ISSN 2395-695X (Print)
ISSN 2395-695X (Online)
Available online at www.ijarbest.com

International Journal of Advanced Research in Biology Ecology Science and Technology (IJARBEST)
Vol. I, Special Issue I, August 2015 in association with VEL TECH HIGH TECH DR. RANGARAJAN DR. SAKUNTHALA ENGINEERING COLLEGE, CHENNAI
National Conference on Recent Technologies for Sustainable Development 2015 [RECHZIG'15] - 28th August 2015

Smart Trolley and Automatic Billing

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ABSTRACT

With the advancement of technology, the level of acceptance of people of all ages towards electronic gadgets is increasing steady speed. Electronic gadgets such as barcode scanner, smart card reader and RFID scanner are gaining more and more usage in various kinds of industries. The same applies to shopping malls. Before, people did their shopping at grocery shops or mini markets. As the number of large scale supermarket increased over the years, people started to prefer the shopping mall. As a consequence, shopping mall technology have to be constantly updated to fulfill the needs of consumers. Thus, a smart trolley with RFID is proposed by this project as an effort to replace the existing barcode scanner. A RFID scanner with LCD display will be attached to the shopping trolley so that consumers can scan items they want to purchase into the shopping trolley. This does not only inform consumer of the total price of items as they shop, but also ensures that price of every item is available. This system is built using Microsoft Visual basic 6 and we used Embedded C as the programming language .This system is built for use with an RFID scanner. Each time the customer has to pull the trolley from rack to rack for collecting things It follows the customer while purchasing items and it will maintains safe distance between customer and itself.

I. INTRODUCTION

Shopping mall is a place where most people from all walks of life will get their daily necessities ranging from food product, apparels, toiletries, gardening tools electrical appliances, and others. The numbers of small and large shopping malls keep on increasing over the years throughout the globe due to the demand of the public. Thus, the level of advancement of shopping mall system and infrastructure also varies. Compared to some foreign countries' shopping mall system, there are still a plenty of spaces for improvement in terms of providing quality shopping experience to the consumers. Consumers often face many problems and inconvenience when shopping. These problems include worrying that the amount of money brought is not enough for paying all the items needed, insufficient information of the items that are for sale and also wasting time at the cashier. These are the problems that are currently faced by most consumers. There are some existing methods to solve the problems that are stated above but the effectiveness still consider improvable. Examples of existing problem solving techniques are substituting the conventional way of keying item per item by hand to the cash register with the technology of barcode scanning where the price are stored in the barcode, and also set up a customer information counter to help the consumer if there are any enquiries about the items at shopping mall. The problems stated above might eventually be solved or else improved by the implementation of RFID technology in shopping

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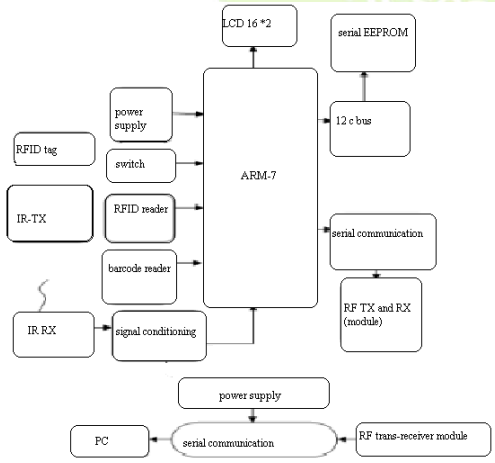
mall. This can be done by simply attach an RFID tag to all the items in shopping mall and attach a RFID reader with a LCD display on the shopping trolley can solve all problems above. With the implementation of this system, consumers can know the price of every item that are scanned in, total price of all the items, and also brief details of the item such as the weight or expiry date.

II. NEED FOR SMART TROLLEY

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.



III. EXISTING SYSTEM

A. Traditional Billing Method

The Currently available method in shopping malls is barcode method. In this method there are barcode labels on each product which can be read through specially designed barcode readers. A barcode reader is an electronic device for reading printed barcodes. Like a flatbed scanner, it 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.

B. 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

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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

IV. AUTOMATIC BILLING SYSTEM (RFID CARD BILLING)

The automatic billing system will calculate the total bill by reading the RFID tags attached to the products put in the cart and will send total value to the display. Also the cart can be connected through UART to the printer to generate hard copy of the bill. RFID is the special type wireless card which has inbuilt the embedded chip along with loop antenna. The inbuilt embedded chip represents the 12 digit card number. This magnetic signal is transmitted by the loop antenna connected along with this circuit which is used to read the RFID card number. RFID reader is interfaced with the microcontroller. RFID reader works on weight and protocol and transmits the wireless signal at 125 KHz. RFID reader has two data line i.e. DATA0 and DATA1. Both the lines are active low and is connected at the external interrupt pins (INT0, INT1) of the microcontroller. Logic 1 is transmitted on DATA1 line and logic 0 is transmitted on DATA0 line. Interfaced RFID reader continuously transmits the electromagnetic field across it. The range is max of 10cm. when the RFID tag/card comes within this range; the RFID card gets powered up and provides their 26 bit ID data to the RFID reader. Here each product has the individual RFID card which represents the product name. Here the microcontroller is already programmed with card number and interfaced with four switches. When person puts any item in the trolley its code will be detected and the price of that item will be stored in memory. If user wants to delete any product from the trolley then he just need to take out that product from the trolley.

