

Design of an Embedded High Efficiency Intelligent Smart Trolley

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Abstract: Now a day's people prefer to shop in big malls and it has become most common activity. As it has become a common activity we can see huge rush during special occasion and discount offers. People buy different product, groceries etc. They put purchased items in the trolley and wait near the billing counter for the payments. Using bar code reader the cashier will generate the bill and give it to the customer. The main aim of this task is to develop a new system and give a solution to above problem. The items are attached with the RFID tags and those items are placed in trolley. All the items in the malls are attached with RFID tags. When a person drops an item into the trolley, the code of an item is detected and item price is stored in the memory. The name of an item and its cost will be displayed on LCD and total cost is sent to billing Counter by Bluetooth module. Total amount of the shopping is also displayed on the LCD display screen.

Keywords: ESP, ESP module, IoT, LCD display, RFID reader, RFID tag, Shopping malls, Trolley.

1. Introduction

People get the daily needs and requirements in the shopping mall. During some unspecified time the customer will have the incomplete information about the sale and the customer need to wait near the billing counter to pay the bill of shopping. So up gradation in the billing system is required and system of shopping must be changed according to the customer requirements. Currently shopping malls are increasing throughout the world wide as of people demand and their expenditures in shopping in the shopping mall. During the time of festivals, discount sale and on holidays etc. there will be huge crowd in the shopping mall. The cashier use barcode reading technique and it always results in time consuming since the customer has to wait until whole items get scanned and read. This is disadvantages of existing system. It can be avoided and up graded by using IOT based embedded high efficiency intelligent smart trolley proposed in this paper. Instead of barcode here it uses the RFID technique. The new system uses separate RFID reader attached to each trolley and RFID Tag attached with each item. If customer purchases any item the RFID reader will read the tag which is attached to the item. One of the major features of proposed system is that when an item is removed from the trolley the cost of the item is deducted and updated cost is sent to the billing counter. The cost of each item

and total bill of the shopping is displayed on the LCD display.

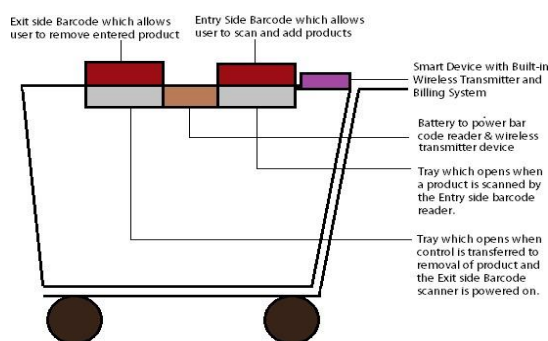


Fig. 1. Barcode trolley

2. Proposed System

The new idea of proposed system will help the customer during their shopping in the shopping mall as the billing system is automated. The proposed system is completely based on RFID reader with some basic technology. In the shopping malls and supermarkets this new system uses separate RFID reader attached to each trolley and RFID Tag attached with each item. This shopping trolley consists of RFID reader, IR sensor, power supply, Arduino and LCD display. Here the customers are given with RFID card for their identification during shopping.

3. Block Diagram of Proposed System

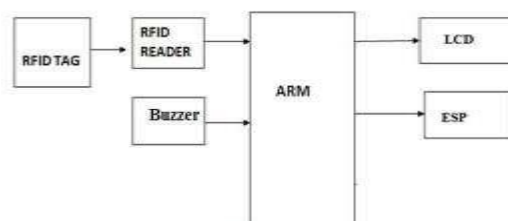


Fig. 2. Block diagram of transmitter

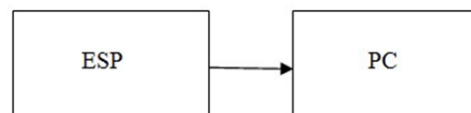


Fig. 3. Block diagram of receiver

In this proposed system helps to avoid the rush and queue in billing counter. Introduction to this new technology will help to reduce the difficulties of the customer near the billing counter while paying the cash. To invent the RFID (Radio Frequency Identification) this proposed System produces the WSN using microcontroller. Instead of barcode reader it uses the RFID. Here RFID Reader is an electronics hardware system that is attached to the trolley to make the shopping comfortable and have a good experience while shopping. When an item is scanned in front of RFID scanner the item name and cost of the item is also displayed on the LCD display. The major benefit of this system is when an item is removed from the trolley the total cost gets deducted and updated bill is showed in the billing counter. Every detail is stored passed to the memory and stored in the computer device.it helps to reduce the work of the shopkeeper and reduce the time.

