RFID BASED SMART TROLLEY FOR SUPERMARKET AUTOMATION

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Abstract -*This paper describes about the designing of a trolley based on RFID reader for supermarket automation. An RFID reader with electronic hardware system is fitted with the trolley to make the purchase comfortable. Those items which are above the particular amount are fixed with the RFID card whose price is fixed into the reader. When item is shown in front of the reader, the amount of the item is added to the purchase bill, and is shown on the LCD display. The trolley is programmed in such a way that it will find the rack number displayed on the LCD. It also has the provision for removing the items from the trolley where the cost is removed from the total cost .Once the items are added, the cost is added up and when it crosses the certain limit, it gives an alarm signal to indicate that the customer budget has exceeded. All this information is send to a computer for billing update through wireless link called Zigbee network, which facilitate the billing system even faster and reduces time.*

Key Words: RFID reader, RFID card, LCD display, Zigbee network.

1. INTRODUCTION

Shopping mall is a place where people get their daily necessities ranging from food products, clothing electrical appliances etc. Nowadays a number of shopping mall has increased around the globe. Sometimes customers have problem regarding the incomplete information about the product on sale and waste of time at the billing counters [1]. Continuous improvement is required in the traditional billing system to improve the quality of shopping experiences to the customers.

To overcome these problems and to improve existing system, we have designed an RFID based shopping trolley. This can be done by attaching RFID tags to the products and a RFID reader with a touch panel display on the shopping trolley. With this system, customers will have information about the price of every items that is scanned in, and total price of the item. This system will save the time of customers and man power required in mall and cost associated with the product.

The advent of newer techniques like RFID technology and wireless networks have makes the process of shopping at a faster pace, making it more efficient as well as making it more transparent [2] .RFID tags are nothing but small transponders, communicates to a reader wirelessly by transmitting some identifier such as serial number .By constructions, they are the special type of wireless cards which carries built-in embedded chip and loop antenna. The chip represents a dual digit card number. The RFID reader circuits generates 125 KHz magnetic signal. RFID tags have been widely used to track items and label them in various shopping destinations like supermarkets. They are treated as advanced form of barcode.

 In existing system, shopping malls are using barcode standards [3]. The cashier in billing system scans the items using the barcode scanner and gives us the total bill. And the customer can gather the items they want, put it into the container and at the time of billing only. They come to know about the total cost. Hence they need to stand in a larger queue of billing those items.

 RFID and barcode are almost similar. They are both data connection technologies that mean it will automatically process the data. However they differ in many areas. RFID can be read without the line of sight, whereas barcode requires a line of sight to read. Barcode scanner requires a manual tracking, whereas RFID can be automatically tracked [4]. In case of barcode scanner, new information cannot be updated. Whereas in case of RFID, new information's can be overwritten.

The proposed system illustrates to reduce the waiting time of customer in shopping mall. This system consists of PIC microcontroller, RFID reader, RFID tag, LCD display, Zigbee, and keypad. RFID is interfaced with the PIC microcontroller. Each and every product will contain the RFID tag, it have unique ID number so that it is used to identify the product. The RFID reader gets information about the product from RFIDtag, and when the customer put the product in to the trolley, the details of the product programmed in the microcontroller compares the product details with its database to give the details to LCD. At that time, the customer can able to see the details such as name, price of the product, rack number of the product in the LCD. If the customer wants to remove the product from the trolley, simply he/she can take off the product; so that the total cost of product will be reduce from the total amount. Also product details from the PIC microcontroller can be transmitted to the main computer in the billing system through zigbee system. And thereby using this proposed system, shopping becomes easier.
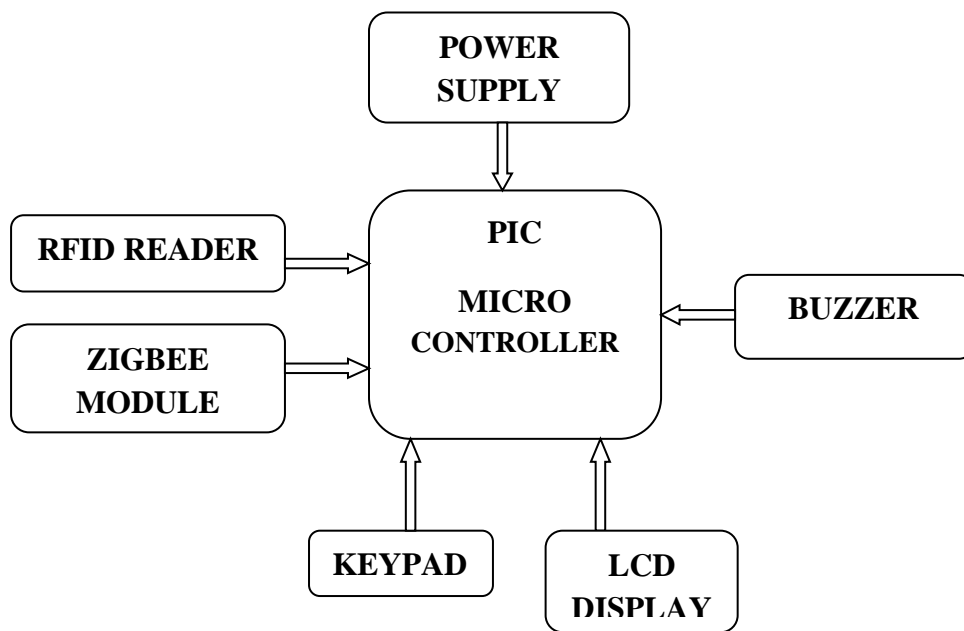
2. DESIGN OVERVIEW

