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RFID BASED SMART TROLLEY FOR REDUCING THE BILLING TIME

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Abstract — RFID technology has received a lot of attention in the retail environment in the past few years. Shopping in big malls has become a common activity on a daily basis in various cities. Thus the requirement of a socially acceptable technology is much needed for comfort and convenience in daily life. In shopping malls the customer often has to purchase the products and put them in the trolley; along with this the customers have to simultaneously compare the total cost of the products with the budget in their pocket. After completing the purchase the customers have to wait in long queues for billing of the products. This consumes a lot of a time. In this paper we are discussing about a product ' The RFID based Smart Trolley for reduced billing time using Zigbee ' that would help to ease the entire budget calculation and the billing process. The main objective of this project is to develop a technology to improve the speed of purchase and that is user friendly and cost effective. This mainly consists of three main components namely: RFID reader module, RFID tags and Zigbee. The smart trolley has LCD display that displays the number of products in the trolley and the total amount of the products. Each trolley has a unique ID and it communicates with the billing counter via zigbee to automatically bill the products in the trolley.

Keywords- RFID reader module, RFID tags, Zigbee, MAX232, Microcontroller, Shopping trolley.

I. INTRODUCTION

Nowadays, if a consumer would like to buy something at a shopping mall, consumers need to take the particular items from the display shelf and queue up and wait for their turn to make the payment. Problem will surely arise when the size of a shopping mall is relatively huge and sometimes consumers don't even know where certain items are placed. Besides, consumers also need to queue for a long time at the cashier o wait for turn to make the payment. The time taken for consumers to wait for the consumers in front of the queue to scan every single item and then followed by making the payment will definitely take a lot of time. This condition will surely become worst during the season of big sales or if the shopping malls still use this conventional way to key in the price of every item by hand to the cash register. On the other hand, consumers will worry the amount of money brought is not enough to pay for all the things that wanted to be bought until it comes to our turn to pay at the cashier, consumers might also worry that whether certain food product available at the shopping mall are suitable for vegetarian since most of the food product might not be stated clearly. It will be great convenience if the information of the items that are available in the shopping mall can be obtained. It will be a great improvement on the existing system if the technology of the RFID is implemented. Consumers will be able to get information of all the items at the shopping mall, total up the prices of the items as they shop, and save unnecessary time at the cashier.

1.1. Motivation

Reason behind choosing the microcontroller based system: In this paper, we have designed system by using the microcontroller, because microcontroller based systems are less bulky and also easily transferable. It requires less power. So the system becomes cheap. It requires less space, easy to install, so can fitted easily in the robot. Benefits to the customers: Purchasing the products within the budget is made easy in this paper; also the customers need not wait in long queues for billing thereby saving a lot of time. User friendly ad cost effective: As this system uses microcontroller, it operate on less power and less space, it is user friendly and cost effective.

1.2. Problem definition

While doing survey we found that most of the people prefer to leave the shopping mall instead of waiting in long queues to buy a few products. People find it difficult to locate the product they wanted to buy, after selecting product they need to stand in a long queue for billing and payment. To try to solve the problems previously identified, recent years have seen the appearance of several technological solutions for hypermarket assistance.

1.3. Objective

The objective of this project is to improve the speed of purchase by using RFID. This project is designed to use the RFID based security system application in the shopping trolley. This project is used in shopping complex for purchase the

products. In this project RFID card is used as security access for product. If the product is put in to the trolley means it will shows the amount and also the total amount. But in this project RFID card is used for accessing the products. So this project improves the security performance and also the speed. It will overcome the Barcode technology which gets lots of problems that will recover in this technology such as the barcode method is so slow and some time it will creating error at the reading the barcode if in case of damaged the barcode it won't be recognized the barcode tag by barcode reader.

