



# **Automatic Billing Trolley using RFID and ZigBee with Android Application Rewarding System**

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**ABSTRACT:** Now-a-days shopping is increasing rapidly. People take the items and put it into trolley. After shopping they go at the billing counter for billing but there are many people standing in queue for billing purpose. So more time is required for the individuals for billing because of existing barcode technology. To reduce this time we have implemented a system which is based on RFID technology. The system contains the items attached with RFID tags. RFID reader which reads the tag information after putting it into the trolley. Then micro-controller calculates total amount and displays it on LCD. The information which is to be sent is sent with the help of zig-bee. Along with this system we have implemented a Android application for rewarding facility. User can get billing details and rewarding points details with the help of this application. We are replacing the existing reward point system which is based on cards by Android application. The existing system have to maintain cards manually.

**KEYWORDS:** RFID tag, RFID reader, Micro-controller, Zig-Bee, Android.

## **I. INTRODUCTION**

In existing system, when a person goes for shopping in any mall then he has to wait for a long time at the counter side for billing purpose. Bill is done with barcode reader. It is time consuming process. In barcode technology, there is need to scan each and every item based on position of that barcode label attached to that item. In short, line of sight is required. It requires more human labour as they need to scan label manually. Barcode cannot be read from a long distance. Barcode can be damaged because of environment etc. So our aim is to design automatic billing system which is based on RFID (Radio Frequency Identification) technology.

The RFID Based Automatic Billing Trolley designed by Galande Jayshree, Rutuja Gholap, Preeti Yadav contained the wireless RF module to transmit the reader data to main pc for calculataing the bill, they used the ARM processor for mapping the stored data with RFID tag data [1]. The RFID Based Smart Shopping Cart provided by Ms. Rupali Sawant, Kripa Krishnan, Shweta Bhokre, Priyanka Bhosale is user friendly as they were provided the option of removing the products from the trolley and also done the billing by cash or by net banking. Different types of RFID tags were used for different type of surfaces [2]. Mr.P. Chandrasekar Ms.T. Sangeetha implemented Smart Shopping Cart with Automatic Billing System through RFID and ZigBee, which contained the microcontroller and EEPROM for interfacing and temporary storage purpose respectively. But the microcontroller used in this system does not have the inbuild I2C protocol for communicating with EEPROM memory [3].

In proposed system, products are attached with RFID tags. RFID tags will be read by RFID reader which is attached on trolley. Reader will send this information of item to micro-controller then micro-controller executes the code embedded in it. The total amount will be displayed on LCD. Using Zig-Bee, micro-controller will send this information to central billing server. Billing server will print the bill. This system will take less time to calculate bill for large scale applications.

In case of rewarding points, people doesn't need to carry the bonus point card for getting reward points. Easily by installing the application into Android phone they will get bonus points according to their shopping or it depends on that mall.

## **II. HARDWARE ARCHITECTURE OF THE SYSTEM**

Each trolley in supermarkets or malls is attached with one device which consists of hardware components such



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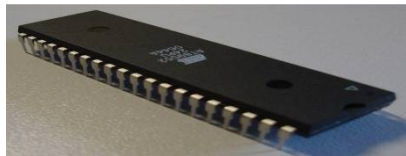
as RFID reader, micro-controller, Zig-Bee and liquid crystal display (LCD).

### A. RFID reader:

Whenever any product having RFID tag attached is in the range of RFID reader then it scans that tag. RFID reader have different types based on radio frequency range for example low, high and ultra high frequency.

### B. Micro-controller:

1. 8-bit CMOS micro-controller having 8 K bytes of in-programming flash memory
2. 32 I/O pins
3. 256 bytes of RAM
4. Flash memory
5. Compatible with 8051 micro-controller.
6. low power and high performance
7. Maximum frequency(33 mHz)
8. Need 4.0 to 5.5 V power supply for programming
9. Three 16 bit timers or counters



Diag. AT89S52 Mico-controller

### C. Zig-Bee:

Zig-bee is an IEEE 802.15.4 standard which is used to create personal area network. Zig-Bee can transmit data over long distances by passing it over mesh network created. It is used in low data rate applications

### D. Liquid Crystal Display:

LCD is one type of flat panel display which uses properties of light. LCD is used for displaying the required messages such as names and total price of all products contained in trolley.