Fig 1: Block diagram of RFID based smart trolley for supermarket automation

The block diagram consists of the following components:

- Power supply
- PIC microcontroller
- RFID module
- Zigbee module
- LCD display
- Keypad
- Buzzer

2.1 POWER SUPPLY

The 230v, 50HZ AC mains is stepped down by using a transformer to deliver the secondary output of 12V, 500mA. The output of the transformer is rectified by using a bridge rectifier comprising of four diodes. And the out of the rectifier is filtered by using a capacitor (1000microF). Then it is given to an LM7805 voltage regulator to make a 5V power supply.

2.2 MICROCONTROLLER

Here microcontroller PIC 16F877A is used. The various functions of microcontroller are:

- Reading various digital input signals from fingerprint sensor.
- Sending this data to LCD so that the person operating this project should understand the status.
- Giving the respective signal to the various output devices.

2.3 RFID

RFID stands for radio frequency identification. Its operating frequency is 125khz. RFID is a technology that uses radio waves to transfer data from an electronic tag called RFID tag or label attatched to an object through an reader for the purpose of identifying and tracking the object.

2.4 ZIGBEE MODULE

Zigbee technology is a standard for data communications with business and consumer devices.It is designed around low power consumption allowing batteries to essentially last forever.The zigbee standard provides network,security and several application support services.Zigbee is a low cost, low power wireless mesh networking standard.The low cost allows th technology to b widely deployed in wireless control and monitoring applications,the low power-usage allows longer life with smaller batteries and the mesh networking provides higher reliability and larger range.

2.5 LCD DISPLAY

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

2.6 BUZZER

Buzzer is used to indicate the invalid access. This is connected to the output of microcontroller. It is an electrical device that makes an buzzing noise and it is mainly used for signaling.

2.7 KEYPAD

A keypad contains a set of buttons arranged in a block or pad which bear digits, symbols or alphabetical letters. Pads which contain numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric inputs such as calculators, push button telephones, vending machines, ATM, Point of Sale device, combination locks and digital door locks.

3. SOFTWARE DETAILS

3.1EMBEDDED C

Embedded systems are systems which perform a specific or a pre-defined task. It is the combinations of hardware and software. It is nothing but a computer inside a product. It is a programmable hardware design nothing but an electronic chip. In some cases a microprocessor may be designed in such way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes Function parameters are always passed by value. Pass-by-reference is simulated in C by explicitly passing pointer values. C program source text is free-format, using the semi colon a statement terminator and curly braces for grouping blocks of statements.

3.2 VISUAL BASIC

Visual Basic is a third-generation event –driven programming language and integrated development environment (IDE) from Microsoft for its Component Object Model (COM) programming model first released in 1991 and declared legacy during 2008.It derives from much older BASIC programming language, and so is considered useful and easy programming language for the beginner to learn.