4. System Objectives

Barcode systems are upgraded using Radio Frequency Identification (RFID) techniques. RFID technology gives an automated identifying method. It stores and retrieves the data. RFID tag is attached with each item. Radio waves are used to differentiate between humans, animals and other objects. RFID tags consist of silicon chips and antennae. Here in this paper the proposed system tend make happy shopping to customer and reduce the rush near bill counter. The proposed system has the capacity to calculate the total amount mechanically and display it on the LCD display. Here it helps the customer ton directly pay the amount of their shopping and need not wait in the queue.

5. Hardware and Software used in Proposed System

A. LCD display

Here LCD is of 16X2 where it displays 16 character for each line and it consists of 2 such lines. Here each character within display are 5X7 pixel matrix. These LCD are categorized into two registers. They are command register and data register. In the LCD the command register store the command instructions. These instructions are those which helps the LCD to perform some predefined task like clear the screen and have the control over the cursor to perform task like set the cursor position, size etc. It will have the control over the display.



Fig. 4. LCD display

B. RFID reader and tag

The RFID technology helps to group all the information from the RFID tag which is attached to an each item. Radio wave acts as a medium to transfer a data from RFID tag to RFID reader.

RFID is an upgraded version of barcode reader. It is an upgraded technology that consists of electronic field and radio frequency. These helps to identify an object automatically where each items are attached with an RFID tag.



Fig. 5. RFID reader and tag

C. Pin Diagram

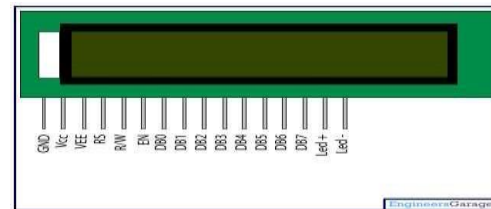


Fig. 6. Pin diagram

Arduino Uno is one of the best electronic and coding board. This is an Arduino pin it consist of 16 pin which is compressed in Arduino board. And it acts as a microcontroller where all the programmable codes are dumped into it.

D. Bluetooth Module

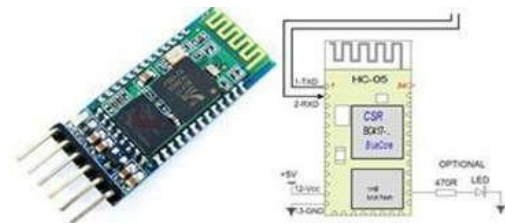


Fig. 7. Bluetooth module

Bluetooth is a device that provides a connection between computer and mobile phones. It also supports the handheld device and helps to connect to the internet. It does not require any cable to connect to the other device.

6. Interfaces

A. Hardware Interface

- Mobile Devices

The mobile devices like smart phones and also LAN networks are hold by this external hardware interface.

- RFID Reader Module

RFID reader which reads tags that is used to track the individual objects, these are used in RFID scanner module.

- Operating System

This product will work with Android 2.1 and above.

- RFID Card

A radio frequency identification reader (RFID reader) is a device used to collect data from RFID tags that is used to trace single or separate objects.

7. Flow of the Application

Initially the customer will be given with a smart card which is RFID specified. The customer can start their shopping by taking trolley provided to him by scanning his smart card on the other side of the RFID reader in the trolley. After authentication customer details displayed and then they are allowed to start their shopping with the message. If customer presses the asterisk ‘\$’ in the keypad which in turn displays the available products and the customer can insert the items into the trolley. Customer starts shopping and he scans items which are needed with RFID tag in the RFID reader of the trolley and the scanned items/products is placed into the trolley. LCD also displays the details of the items/products and total cost of shopping the customer had done. During this process IR sensor will identifies the number of products that are removed, which helps to cross check the number of products scanned and number of products removed from the trolley. Light emitting diode helps in preventing the theft and also avoids dropping of products accidentally which are not been scanned. This process repeats until customer finishes his/her shopping. Whenever customer needs to remove an item/product, remove button that is ‘*’ present in the keypad should be pressed for remove operation such that the product is removed by rescanning and also satisfying the condition that the scanned product id should be present in the shopping bill/ list. The cost of product removed is subtracted from the total cost during this removing process and LCD displays the updated cost. After customer finished shopping he should to press hash ‘#’ then the total cost of the bill is displayed in the LCD. After successful payment the customer can take away the products.

8. Flow chart of the billing System

The figure 8 shows the flowchart of the billing system. Flow diagram is explained as follows.

- Step 1: Start the process.
- Step 2: If the customer hit the start button then the system will gets start and all the components starts working.
- Step 3: Customer need to search for the required product.
- Step 4: When the customer enters the required product then the product detail will be extracted from the database.
- Step 5: If the entered product is available then it displays its location otherwise it will display none.
- Step 6: When the customer drops any item in the trolley, RFID reader will read the tag.
- Step 7: Then the item details like item name, card number, price etc. will be displayed on the LCD screen.
- Step 8: If the customer wants to remove any item then they can press the remove button.
- Step 9: The item will be removed and the price will be subtracted from the total amount.
- Step 9: Then the total amount will be displayed on the LCD display.
- Step 10: If the budget is exceeded then the buzzer will be on so that we have to remove the item.