II. LITERATURE SURVEY

2.1. Existing system

The objective of this project is to improve the speed of purchase by using RFID. This project is designed to use the RFID based security system application in the shopping trolley. This project is used in shopping complex for purchase the products. In this project RFID card is used as security access for product. If the product is put in to the trolley means it will shows the amount and also the total amount. But in this project RFID card is used for accessing the products. So this project improves the security performance and also the speed. It will overcome the Barcode technology which gets lots of problems that will recover in this technology such as the barcode method is so slow and some time it will creating error at the reading the barcode if in case of damaged the barcode it won't be recognized the barcode tag by barcode reader.

2.2. Survey

Nowadays, if a consumer would like to buy something at a shopping mall, consumers need to take the particular items from the display shelf and then queue up and wait for their turn to make payment. Problem will surely arise when the size of a shopping mall is relatively huge and sometimes consumers don't even know where certain items are placed. Besides, consumers also need to queue for a long time at the cashier to wait for turn to make payment. The time taken for consumers to wait for the customers in front of the queue to scan every single item and then followed by making payment will definitely take plenty of time. This condition will surely become worst during the season of big sales or if the shopping mall still uses the conventional way to key in the price of every item by hand to the cash register. On the other hand, consumers often have to worry about plenty of things when going to the shopping mall. For example, most consumers will worry the amount of money brought is not enough to pay for all the things that wanted to be bought until it comes to our turn to pay at the cashier, consumers might also worry that whether certain food product available at the shopping mall are suitable for vegetarian since most of the food product might not be stated clearly. It will be a great convenience if the information of items that are available in the shopping mall can be obtained. It will be a great improvement on the existing system if the technology of RFID is implemented. Consumers will be able to get information of all the items at shopping mall, total up the prices of items as they shop, and save unnecessary time at the cashier.

2.3. Proposed system

When any selected product is dropped in into the cart, RFID reader the reads the tag inside the product and the information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated. The working of the Intelligent Shopping Cart can be explained with the following steps: 1) When shoppers with the cart press "start button" the system turns ON and then all the components such as RFID reader, microcontroller and physical media start working. 2) Every product has an RFID tag which contains unique id. These Ids's are fed in the database assigned to the corresponding products. 3) When the shopper drops any product in the cart then the RFID reader reads the tag. The information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated. 4) These steps are repeated until the end of shopping button is pressed. Once the "End Shopping" button is pressed the total bill is send to master pc. 5) There is also a option provided to delete some of the products from the cart and the bill will be updated accordingly, This goes by the customer choice. 6) At the end of shopping, the customer can straight away pay the bill and leave. 7) Inventory status of the products is also updated at the end of shopping.

III. SYSTEM DESIGN

3.1. Block diagram

The block diagram consists of two parts viz. The trolley side and the billing side.

