RFID Based Smart Trolley for Automatic Billing System

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Abstract- The super shops are the places where people go to buy their daily using products and also pay for that.So the need to calculate the number of products sold and generation of bill for the customer. When people go for the shopping in a shop, we have to select the right product.After that, it's a hectic to stand in line for billing purpose. Hence, we are going to propose the "Smart Shopping Cart System"that will save the track of products which are purchased and calculate the bill using RFID reader and Transmitter and Receiver. The system will also provide suggestions for products to buy based on user purchase history from a centralized system. In "Smart Shopping Cart System" every product in Mart will be attached with RFID tag, and every cart will be having RFID Reader,LCD display and Transmitter and receiver attached to it.

Keywords: RFID (Radio Frequency Identification) reader, RFID Tag, Transmitter and receiver.

1 Introduction

In metro citiespurchasing and shopping at super shops,big malls is a daily activity. We have seen big lines for payment of the bill at malls on holidays and weekends. When there are special offers and discountthe rush is also even more. Customers will purchase many items and put it into the trolley. After customers done the purchase theyneeds to go to billing counter for payment. At the billing counter the customer will prepare the bill using bar code reader which is a time consuming process and will creates the long queues at billing counters.All the products in the shop are attached with RFID tags. When a customer put any products in the trolley, its unique code will be detected and the price of those products will be getstored in memory. As we put the products into the trolleythen costs will automatically get added to total bill.

Thus the billing will be done in the trolley itself. Total bill information will be transferred to PC by wireless Transmitter and receiver modules at the billing counter.

When the customer purchase a product, she/he first scans the RFID tag of the product using the RFID reader and then put it into the trolley.While purchasing the products customer needs to scan the RFID tag of the product, a price of the product is taken and stored in the system's memory.

2 Working of RFID:

To accomplish this RFID methods utilize radio waves. At a simple level, RFID systems consist of components such as RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and antennas are used to transmit the information to the RFIDreader.

A radio device known as a tag is attached to the products that are to be identified. When this tagged products are get in contact with a suitable RFID reader,tag transmits this data to the reader.
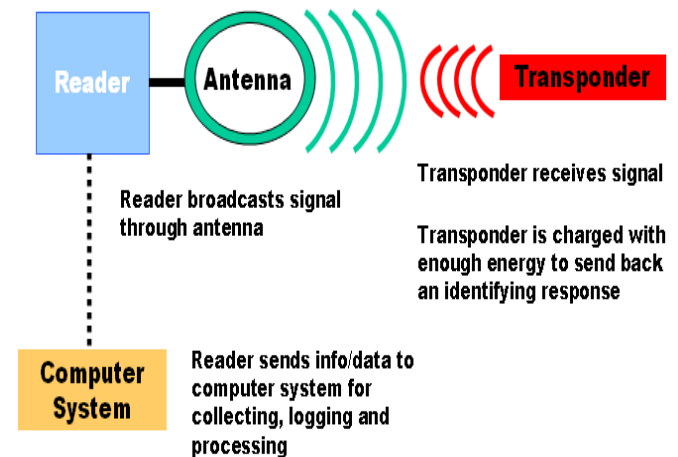
The RFID reader then reads the data and has the capability to forward it over the channel. This system will then use this unique informationto identify the productwhich is come in contact to the RFID Reader. IT can then perform a variety of actions.

3 Existing System:

While billing by having the barcode scanner we need to detect every barcode attached to every item in purchased item list.When all the items get scanned the price and quantity of items is automatically get into the system and then the bill is get generated.Customers can pay bill through credit/debit cards or by cash. But it is a time consuming process for the

billing purpose, so that the waiting time to pay the bill is increased. To overcome on the time consuming process the RFID based smart trolley is proposed.

4 Proposed System:

Each andevery product in the shop will have an RFID tag attached to it.

Each Cart will be fitted with the RFID reader, LCD display, and Zig-Bee trans-receiver implemented on it.

There will be a Centralized Server System.

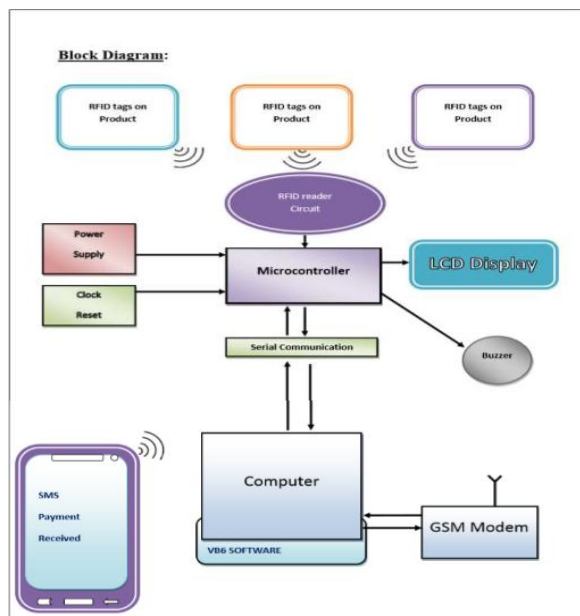After the payment of cash, the Cart must get reset.