- Step 11: After that we can print the bill.
- Step 12: If the customer has the registered user card the payment can be done by swapping in the trolley itself.
- Step 13: All the information about the product will be displayed on the LCD screen and also it will be sent to the counter.
- Step 14: And the process will continue like this.

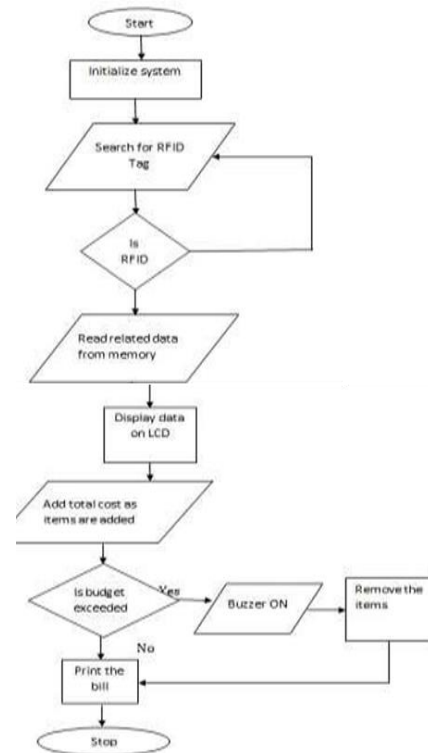


Fig. 8. Flow chart

9. Disadvantages of Existing System

- Large database will be required.
- It is not possible to track the item information if RFID tag is abraded.
- Needs constant battery backup for RFID.
- Customer needs to wait in queue.
- Customers spend most of their time in billing system.

10. Advantage of Proposed System

- Reduces the man power required to purchase the item.
- At the time of shopping the customer will get to know the total bill.
- Avoids waiting in the billing counter.
- Increases customer satisfaction
- Displays all the information about the item like item name, price and expiry date etc.
- Does not require any special training.
- Customer can get all the information at the time of shopping.
- Saves the time.

- Bluetooth module is used to send the total amount to the main system.

11. Application of Proposed System

- Used in supermarkets, malls and airports.
- There is no repetitive checkout and scanning of product.
- It is used in shopping mall for automatic billing.
- It can be used as a common observatory system for the owner that they can get all the information about all malls from anywhere.

12. Conclusion

- We came to conclusion that the smart trolley is necessary for the marketing industry for the fast billing.
- The process is easy for customer.
- The use of LCD and android app make the system user friendly.
- It will reduce the rush at the billing counter. Customer can get the bill through android app.
- The customer can make happy shopping with this model.

13. Future Scope

The future implications of the proposed system are very promising considering the amount of time and resources that it saves. The transaction and billing system can be linked with bank account of individual user to make direct payment provided that security issues are being taken care of. Also, the trolley can be further designed to search products in shelves and

guide the user accordingly to the position of the exact product. Grocery shopping is one of the most fundamental everyday activities. For most customers a shopping list is an integral part of the shopping experience. We can usually find people going to the malls in order to get items in bulk. Hence our project smart trolley is designed where customers can buy any number of items and can drop it to the smart trolley. The complex procedure of counting the items in the trolley will be reduced since the RFID is attached to each system. Hence reducing the work of customers as well as shopkeepers. In future this project can be implemented by adding more modules and also an android or ios system can be developed.

Acknowledgement

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References

- [1] Ekta Maini, and Jyoti Sheltar, "Wireless Intelligent Billing Trolley for malls", *International Journal of Scientific Engineering & Technology*, volume 3 Issue 9, 1175-1178, September 2014.
- [2] Satish Kambale, "Developing a multitasking shopping Trolley Based on RFID Technology", *IJSCE*, volume 3, Issue 6, pp. 179-183, January 2014.
- [3] Vadita Gangwal, "Smart Shopping Cart for Automated Billing using Wireless Sensor N/W", *International Institute of Informational Technology*.
- [4] Hiren Jethava, "Electronic shopping cart facility for blind people using USB firmware", *International journal of Emerging Technology and Advanced engineering*, volume 4, Issue 6, pp. 647-651, January 2014
- [5] Nisha Ashok Somani, "ZIGBEE: A low power wireless technology for industrial applications", *International Journal of control theory and computer modeling*, volume 2, pp. 27-33, May 2012.
- [6] Aniket Wani, "RFID Based Intelligent Trolley system using ZIGBEE", *International Journal of Engineering & computer science*, volume 4, Issue 3, pp. 10886-10889, March 2014.