3.1.1. Trolley side

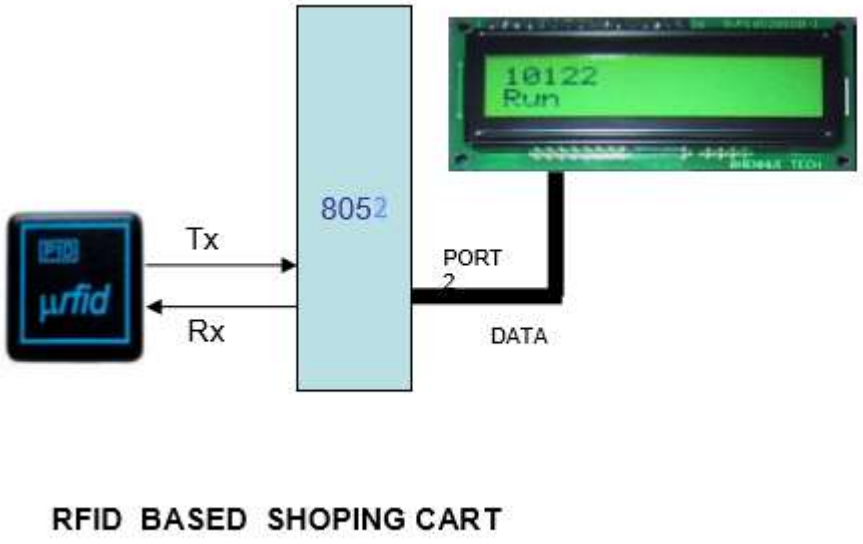


Figure 1. RFID based shopping cart

3.1.2. Billing side

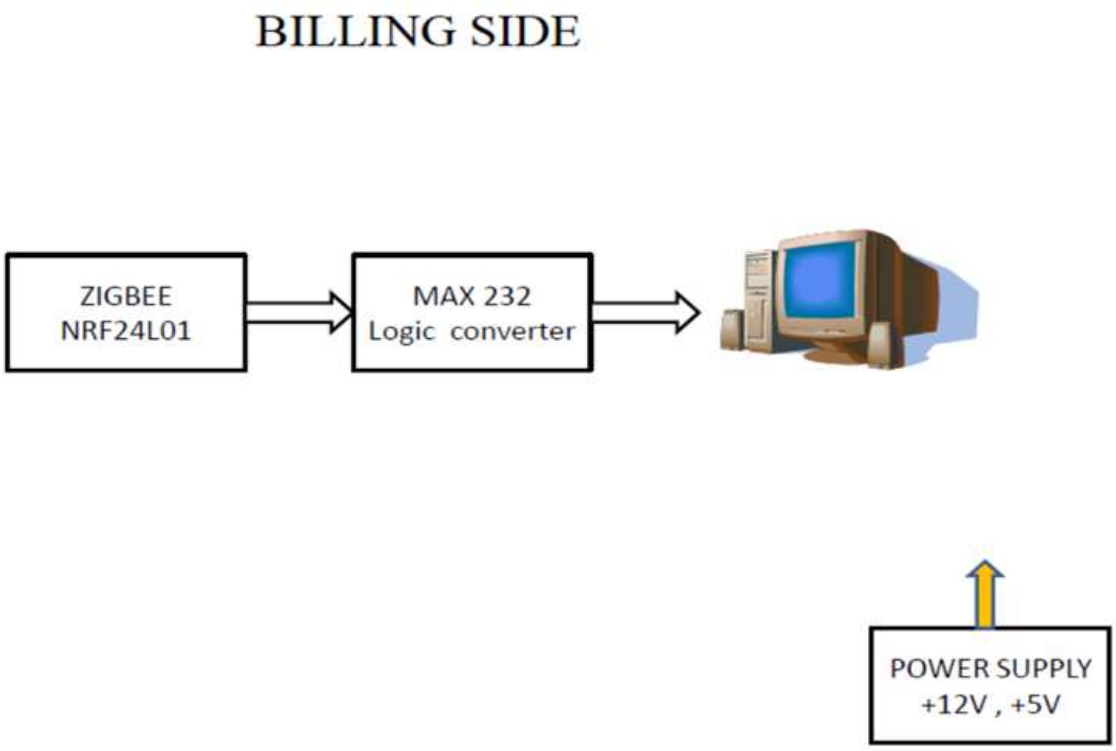
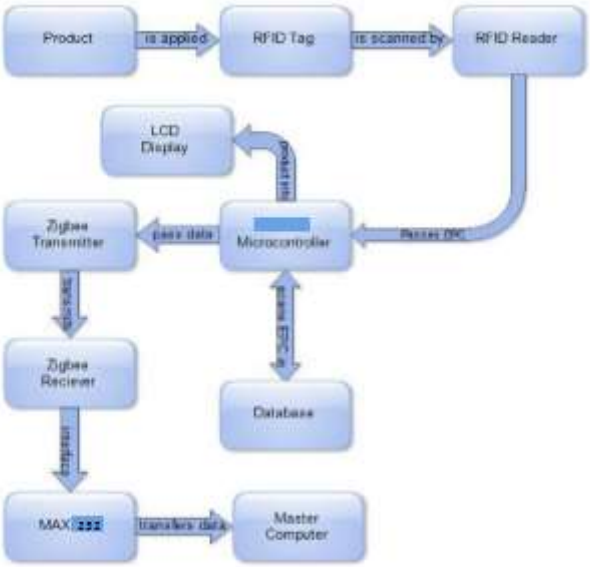