Fig.1 ProposedSystem

If the product is removed, it will get deleted from bill too. Display Product Info, Expiry Date and Better Alternative.
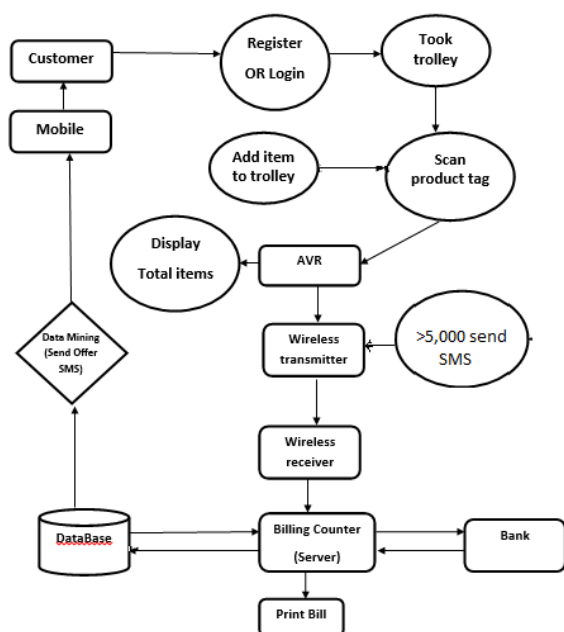
5 Architecture Diagram:

Fig.2 Architecture of automatic billing trolley

6 Working of smart cart:

When a customer with the cart enters a shopping aisle, the cart is brought in range of the IR Receiver and the microcontroller checks for the aisle information code. The aisle information code is transmitted over the Transmitter and Receiver wireless from the cart to the server. Based on the aisle number received the database is queried and relevant information is retrieved and transmitted to the cart via the Transmitter and Receiver module.

The received information is stored in the EEPROM present on the cart. This serves as a temporary database until the customer exits the particular aisle that he/she is in. The relevant products information is displayed on the display unit. Every product has an RFID tag which contains a Unique ID. These ID's are fed in the database assigned to the corresponding products. If there needs to be a purchase done, then that product can be dropped in the cart where 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. Upon exit of the aisle, the aisle info is sent to the server along with details of purchase. Server will store the required information in database. These steps are repeated until and unless the shopping button is pressed at the end.Once the "Complete" button is pressed there's an option provided to end the shopping with the same products or to delete some of the products from the cart. This all process the customer choice. At the end of shopping, the customer can straight way pay the bill and leave.

Inventory status of the products is also updated at the end of shopping**.** Smart carts can be either contact or contactless smart cart. Smart carts can provide personal identification, authentication, data storage, and application processing. Smart carts may provide strong security authentication for single sign-on(SSO) within large organizations.

7 Algorithm:

Step1: Start
Step2: Initialize System
Step3: search for RFID
Step4: check RFID tag
Step5: Read related data from memory
Step6: Display data on LCD
Step7: Add item cost as items are added
Step8: When upload key is pressed send data to the counter
Step9: Print the Bill
Step10: Stop

8 System Flow:

Once the consumer gets his desired product from the shelf in the retail store and puts it into the cart, the RFID reader reads the tag on the product and the product information is displayed on the LCD screen. Side by side, the billing information is also updated. The working of the smart shopping cart can be explained in 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 Transmitter and Receiver start working.

2) Every product has an RFID tag which contains a unique id. They are fed in the database assigned to the corresponding products.

3) When the shopper puts any product in the cart then the tag is read by the RFID reader. The information of the product is extracted and displayed on the LCD screen. Also side by side, the 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 via Wi-Fi (Transmitter and Recevier).

5) There is also an 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.

9 Project Simulation:

The following test case scenarios were used in the integrated system testing to prove the working of the developed system.

a) Shopping cart and server communication using the wireless Transmitter and Receiver module

b) Identifying items based on RFID tags and synchronizing with central database.

c) Automatic billing

d) Display the product name & price.

e) Complete listings of the products along with their price on LCD display.

f) Update inventory in the central system upon each purchase of a product.

g) Automatic billing update when the products are dropped in the cart or removed from the cart.

h) Display of total bill on the master pc.

All test cases were successfully tested. The system developed is user friendly and no special training is required to use the cart.

10 Results and Discussion:

The proposed methodology of providing RFID Based Automatic Billing System for customers is implemented in java technology. To deploy the system we use the embedded operating system.
Proposed methodology is subjected to provide the automatic billing system for customer and also provide facilities to them.
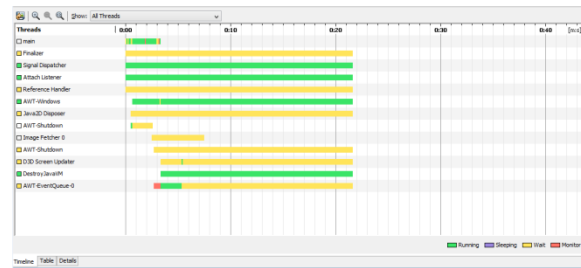

Fig 3: Performance of Running all threads

11Conclusion:

Experience with Smart Shopping has indicated that there are many technical challenges will be met in deploying a pervasive retail system.Technologies that capture information about interactions between physical products are not yet mature enough for the consumer market as they are relatively costly. Even when such data is available the task of interpreting it is often as challenging as its registration, since no standardized classification scheme or appropriate taxonomy exists. Several efforts to create standards are underway but are still at least years away. Although in the relatively controlled environment of the smart shopping trolley project it has been possible to address this problem on a wireless basis it is hard to envision a situation where widely deployed retail services can operate without such standards. A related problem is that new systems must be integrated in existing retail infrastructures, which often operate using legacy and incompatible systems. Moreover, the deployment of retail causes significant growth in electronic transaction loads which current systems are unable to cope with. Like smart shopping should be available on whatever device consumers have at hand. Although considerable advances have been made in this area, developing and maintaining such applications is still a major challenge.

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