

Wireless Intelligent Billing Trolley for Malls

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ABSTRACT : *Microcontroller based design, has acquired the status of most happening field in electronics. This is highly specialized field that has the power of integrating thousands of transistors on single silicon chip. Nowadays, in mall for purchasing variety of items it requires trolley. As we know that there is a huge crowd in the malls in metro cities. Specially it becomes more crowded on holidays. People purchase different items in the malls and puts them in the trolley. At the cash counter billing process is done using bar code scanner. This is very time consuming process. To avoid this we are developing a system which we call as Wireless Intelligent Billing Trolley for Malls. In this system we are using RFID tags instead of barcodes. This RFID tags will be on the product. Whenever the customer puts a product into trolley it will get scanned by bvgfc RFID reader and product price and cost will be display on LCD display. Like this the process goes on. We are using ZIGBEE transmitter which will be at trolley which is used to transfer data to main computer. At the main computer ZIGBEE receiver will be placed which will receive data from transmitter. The heart of circuit is an ARM7 (LPC2148), which is of NXP semiconductor (Philips) made IC. LCD used will be 16X2 alphanumeric display . It will be used to display products names, products cost etc.*

Keywords— Barcode scanner, Development Board, RFID, Zigbee Technology, microcontroller.

1. Introduction

Barcodes have been in existence for many years and have been used by departmental stores and supermarkets to manage purchases of merchandize by customers and keep track of inventory. However, the barcode system is no longer the best way to business operation. Customers are tired of waiting in long, slowly moving checkout line in departmental stores, especially, in holidays. With the decrease of prices through efficiencies of technology and large-scale production of semiconductor wireless components, there has been a search for new markets in which semiconductor chips can be used. This has led to the use of RFID also known as smart tags. RFID stands for Radio Frequency Identification. The intelligent shopping cart is equipped with Radio Frequency Identification (RFID) for product identification with the shop's server. Besides, it also has an LCD display that informs customers about the product prices, discounts, offers and total bill. As soon as the object is dropped into or moved from the cart, the RFID tag identifies the product and updates the bill. When the customer is done with shopping, he can just press the 'END SHOPPING' button and the details are sent to the shop's server and the customer has to pay just the amount and leave. The proposed cart is easy to use and does not need any special training. The cart's inbuilt automatic billing

system makes shopping a breeze and has other positive spin-offs such as freeing staffs from repetitive checkout scanning, reducing pilferage and increasing operational efficiency in stock taking.

2. Existing System

2.1 Traditional billing method

Currently available method in shopping malls is barcode method. In this method there are barcode labels on each product, which is read by a bar code scanner. A barcode reader (or barcode scanner) is an electronic device that consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain decoder circuitry analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port. When we select any product for buying we put it in the trolley and take it to the billing counter. The cashier scans the product through the barcode scanner and gives us the bill. But this becomes a slow process when lot of products is to be scanned, thus making the billing process slow. This eventually results in long queues.

2.2 Barcode vs RFID

If compared, RFID technology is found to be more comprehensive than barcode technology. It is possible to read RFID tags from a greater distance. An RFID reader can access the information of the tag from a distance of around 300 feet, whereas barcode technology can't be read from a distance of more than 15 feet. RFID technology also scores over barcode technology in terms of speed. RFID tags can be interpreted much faster than barcode tags. Barcode reading is comparatively slower because it requires a direct line of sight. On an average, a barcode reader takes around one second to successfully interpret two tags, whereas in the same time the RFID reader can interpret around 40 tags. RFID tags are well protected or either implanted inside the product, and hence is not subjected too much wear and tear. Interpreting a barcode requires a direct line of sight to the printed barcode, because of which the barcode is printed on the outer side of the product, and is thus subjected to greater wear and tear. It also limits the re-utilization of barcodes. As barcode lacks read and write facility, it is not possible to add to the information already existing on it. On the other hand rewriting on RFID tags is possible

