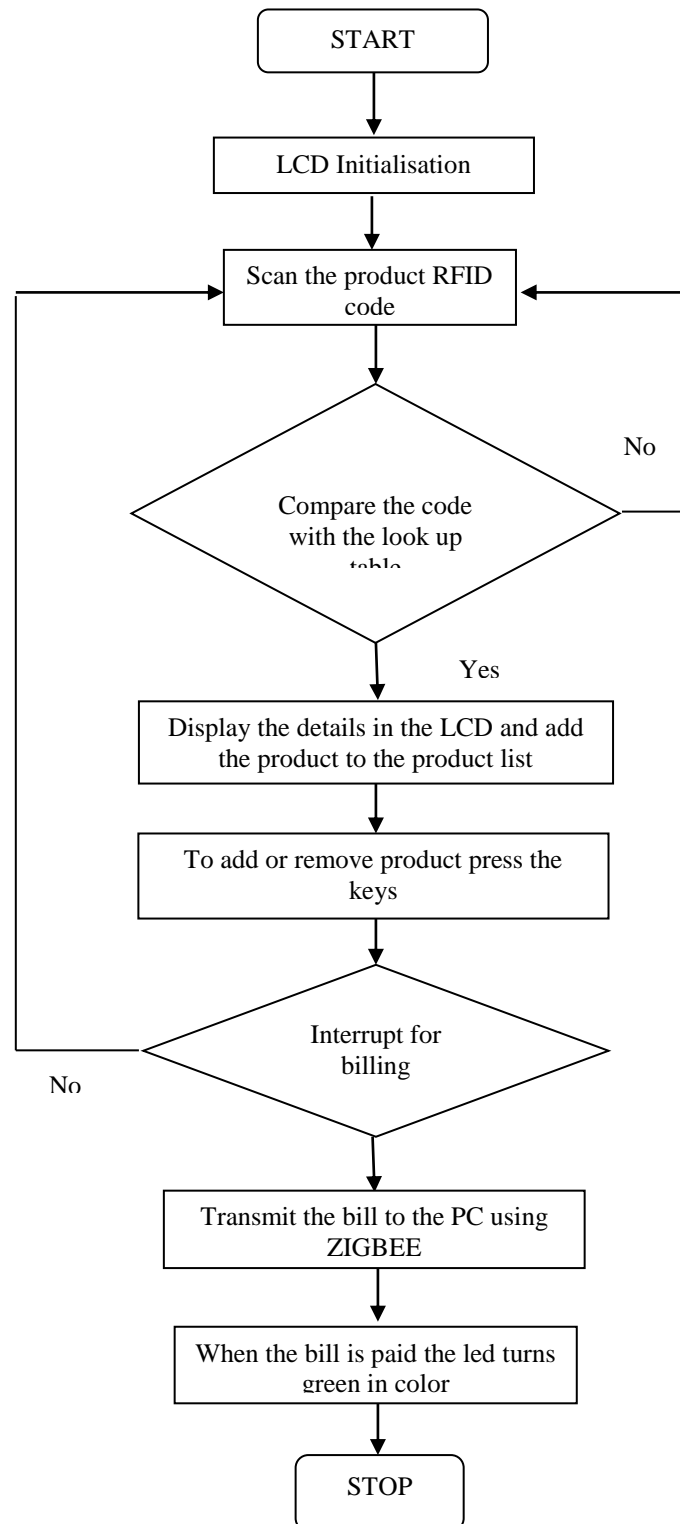
The third key is to send the bill serially to the computer which is near the exit using ZigBee transmission, when the key is pressed for the first time the microcontroller will ask for confirmation for sending the bill. When the key is pressed again the bill is transmitted.

LED unit:

The LED unit glows in red color when the purchase is done. After the purchase is over, the customer moves to the billing counter to pay the corresponding purchased amount. When the amount for the purchase is paid at the billing counter the LED turns into Green color by interrupt using ZigBee transmission from the PC.

This Green Light indicates that the trolley can be unloaded and it is ready to be used by another customer.

5. FLOW CHART



6. WORKING OF THE RFID TROLLEY

When the customer enters the Shopping mall, the customer picks up the Automatic Billing trolley and the LED in the trolley glows in green color which shows the trolley is in working mode.