Figure 2. Billing in the master computer

3.2. System architecture

In our Futuristic 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 Futuristic 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 micro-controller where microcontroller 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 microcontroller gets displayed on the LCD display of the Futuristic Billing Trolley, where user can see the product information. The 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 232 interface. Max 232 interface is the interconnection media between the Zigbee receiver and the computer



IV. COMPONENTS USED

4.1. RFID reader

The antenna in the RFID reader module emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas are available in a variety of shapes and sizes; they can be built into a door frame to receive tag data from persons or things passing through the door, or mounted on an interstate tollbooth to monitor traffic passing by on a freeway. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually. If constant interrogation is not required, a sensor device can activate the field. Often the antenna is packaged with the transceiver and decoder. The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.

4.2. RFID tags

Consist in general of microchip Antenna Case Battery (for active tags only) the size of the chip depends mostly on the Antenna. Its size and form is dependent on the frequency the tag is using. The size of a tag also depends on its area of use. It can range from less than a millimeter for implants to the size of a book in container logistic. In addition to the microchip, some tags also have rewritable memory attached where the tag can store updates between reading cycles or new data like serial numbers. The antenna is clearly visible as said before the antenna has the largest impact of the size of the tag. The microchip is visible in the center of the tag, and since this is a passive tag it does not have an internal power source.

4.3. LCD

This library makes it easy to use a Graphical LCD. This is an extensive modification of the ks0108 library that has higher performance, more features, supports more Arduino boards and is easier to integrate with different panels. Sketches written for the old library should work with little or no modification. The configuration mechanism has been changed to facilitate use with a broad range of GLCD chips and AT mega Controllers, See the section on sketch migration for details on modifications for the new library.

4.4. Power supply

Power supply is used to give the 5V to the controller. 5V can be received from IC voltage regulator. Inside the power supply rectifier, filter is present.

4.5. Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

4.6. MAX 232

MAX 232 is an integrated circuit that is created by Maxim Integrated Products that convers signals from a RS 232 serial port to signals suitable for use in TTL compatible circuits. The max 232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The divers provide a voltage level outputs of about 7V or -7V supply from a single 5V supply. The receiver reduce the RS 232 inputs which may be as high as 25V or -25V.

V. SYMBOLS AND ABBREVIATIONS

Below is a list of abbreviations used in this report. The abbreviation, the description of the abbreviation and first mention page in the report are listed in the respective columns:

SR NO•	ABBREVIATION	ACRONYOMS
1	RFID	Radio Frequency Identification
2	DoD	Department of Defense
3	EAS	Electronic Article Surveillance
4	EPC	Electronic Product Code
5	ISO	Indian Standard of Organization
6	ARPT	Active Reader Passive Tag
7	LCD	Liquid Crystal Display
8	PCB	Printed Circuit Board
9	BAP	Battery Assisted Passive
10	CRT	cathode ray tubes
11	PRAT	Passive Reader Active Tag
12	IDE	Integrated Development Environment
13	SCC	Server Communication component
15	UIDC	User Interface and display component
16	ABC	Automatic billing component

VI. CONCLUSION

This paper presents an RFID based Smart Trolley for reduced billing time using Zigbee. The service presented makes use of the RFID and the Zigbee technology to develop a Smart Trolley system that can drastically reduce the billing time at the billing counters in shopping malls.
The customers while buying the products have to calculate the total amount of the products and compare it with his/her budget in the pocket. Then they have to wait in long queues for billing the products. It is found that the customers prefer leaving the shopping malls rather than waiting in long queues for billing only a few products. We believe that our proposed system can be a key element in solving this problem**.**

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