3. Proposed System

3.1 Block Diagram

Trolley section

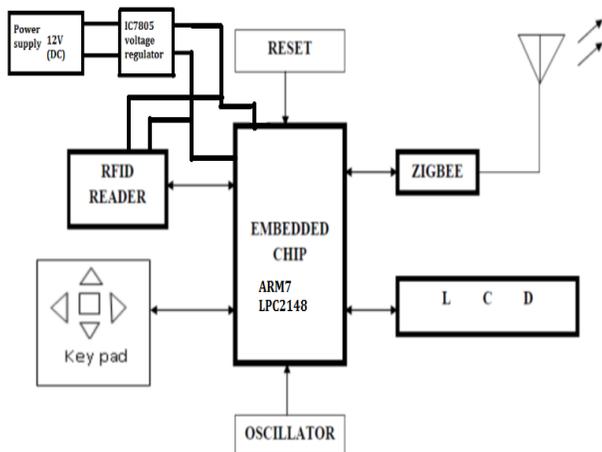


Fig.1. Block diagram of trolley section

Receiver Section

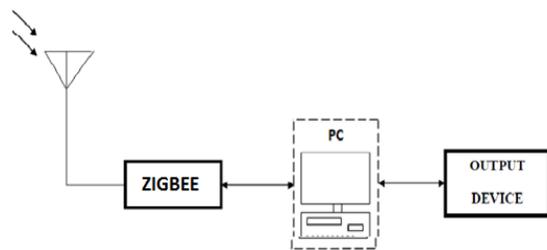


Fig.2. Block diagram of receiver section

3.2 System Architecture

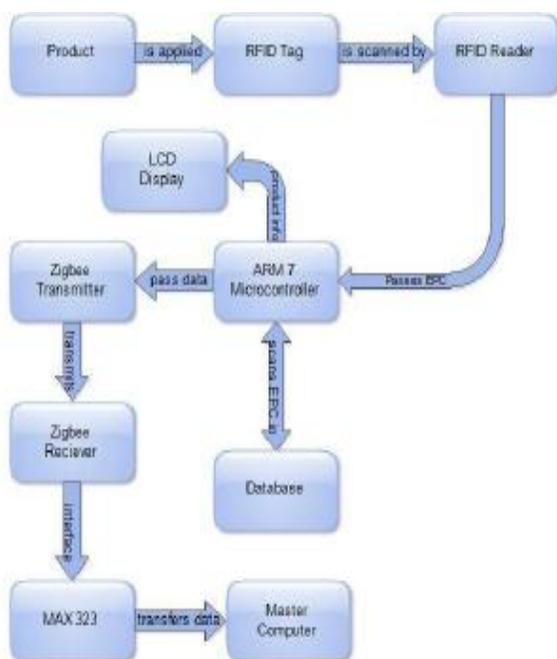


Fig.3. System architecture

In our Intelligent Billing Trolley system environment, each product will have the passive Radio Frequency ID tag which is bearing a unique Electronic Product Code.. This Electronic Product Code provides the info like name, price etc about the product. When the customer will put the product in the Intelligent Billing Trolley, the Radio Frequency ID scans the tag and the Electronic Product Code number is known by Radio Frequency ID reader. Radio Frequency ID reader passes the Electronic Product Code to the ARM 7 micro-controller where ARM 7 compares the Electronic Product Code with the database of the system containing various products. After that the name and price of the product obtained by the ARM gets displayed on the LCD display of the Intelligent Billing Trolley, where user can see the product information. The ARM 7 microcontroller also passes the data obtained from the database to the Zigbee transmitter from where the data is wirelessly transmitted to the billing computer. The master computer receives this data through Zigbee receiver

using Max 323 interface. Max 323 interface is the interconnection media between the Zigbee receiver and the computer