V. USER INTERFACE AND DISPLAY COMPONENT

The display will show the following:

1. Number of items collected
2. Cost of current item
3. Total cost

Control switches are provided on the trolley for the user to check the total cost of the items he is to purchase, what products he has taken, per unit cost of the item, etc. after completing the shopping, the user need to press the finish button. Also as we put the items the costs will get added to total. Thus the billing will be done at the trolley itself. Item name and its cost will be displayed. At the billing Counter the total bill data will be transferred to PC by using wired modules.

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VI. HARDWARE USED

A. Trolley Unit

In this unit the ARM processor is attached to a RFID reader and barcode reader. As the user puts the items in the trolley the reader on the trolley reads the tag and sends a signal to the ARM processor. The ARM processor then stores it in the memory and compares it with the lookup table. If it matches then it shows the name of item on LCD &also the total amount of items purchased

B. Billing Unit

As soon as the shopping is over the total bill will display on the billing computer and on the LCD display in the trolley.

C. Power Supply

The AC supply is applied to 12V step down transformer. The transformer output is the 12V AC which is rectified using a diode bridge. The output of Diode Bridge of 12V DC is filtered by capacitors. RFID Tags .Tags are of two types: passive tags which have no battery life and active tags which have battery life. RFID tags released for automatically identifying a person, a package or an items. These are transponders that transmit information. RFID tag contains two parts. One is integrated circuit for modulating, storing and processing information and demodulating radio frequency (RF) signal. The second is an antenna for receiving and transmitting signal.

D. RFID Reader

RFID reader consists of an RF module that acts as a transmitter and receiver of radio frequency signal.

Transmitter consists of an oscillator to create the carrier frequency; a modulator to make impact on data commands upon this carrier signal & a receiver that contains demodulator to extract the data returned.

E. Barcode Reader

A barcode reader is used to read printed barcodes. All barcode readers consist of decoder circuitry for analyzing the barcode image data and sending the barcode's content to the output port of the scanner.

F. IR Sensor

IR sensor is used for detecting a select light wavelength in the infra-red (IR) spectrum by using a specific light sensor. In IR sensor, LED is used which produces light at the same wavelength as what the sensor is looking for.

When an object is brought close to the sensor, the light from the LED reflects from the object and bounces into the light sensor.

G. LCD Display

LCD has the ability to display numbers, characters & graphics. The display is interfaced to I/O port of microcontroller (P0.0-P0.7). The display is in multiplexed mode i.e. only one display remains on at a time. Within 1/10th of a second the next display switches on. In this way sequentially on and off display will result in continuous display of count due to persistence of Vision.

H. Optical Sensor

In this paper we have adopted the Obstacle Detection methodology. It is used to keep safe distance between trolley and customer.

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I. RF Module

RF module consists of RF transmitter and RF receiver. It is a small electronic circuit used to transmit and receive

radio signal. It selects one out of a number of carrier frequencies. Types of RF module are:

- Transmitter module
- Receiver module
- Tran receiver module

In this project we have used Trans receiver type RF module. It is a small PCB sub assembly and is capable of transmitting and modulating a radio wave that carries data. Transmitter modules are implemented alongside a microcontroller which will provide data that can be transmitted to the module.

VII. SOFTWARE DESCRIPTION

The software consists of two segments

1. Embedded c that is used by the hardware that is RFID receiver (fitted in trolley) and transmitter (RFID tags) that look ups up the specified table of item and maps the product with price.

2. VB is used on the front end to display the final billed amount to the customer on both the display on the trolley and display exit where the final payment is made. VB has to be ensured as a simpler user interface and embedded C must ensure accurate billing of the items.

VIII. ADVANTAGES

The advantages of proposed system is explained in the following sub section.

A) Features of RFID based trolley

• Bill calculation at trolley itself.

• Low chance of traffic & mismanagement.

• Reduction in support staff.

IX. CONCLUSION

In Smart trolley, there is no need to pull the heavy trolley, no need to wait in billing queue and no need to worry about the bill amount. The microcontroller based trolley automatically follows the customer. The Omni wheels in trolley will make it easy for the trolley to maintain its direction and with ultrasonic sensors absolute avoidance of the obstacles is possible. This smart trolley gives the total number of product purchased and displays the bill immediately. Using this the billing counter work will be reduced to almost null as the bill has already been generated. Further if credit card facility or any other transfer facility is offered on the trolley the billing counter can be totally eliminated and the need for staff to look on can be reduced

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