SUPER MARKET BILLING SYSTEM USING RFID AND ZIGBEE

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Abstract: Now a days it is common to see people getting enthusiast in online shopping through e-commerce websites but still the shopping centres are popular. We come across many types of carts used for shopping in malls and shopping centres. We are proposing smart shopping cart which uses the RFID and ZIGBEE technology to identify the products details and sends the data wirelessly to the receiver. We propose to have facility to browse the available products list on-screen in the display connected to the microcontroller which is situated in smart cart. The cart is interacting with the and it will have the facility to generate the bill for all the products added into the cart. The proposed system will be helpful for avoiding queues in shopping malls for billing. With the proposed design conventional queue system for billing generation and hence the shopping becomes easy and enjoyable.

Keywords—IR Sensor; ZIGBEE; RFID Reader; RFID Tags; smart cart.

I. INTRODUCTION

Frequently, people encounter a problem of spending too much of their time waiting in queues for billing their purchases in different shopping centres or supermarkets. Waiting in-queues negatively affects human morale and may cause misunderstandings or conflict amongst people, for instance, when someone breaks the line and stands in front of other people. The proposed project aims to eliminate this problem by introducing a novel alternative to traditional billing methods, speeding up the payment process.

A. Generic Approaches (Present Status)

AVR Microcontroller was developed in the year 1996 by Atmel Corporation. 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. Every time customer has to pull the trolley from rack to rack for collecting items and at the same time customer has to do calculation of those items and need to compare it with his budget in pocket. After this procedure, customer has to wait in queue for billing. So, to avoid headache like -Pulling trolley, waiting in billing queue, thinking about budget. We are introducing new concept that is “A New Technology of Smart Shopping Cart Using RFID and ZIGBEE.”

B. Smart Cart Description

The smart card uses a serial interface and receives its power from sources like a card reader. a smart card is like a chip card. It is a plastic card that contains an embedded computer chip—either a memory or microcontroller type that store and transacts data. This data usually associated either value, processed within the card’s chip. The card data is transacted via a reader that is part of computing system. In the proposed model, the smart card provides a predefined code and balance
amounts. Every card has some unique code stored in its EEPROM also known as firmware, which is an integrated program with specific data when it is manufactured.

C. Smart shopping Cart
The smart shopping systems usually require other auxiliary wireless communication systems but the proposed system we are using called as ZIGBEE wireless communication (especially low-cost) to perform indoor positioning and product information broadcasting. Thus, the dual-antenna RFID reader is adopted in the developed SSC to identify the items in the cart (internal antenna) and out of the cart (external antenna). A customer when purchases item after swiping card the prize and number of items are read by the RFID reader and the number of items purchased are already entered in to the cart before reaching up to the counter. There will be elimination of queue.

D. Elimination
Another important technology used in Smart Cart system is called ZIGBEE wireless communication, which is one measure to reduce the waiting time of customer’s is to introduce an intelligent billing system using electronic Smart Cart as an alternative to existing barcode system. Smart cart shown in Fig. allows a customer to manually perform billing without relying on cashier by means of swiping the RFID tags over RFID reader. Unlike barcode system, smart cart does not need any visual contact with barcodes which may get distorted in real life situations. All data about purchased products and user account data are stored in a cloud database in the Internet. Then, smart cart shows this information to customers on its display. A customer can delete an item from the list whenever he or she wishes by selecting subtraction button. If the customer decides to finish purchasing, there’s a total button press is required to upload all purchased product data and their total cost to billing counter PC through ZIGBEE. Once all payment data is sent to the PC, total cost is withdrawn from the registered account cash of the customer and the customer can freely pass the anti-theft gate with the purchased products.

II. EXISTING SYSTEM

The technology currently used in checkouts at supermarket is barcodes. Which is developed in the 1970s. Today barcodes is found on almost every item. Barcodes are a universal technology in that they are the norm for retail products; stores that own a barcode reader can process barcodes and imprint it on the products. The most important factor that is involved in barcode scanning is that the product should be in the Line of Sight (LOS) of the reader in order to get the barcode imprinted on the product scanned. Thus Shopping in the present day usually involves waiting in line to get your items scanned for checkout. During a shopping excursion to a shopping mall, you would have noticed the cashier scanning your products using some Laser device to produce a bill. What actually he is doing that he is reading the product barcodes using a Laser/Barcode scanner. Barcode scanner reads the code, data is sent to the computer, and computer looks up into the database for the price and description of the item. Barcodes are structured to contain specific product related information. It basically encodes alphanumeric characters and symbols using black and white stripes, also called bars. Bar-coding is one of the AIDC (Automatic Identification and Data Collection)technologies. Some major **Drawbacks** of Existing systems are barcode scanners need a direct line of sight to the barcode to be able to read, and in order to read barcodes the scanner needs to be quite closer, Barcodes have no read or write capabilities; they do not contain any information such as expiry date etc. They are very labour intensive, Barcodes have less security than RFID, and Barcodes are more easily prone to damages. Waiting in a line to get your items scanned from barcodes in supermarket for checkout is the major drawback.
III. PROPOSED SYSTEM