3.3. System Flow Chart

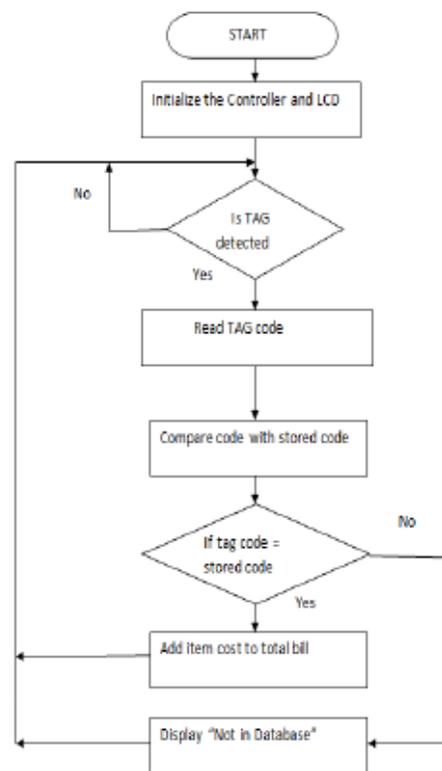


Fig.4. Flow Chart

1. All the items in the mall will be equipped with RFID tags. When person puts an item in the trolley, its code will be detected by RFID reader which is interfaced with processor.

2. Reader send this code to ARM processor, after matching code with codes stored memory, processor reads item's name, cost &

other details. Then it displays on LCD. The item details like name, cost & total bill of items inserted in trolley are displayed on LCD.

3. As we put the items, the costs will get added to total. Thus the billing is done at the trolley itself. Simultaneously all details are displayed on LCD. LCD used is 16X2 character alphanumeric type display. And also if we want to remove some inserted item then we press the delete key and remove a particular item. That item's cost gets subtracted from total bill and item removal message is displayed on LCD.

4. LCD is interfaced with microcontroller in 4bit mode. It is used to indicate the customers the action taken by customer that is inserting of an item, removal of item, item's price and total billing cost of items in the trolley.

5 At the billing Counter the total bill data will be transferred to PC by wireless ZigBee transmitter interfaced with processor. It is 2.4 GHz RF module which works in free ISM band so does not require licensing.

6.The ZigBee receiver is connected to billing PC using RS3232 protocol, it receives billing data & gives it to the PC for printing. This data contains all details of purchased items with total bill of items. The total bill is displayed in Visual Basics 6.0. It shows name of every item, its corresponding cost and the total bill of all products. The bill is displayed in VB after GET DATA is clicked in screen.

7.The data send by ZigBee contains all details of the items purchased i.e. name of the item, it's price etc.

8. RFID tags we are going to use are 125 KHz passive type tags. Transponder (tag) that is attached to the object. An RFID tag is composed of a miniscule microchip and antenna. RFID tags can come in a wide variety of sizes, shapes, and forms. Communication between the RFID Reader and tags occurs wirelessly and generally does not require a line of sight between the devices. An RFID Reader can read through most anything. The RFID Reader emits a low-power radio wave field which is used to power up the tag so as to pass on any information that is contained on the chip.

9.We are going to use ZigBee modules (transmitter & receiver) to transmit the billing details from trolley unit to the billing PC at counter wirelessly when customer completes putting the items in trolley and reaches at counter for billing. The person at counter clicks the GET DATA option and hence data is transmitted from trolley to the PC using ZigBee.

10. LCD is used as main output device for the customers. It displays the details of items, price and total bill etc to indicate the activity made by customer.

4. Advantages

- The main application of this system is at shopping malls to reduce the billing time and enhancing the shopping joy.
- It can be used anywhere like shopping markets where the barcodes are used to good solution which avoids barcode technology.
- Can also be employed to track items in stock.
- The proposed cart is easy to use and does not need any special training

5. Results & Observations

The hardware module developed for wireless intelligent trolley billing is as shown below. There are two separate sections, receiver section & transmitter. There is a Zigbee module for wireless transmission of data.



Fig.5. Module for Receiver Section



Fig.6. Module for Trolley Section

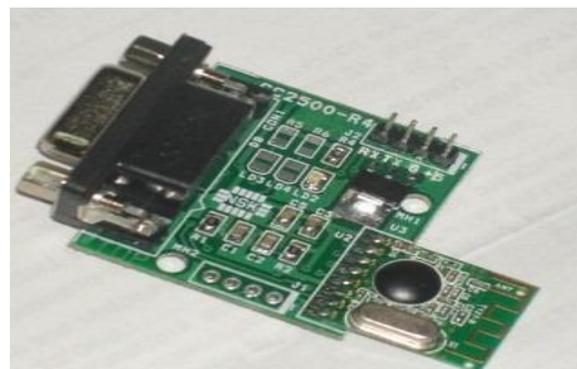


Fig.7. Zigbee module

The template shown in Fig.8. is developed using Visual Basic. This is displayed in the cashier's computer. The total amount and the items taken appears as shown.