- i) The LCD in the trolley displays the welcome note to the customer, and it waits for the customer to scan the article.

- ii) As the customer drops the product that he/she purchases into the trolley, The RFID reader detects the RFID tag present with the product.
- iii) As soon as the first article is scanned the LED turns into Red color.
- iv) The RFID reader sends the scanned information to the microcontroller present in the trolley in the form of Hexadecimal code.
- v) The microcontroller compares the obtained information with the value present in the lookup table found in the memory.
- vi) The lookup table contains all the information regarding each and every product along with its RFID tags hexadecimal code.
- vii) When the code matches, the product details along with its price and total amount of purchase is displayed in the LCD.
- viii) When a product needs to be added or removed, that particular action is selected using 'add or remove product' keys present in the trolley.
- ix) After the purchase is over, the customer needs to press the third key, to send the bill, the microcontroller asks for confirmation for transmitting the bill.
- x) To confirm the end of purchase press the same key again, when pressed the bill is serially transmitted along with their trolley number using ZigBee Module.
- xi) The customer now needs to go near the exit and pay their bill and gets their purchased item unloaded.
- xii) As the customer pays the bill the LED module turns Green again to indicate the trolley is ready for next purchase.

7. ADVANTAGES

- i) Reduces the queue in the billing counter and thereby using time effectively.
- ii) The implementation of smart trolley reduces the need of manpower.
- iii) It helps the customer to manage the total amount of their purchase before paying the bill.

8. DISADVANTAGES

- i) The trolley needs continuous battery backup, if it stops in the middle of the purchase it leads to confusion among customers.
- ii) Using RFID tags for all products proves costlier than barcode.