### E. RFID tags:

Each product in mall is attached with RFID tag. There are two types of RFID tags:

1. Active Tags: - Own battery - Costly
  - Large Memory than Passive tag
  - Reading Range is upto 100 meters
2. Passive RFID Tag
  - Battery-less
  - Less cost than active tags.
  - Reading range is less than active tags



Diag. RFID Tag



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## III. WORKING OF SYSTEM

The proposed system is divided into following parts: 1.Hardware 2.Communication between hardware and billing server 3.Execution of server side application 4.Print bill  
In case of reward points, use android application.

### 1. Hardware:

In the proposed system, we have attached one product identification device to each trolley. For demo purpose we have taken only one trolley and one device. You can take multiple trolleys and assign one id to each trolley for uniqueness.

This hardware device consists of RFID reader, AT89s52 micro-controller, Zig-Bee and LCD. First of all RFID reader reads RFID tag's information. This information is in analog form. There is one module called RS232 which converts this analog information into digital form. This module is with RFID reader. Then micro-controller executes the program embedded in it. This program takes input of RS232 module. It displays the required information on LCD. The displayed information contains price and name of the product. Then it displays total amount on LCD. LCD initialization is done in program itself.

### 2. Communication between hardware and billing server:

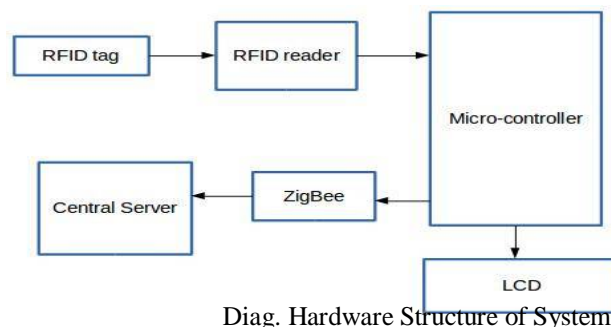
For billing purpose, there is one billing server at the counter side. The information which needs to be printed in the bill sends through network. We have used Zig-Bee here. You can use bluetooth, Wi-Fi, Wireless LAN as per your requirements and your system.

Zig-Bee is an IEEE 802.15.4 based specification. The technology defined by the Zig-Bee specification is intended to be simpler and inexpensive than other Wireless PAN. Zig-Bee transmitter takes the information and sends it to the Zig-Bee receiver. This receiver is attached at the counter side billing server.

### 3. Execution of server side application:

At the counter side, billing server gets information which is sent by Zig-Bee transmitter. This information is retrieved in PuTTY terminal. PuTTY is a free and open source terminal emulator and network file transfer application. It supports various network protocols. It includes SCP, SSH, TELNET, rlogin etc. It is compatible with Windows, Linux and OS X.

The server side application takes this information as an input. There can be multiple ports to your system. You have to select the proper port here. With the help of programming this application prints the bill. In case of rewarding points, android application helps users to have information related with it. MySQL is used for storage purpose here. For connecting MySQL with android application and this server side application, JDBC connectivity is done.



Diag. Hardware Structure of System

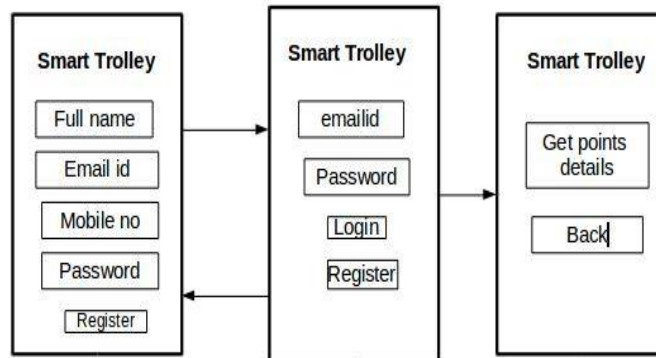
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## 4. Print Bill

The format of bill or receipt is in application. Application gets executed and it prints bill. Android application keeps record of rewarding points based on the amount purchased. It deducts that amount manually and prints bill.