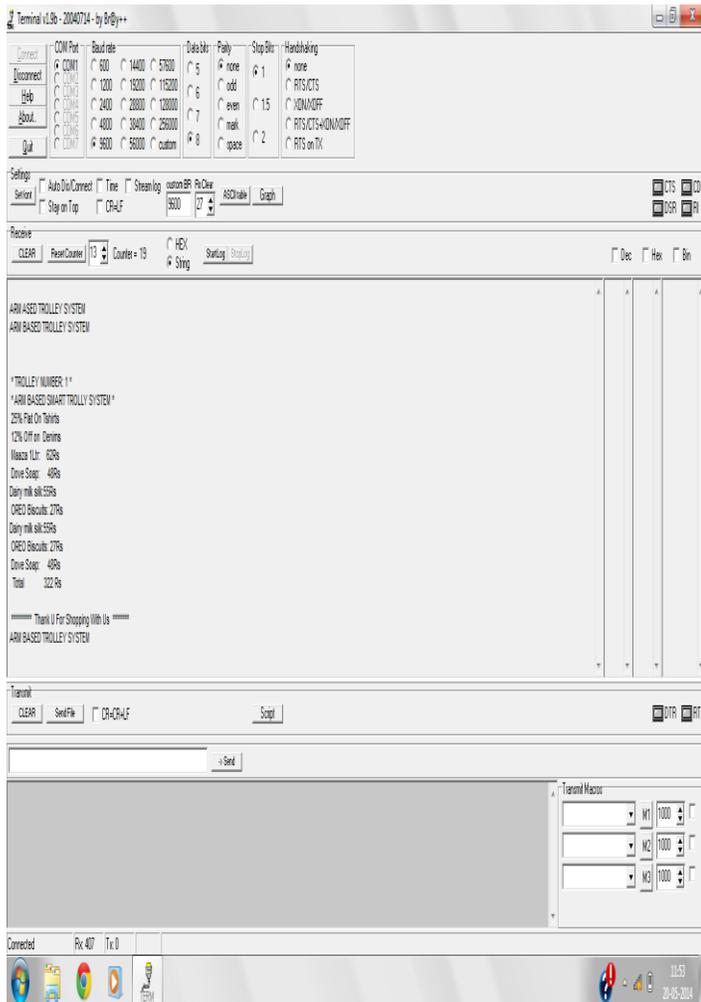


Fig.8. Template developed in VB

5. CONCLUSION

Concluding this paper, we would like to highlight that we drew the inspiration and idea of this paper after observing large queues at the sales and billing counters at the Retail bazaars. While working on this paper we learnt substantially about RFID technology, embedded systems and wireless systems, especially ZigBee modules alike. This system would help in cost saving at the supply chain level. At the same time it would also reduce the required no of salesmen. Thus it is truly time saving method and guarantees the less time consumption out of all present billing methods.

The cart's inbuilt automatic billing system makes shopping a breeze and has other positive spin-offs such as freeing staff from repetitive checkout scanning, reducing pilferage and increasing operational efficiency in stock taking.

6. REFERENCES

- i. *Stephen.B.Miles and Sanjay.E.Sharma,RFID Technology and Applications,Cambridge University Press,1st edition.*
- ii. *Myke Predko,Programming and Customising the ARM7 Microcontroller, Tata Mc.graw-hill,2nd edition.*
- iii. *<http://www.scribd.com/doc/60264988/IEEE-Projects-in-Embedded-Systems>*
- iv. *<http://www.engineersgarage.com/irfid-radio-frequency-identification-anddetection>*
- v. *Suryaprasad, J; Kumar, B.O.P.; Roopa, D; Arjun A.k: Network Embedded systems for Enterprise Applications (NESEA), 2011 IEEE 2nd International conference.*
- vi. *<http://truthdive.com/2012/01/18/Now-a-shpp-ing-cart-to-make-long-cash-countergueues-a-thing-of-the-past.html>*