9. IMPLEMENTATION

i) Proteus Simulation

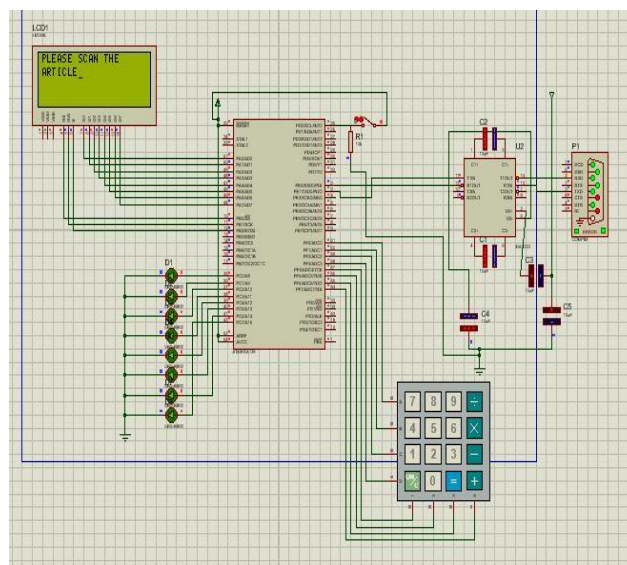


Figure 2. Proteus Simulation of the Project

ii) Hardware Implementation

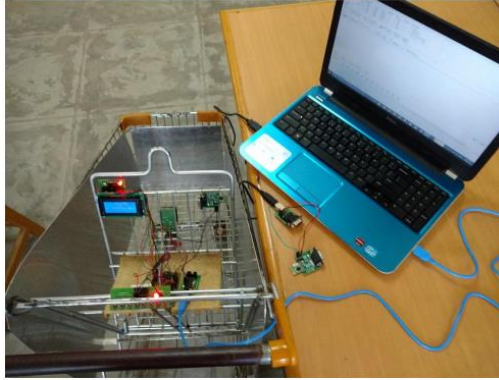


Figure 3. Smart Trolley

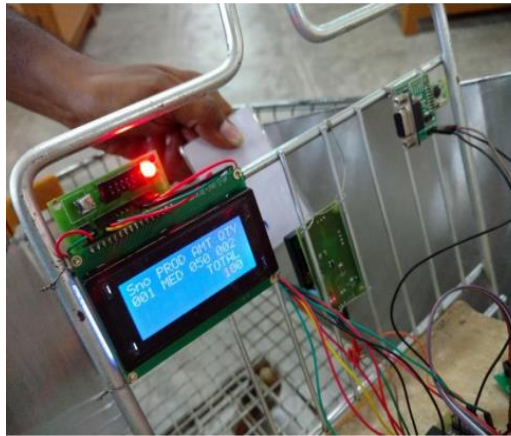


Figure 4. LCD shows the details of item

10. CONCLUSION

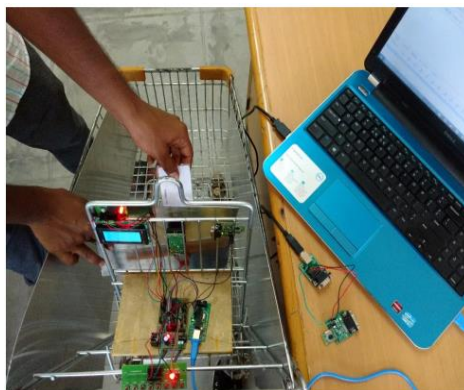


Figure 5. Shielding of RF waves using aluminium sheet

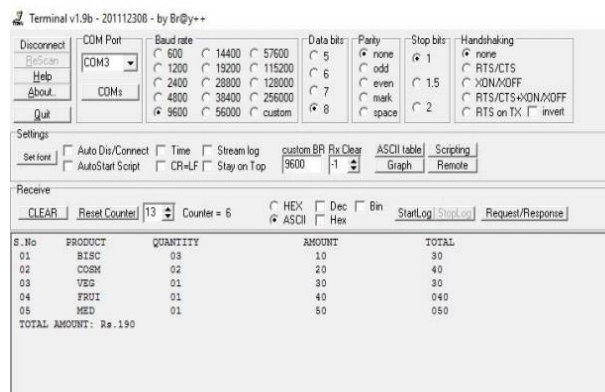


Figure 6. Transmitting Bill to PC

Thus the newly evolving RFID technology is effectively used in developing a smart trolley which primarily reduces the queue in the Shopping malls and thereby enables saving of time, energy of both the customers and the people working in the malls under billing counter.

REFERENCES

- [1] Galande Jayshree, Ratuja Gholap, Preeti Yadav, "RFID Based Automatic billing Trolley", *International Journal of emerging Technology and Advance Engineering* (ISSN:2250-2459, ISO 9001:2008, Volume 4, Issue 3, March 2014).
- [2] Satish Kamble, Sachin Meshram, Rahul Thokal, Roshan Gakre, "Developing a Multitasking Shopping Trolley Based On RFID Technology", *IJSCE* (ISSN: 2231-2307 Volume-3, Issue-6, January 2014).
- [3] Raju Kumar, K.Gopalakrishna, K.Ramesha, "Intelligent Shopping Cart", *IJSIT* (ISSN: 2319-5967, ISO 9001:2008, Volume 2, Issue 4, July 2013).
- [4] Parvathi S J, Nagarathna, "RFID Based Supermarket Queue Prevention and Automation System for Physically Challenged People", *IJCSITR* (ISSN 2348-1196, Volume 3, Issue 2, April- June 2015).
- [5] T. Shanmugapriyan, "Smart Cart to Recognize Objects based on User Intention", *IJARCCCE*, (ISSN: 2278-1021, Volume 2, Issue 5, May 2013).
- [6] J. Thangakumar, S. Sainath, K. Surender, V. Vikram Arvind, "Automated Shopping Trolley for Super Market Billing System", (ICCMIT-2014, IJCA 0975-8887)
- [7] Ankit Anil Agarwal, Saurabh Kumar Sultania, Gaurav Jaiswal and Prakeet Jain on "RFID based Automatic Shopping Cart", in *Control Theory and Infomatics*; (ISSN 2225-0492, volume 1, No.1, 2011).
- [8] J. Awati and S. Awati, "Smart Trolley In Mega Mall", in *IJETAE* (ISSN: 2231-2307, Volume 3, Issue 6, January 2014).
- [9] Manish Kumar, Ramandeep Singh, "Home Appliances Using ZigBee on Atmega 128 Hardware Platform", *IJRET* (ISSN: 2319-1163, Volume 3, Issue 7, July 2014).