This proposed system describes how to build an automated and time saving system for the world of retail which will make shopping experience impetuous, customer friendly and secure. The proposed system uses RFID agent-based architecture that adopts intelligent agent technology with an RFID based applications. RFID provides capability to uniquely identify an object within a supermarket area, while agents are able to establish a channel of communication which can be used to facilitate communications between a RFID device and supermarket back-end system. The proposed framework includes a design of intelligent mobile shopping cart equipped with both RFID and agent technologies. As a result of using the proposed RFID agent based architecture, the customer shopping experience will be improved due to ease of retrieving of the detailed information on items and quick checkout by scanning all items at once, thus eliminating queues. From supermarket management point of view the proposed architecture will reduce the cost of operation e.g., decreasing cost of goods sold which comes in the form of labour efficiency in areas of checkout operation, inventory management and alerting the supermarket management when a certain product is running out of stock and needs to be restocked.

The main technological objective for our present solution is the usage of RFID technology for the automatic product identification inside the shopping cart thus eliminating consumer intervention in the process of product reading for payment. Nowadays, the usage of barcode for product identification presents several limitations. RFID technology is more resistant, safer, identifies products in a unique way, can provide other types of information, can make several simultaneous readings, doesn’t need line-of-sight and it has a high range. So that automatic product identification is possible all existing products inside the supermarket need to be identified with RFID tags and each shopping cart must have an RFID reader. The range of the RFID reader must not extend beyond the horizontal shopping cart limits so that reading products inside other shopping carts or on shelves does not happen. Nevertheless, range cannot be less than the cart’s limits with consequence of not identifying products that are inside the shopping cart but out of the reader’s range.

The RFID reader should be able to read all the tags no matter the material (paper, plastic, metal, etc) they are inserted into. The usage of RFIDs in this solution comprehend benefits such as increasing safety and the consequent reduction in product loss, reduced human intervention and error, increased speed in involved processes, unique identification of products with additional information and availability of real-time information, amongst others. By using RFID technology there are many advantages like RFID tags can be read from a greater distance than barcodes, RFID tags don’t need to be positioned in line of sight with the scanner, RFID tags can be read at faster rate than barcodes, RFID tags are read/write devices, RFID contains high level of security, RFID tags are more reusable, RFID tags carry large data capabilities such as product maintained, shipping history and expiry date etc, and by using this technology bills can be paid very easily and quickly And it also removes the waiting in a line to get the item scanned for checkout.
IV. SYSTEM ARCHITECTURE

The above process can be divided into two components.

1. Customer Section:
   Where the above fig.1 depicts the customer section. Customer section consists of RF Tags, RFID reader, AVR Microcontroller, Keypad, LCD Display, ZIGBEE module and power supply. Billing section consists of ZIGBEE module and PC. RF Tags are connected with items and when putting the item in trolley tag IDs are read by RFID Reader and code read by RFID is given to AVR Microcontroller. Arduino software to program the AVR Microcontroller board. In AVR Microcontroller items database are created for each tag ID and store in memory. When tag is scanned then AVR Microcontroller send display information to LCD display. Items database contains item name, total number of item and price.
   AVR Microcontroller also displays total number of item and total cost details on LCD display. Indication unit is used to get item scanning information. AVR Microcontroller send the items and billing information to Billing section. Keypad unit is used to change the price when need update.

2. Billing Section:
   Where the above fig. 2 depicts the billing section. In billing area there is no need bill again to customer’s item and due to this techniques work load of billing person reduce and customer can save time. At PC hyper-terminal software is used to monitor item and billing information.
V. FLOW OF CONTROL

1. Start
2. Initiate the system
3. Scanned RFID TAGS
4. Is RFID TAG?
5. Read data from memory
6. Display on the LCD
7. Add item cost as items are added
8. If item removed
9. Total will be same
10. Send the total amount
11. Print the Bill
12. End
13. Total amount
VI. COMPONENT DESCRIPTION

i. **AVR Microcontroller** : It is the heart of the project, here the ATMEGA 328 IC is used for storing programmed memory.

ii. **Tag** : It is a electromagnet card reader, which is used for electronic bar code reader in all products.

iii. **RFID Reader** : Which reads the electronic bar code from card reader during scanning & sends that series code to Atmega -328 IC, which compares the product details according to user defined applications written by embedded c code.

iv. **Key Pad** : Which is used for incrementing, decrementing the quantity & price details of the products.

v. **LCD Display** : Which is a monitoring unit, here we can monitor all product details serially.

vi. **Power Supply** : DC power supply 5V & 500mA is given to the microcontroller, which works at 5V voltage & 500ma current mode.

vii. **ZIGBEE** : It is a wireless device, which is used for wireless data transceiver purpose.

VII. CONCLUSION

This new technology develops a smart shopping cart which can be applied for supermarkets and malls. The user interface provides whole information to promote the shopping service for customers. During purchasing if the extra item is inserted then by pressing the return key customer can put it back. After finishing the shopping it is necessary to press the button then the detail information is transferred through the ZIGBEE towards the billing system. In addition, the billing facility can avoid queue in the check-out process so that the better shopping experience for customers can be created.

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