Abstract - Today purchasing various items in malls or supermarkets require a trolley. Product procurement represents a complex process. On each occasion customer has to pull the trolley from rack to rack for collecting items and simultaneously customer has to perform estimated expense computation. At the end, customer has to wait in queue for billing and payment.

To overcome that we have been developed a smart way for shopping. Each and every product has RFID tag instead of barcode scanner. The smart trolley will consists of a RFID reader, LCD display and Zigbee transmitter. When a person puts any product in the trolley it will scan the product and the cost and the name of the product will be displayed. The sum total cost of all the products will be added to the final bill, which will be stored in the microcontroller memory. It will wirelessly transfer the product information of the items placed in the trolley using a Zigbee transmitter to the main computer. So, to avoid waiting in billing queue while constantly thinking about the budget, a new concept has been introduced which is the ‘SMART TROLLEY’

For this project we have used Embedded C, Zigbee and VB6.0 software.

Keywords - Embedded, Microcontroller 89S52, RFID tags, RFID Reader, ZIGBEE nRF24L01.

I. INTRODUCTION

The advent of wireless technology along with other communication techniques has helped in making electronic commerce very popular. A modern futuristic product is the one that aids the comfort, convenience and efficiency in everyday life. In this project, we discuss an innovative concept of RFID Based Smart Shopping and Billing System. The main goal is to provide a technology oriented, low-cost, easily scalable, and rugged system for aiding shopping in person. The smart shopping trolley will help shorten the checkout lines thereby making the customers at retail stores. The System consists of an RFID based trolley which communicates with the billing counter wirelessly using a ZigBee Transmitter (nrf24L01). Each trolley will consist of a similar type of hardware with unique trolley address. The developed system comprises of User Interface and Display Unit (UIDU) and Billing and Inventory Management Unit (BIMU).

The customers will be able to scan the items themselves and the LCD screen on the shopping cart will keep updating the total. The billing counter can at any point of time inquire about the current items present in the trolley. This will turn out to be very beneficial for the retail stores as more people will enjoy the shopping experience and come more often to shop.

II. EXISTING SYSTEM

A. Traditional Billing Method

Currently available method in shopping malls is the barcode method. The cashier scans the product through the barcode scanner and gives us the total bill. But this becomes a slow process when lots of products are to be scanned which eventually results in long queues, making the billing process slow. 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. To try to solve the problems previously identified, recent years have seen the appearance of several technological solutions for hypermarket assistance. All such solutions share the same objectives: save consumers time and money and help the retailers to win loyal clients.

B. Barcode Vs RFID

RFID and barcodes are similar in that they are both data collection technologies, meaning they automate the process of collecting data. However, they also differ significantly in many areas. If compared, RFID technology is found to be more comprehensive than barcode technology. Barcode scanner requires line of sight whereas RFID can be read without the line of sight. 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 cannot be read from a distance of more than 15 feet. Barcode coded items can only be read individually whereas multiple tags can be read by RFID reader simultaneously.

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 not subjected to too much wear and tear. Interpreting a barcode requires a direct line of sight to the printed barcode, because of which the barcode has to be 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 and that’s the main advantage of using RFID tags.

III. PROPOSED SYSTEM

3.1 Block Diagram Of The System

![Fig.3.1 Block Diagram of from trolley side](image1)

![Fig.3.2 Block Diagram of from server side](image2)

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 information about the product i.e. its name and price. When the customer puts the product in the Smart Trolley, the Radio Frequency ID scans the tag and the Electronic Product Code number is generated that is previously known by Radio Frequency ID reader. Radio Frequency ID reader passes the Electronic Product Code to the microcontroller 89S52 where the controller 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 controller gets displayed on the LCD display of the Smart Trolley, where user can see the product information. The microcontroller 89S52 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. Thus the final information of all products is transmitted to a computer with the help of serial communication.
3.3 Flow Chart

![Flow Chart of System](image)

3.4 Algorithm

Step 1: Start
Step 2: Initialize System
Step 3: Search for RFID
Step 4: Check RFID tag
Step 5: If the tag is registered, read related data from memory
Step 6: Display the data on LCD
Step 7: Add item cost as items are added
Step 8: If an item is removed display a message ‘ADD OR REMOVE?’
Step 9: Press REMOVE and continue the shopping as the total amount will be reduced, else ADD and hence there will be no change.
Step 10: When upload key is pressed send data to the counter
Step 11: Print the Bill
Step 12: Stop

IV. System Flow

i. All the products in the mall will be equipped with RFID tag. 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 nRF24L01. It requires 5v supply for operation & after receiving the tag code it gives interrupt to the controller.

ii. Reader send this code to microcontroller, after matching code with codes stored in SPI memory, controller 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.

iii. 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 remove key and remove a particular item. That item’s cost gets subtracted from total bill and item removal message is displayed on LCD.

iv. To store the item price and total billing data, memory used is the Atmel AT89S52 is a powerful microcontroller which provides a highly flexible and cost effective solution to many applications.

v. 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.

vi. 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.
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 bill is generated on the screen.

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

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.

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.

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.

The data send by ZigBee contains all details of the items purchased i.e. name of the item, it’s price etc. Thus the final information of all products is transmitted to a computer with the help of serial communication.

V. RESULT

i. The utility of trolley will be first of its kind for commercial use.

ii. Use of Microcontroller

In this project, we have designed system using microcontroller, because microcontroller based system are less bulky and also easily transferable. The system also becomes cheap. It requires less space and also easy to install, hence can be fitted easily on the trolley.

iii. Variety of usage

Nowadays, world is moving fast and so are the people. Shopping often takes too much time; have to find for the product on the list, queue to pay, so they seek for something which is easy, convenient, and fast. By having Smart Trolley, the consumers able to balance their budget because the trolley automatically sums up the total of the items placed inside the trolley and so they could see how much they already purchase. Besides, consumers no longer have to stand in the queue.

iv. Speed of Service

In an environment where the customers are always pressed for time, the speediness is needed. The product which is scanned right after the customers are placed in the trolley, and can pay via credit card help customers get through the hardness of line up to pay for the goods indirectly, reduce traffic jam in the store.

B. Disadvantages

i. Expensive

It is comparatively more expensive than the regular shopping cart. The startup capital will be high that is the initial installation cost of the cart and the products that need to be bought and installed are very expensive.

ii. Damaging

The system has LCD and other hardware which can be damaged easily. It will be hard to predict the person who has damaged the cart or misused it since tracking the person down will be difficult.

VI. FUTURE SCOPE

The movement of the trolley can be made automatic with the help of various sensors. In this way there is no need to pull heavy trolley. The LCD side can be improvised. The discounts should be added in the products. The counting of the items can be done automatically.

Also the LCD can be provided with a layout of the shopping market by which the customer can get the exact information of the products present in different aisles. This increase user friendliness.

VII. CONCLUSION

The intended objectives were successfully achieved in the prototype model developed.
The developed product is easy to use, economical and does not require any special training. This project simplifies the billing process, makes it swift & increases the security using RFID technique. This will take the overall shopping experience to a different level.

REFERENCES