4.   FLOWCHART
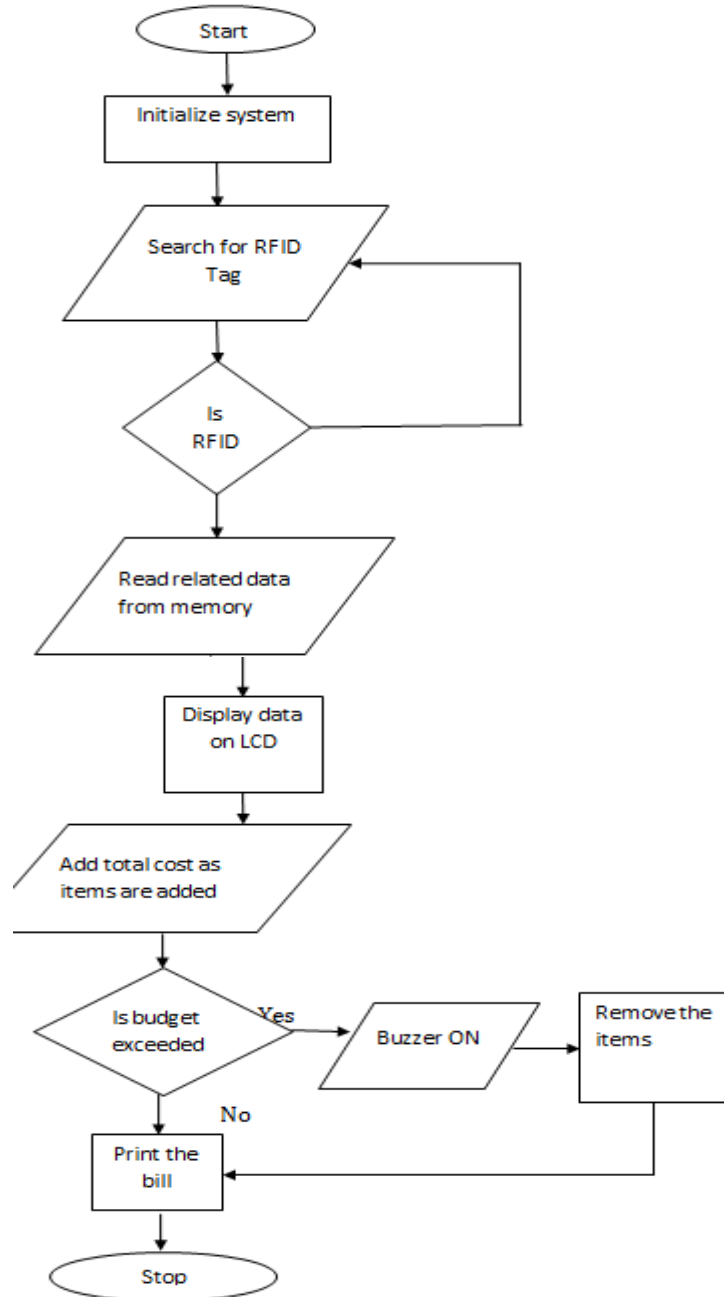
1. All the items in the mall will be equipped with RFID tags. When person puts an item in the trolley, its code will be detected by RFID reader which is interfaced with processor. RFID reader is serially interfaced with LPC2138. It requires 12V supply for operation & after receiving the tag code it gives interrupt to the controller.

 2. Reader send this code to ARM processor, after matching code with codes stored in SPI 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. Simultaneously all details are displayed on LCD. LCD used is 16X2 character alphanumeric type displays. And also if we want to remove some inserted item, then that amount will be automatically deducted from the total amount and item removal message is displayed on LCD.

 4. To store the item price and total billing data, memory used is AT45DB161. It has capacity to store 2MB audio files on chip & is interfaced to microcontroller using SPI protocol.

 5. 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.

 6. 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.

7. The ZigBee receiver is connected to billing PCusing 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.

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

 9. RFID tags we are going to use are 125 KHz passive type tags. Transponder (tag) 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.

 10. 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.

 11. 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.

12.Once the items are added the cost is added up and when it crosses the certain limit, it gives an alarm signal to indicate that.

6 . RESULT
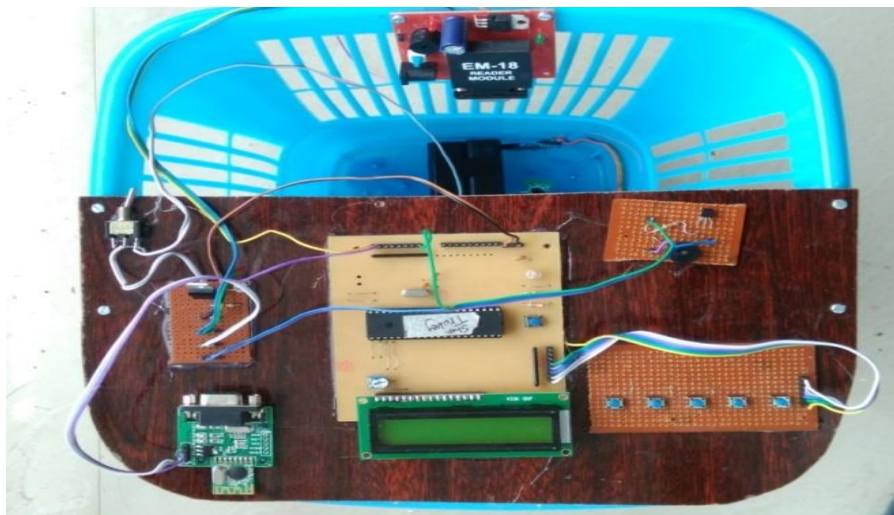
7. ADVANTAGES

- Reduces man power required in purchasing section. This can reduce the expenses incurred by the management.
- Users can be aware of the total bill amount during the time of purchase.
- Safer working condition.
- Reduces time spent at the billing counter and increases customer satisfaction.

8. FUTURE SCOPE

- Using a GSM module we can transfer the bill to mobile instead of printing it.
- Voice assistance can be included.
- Net banking can be included.
- Robotic ARM can be used for picking and dropping of products.

9. CONCLUSION

The progress in science and technology is a nonstop process. New things and new technologies are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. Hence this paper on RFID based smart trolley describes about purchasing the products with much ease and comfortable.

10.REFERENCES

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