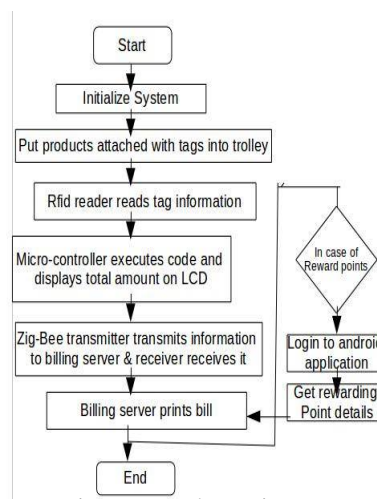


Diag. Android UI

Android UI: User will register first by entering required fields. Then he will be able to get details of points and the bill.

## IV. ALGORITHM

- Step1: Start
- Step2: Initialize System
- Step3: Put the item attached with RFID tag into trolley
- Step4: RFID reader reads the tag information
- Step5: Reader send the data to the micro-controller
- Step6: Micro-controller executes the program and total will be displayed on LCD.
- Step 7: Micro-controller sends the data to the billing server using Zig-Bee.
- Step 8: Billing Server prints the bill.
- Step 9: If customer wants reward point then go Step 10 else Step13
- Step10: Create account on android application.
- Step11: Choose required option. User will get details about the billing.
- Step12: User selects rewarding points details.
- Step13: Stop



Diag. Data Flow Diagram

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## V. RESULT AND DISCUSSION

The below Fig1. Shows the hardware connection of system and the bill displayed on LCD

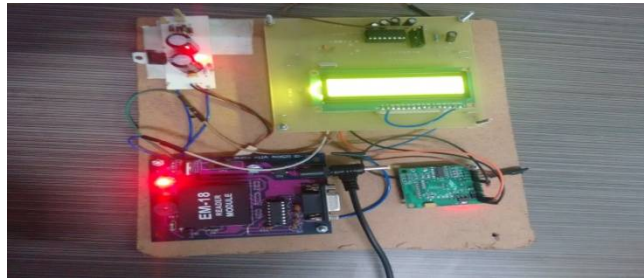


Fig1. Hardware Architecture

The below Fig2. Shows the total bill of purchased product at counter side

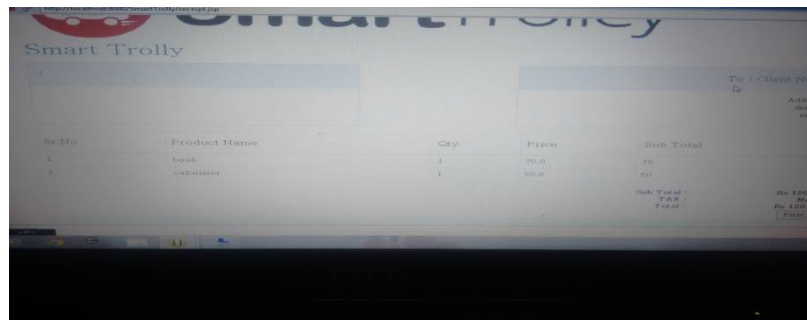


Fig2. Total Bill at Counter Side

The below Fig3. Shows the reward points on Android Application

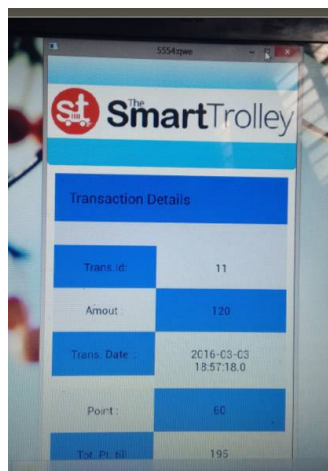


Fig3. Reward Point on Android app



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## **VI.CONCLUSION**

Thus the proposed system created bill of the purchased items. This process saved the time of customer and also reduced the manpower in the malls. So ultimately it becomes a easiest way of the shopping. Also with this system we have implemented the reward point system using Android application. The objective behind the application is to replace the existing card based system by android application. So the intended objective is successfully achieved in given system.

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