

Smart Shopping Cart with Automatic Billing System

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Abstract— Advancement in wireless technology and other communication techniques have made the electronic commerce very popular. In this paper, we are going to discuss about using RFID technology in shopping cart. The main goal is to assist a person in terms of reduced time spent while purchasing a product. While shopping customer will add product one by one in trolley. After that much time is consumed at the billing counters when customers have to pay the bills. Now-a-days, shopping malls are using barcode scanners at billing counters in order to scan the product and create the final bill. But because of using barcode scanners customers have to wait in the lines especially when there is rush in malls. In this paper, we are proposing the system that can overcome above problems using RFID. After using this system in shopping, it will reduce the delay caused during shopping due to standing in lanes while billing and provide customers better shopping experience also, by displaying their bought items on the screen which is located on the trolley itself.

Key words: RFID tag, RFID reader, Bluetooth, Wi-fi, Cartapp, Clientapp, Server

I. INTRODUCTION

Now-a-days, number of shopping malls has increased so much throughout the global due to increasing public demand and spending. People visits shopping malls and buy the products, but while shopping they do not get any display of their total purchases i.e., their bill. Also when there is rush, people have to wait in the lanes at billing counters only for paying the bills. Today's billing system at shopping malls uses barcode scanning to scan the tag present on the product. Person at the counter have to scan the products in the trolley one by one which results in unnecessary delay to the customers and affect the shopping experience of the customer in negative way. These problems can be solved by the system that we are proposing.

In this paper, we are developing the system by using microcontrollers. Because system designed using microcontrollers is less bulky and easily transferrable. The microcontroller we are using for this system is 8051. Using the system that we are proposing in this paper can also benefit the organization implementing it, as there will not require any manpower for scanning the products at the counters.

RFID readers can be used instead of barcode scanners which will effectively reduce the delay caused due to waiting in lanes at the billing counters. In this system, we are using RFID tags which are placed on the items and RFID reader on the trolley which is responsible for scanning the RFID tags. When customer adds the product in the trolley it will be scanned by the RFID scanner and then the information about the product will be displayed on the screen placed on the trolley. In this way, customers can get clear information about what items they have added in their trolley.

Once the shopping is done the bill will be displayed on the client side application which is placed at the mobile phone of the customer. Wallet facility is also added for the billing purpose. Customers add money in their account. Payment can be done using cash or wallet. This client side application also provide the information about the products that have been purchased by the customers i.e.history of purchases done by the customers.

Objective of developing this system is to develop a system that assist customers to give better shopping experience by dynamically providing them their shopping item list which will be displayed on the screen on the trolley. Additionally, by using this system, we can also reduce the delay caused at the billing counters which will help a lot in increasing the shopping experience of the customer positively. This system will save time for shopping and also reduce the manpower required at the counters for scanning the products.

II. HARDWARE ARCHITECTURE

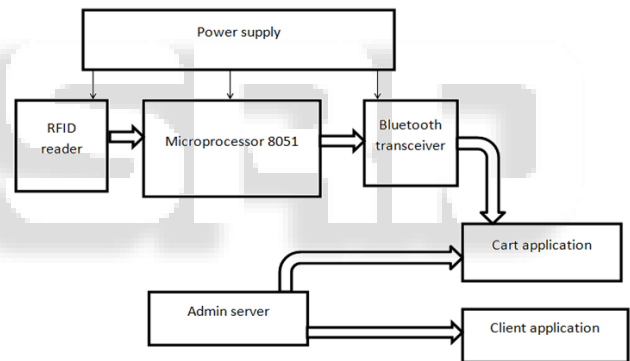


Fig. 1:

A. Microcontroller

For implementing this system, we are using 8051 AT89S52 microcontroller. It is 8-bit low power and high performance microcontroller with 8k bytes of in-built flash memory. On this microcontroller various different units such as RFID reader, bluetooth module, etc. are implemented.



Fig. 2

B. RFID Reader



Fig. 3: RFID Reader

Radio Frequency Identification (RFID) is a technology to electrically catch the presence of any object or obstacle using radio signals. RFID reader consists of RF transmitter and RF receiver. RFID reader captures the presence of RFID tags by using radio frequency signal. In RFID reader, transmitter consists of an oscillator to create the carrier frequency and receiver that contains demodulator to extract the data returned. For implementing this system, we are using RFID 125 kHz at 2.4GHz.

C. RFID Tags



Fig. 4: RFID Tags

There are two types of tags: Passive tags and Active tags. RFID tags consist of two parts. These are the transponders that transmit information. One is integrated circuit for modulation, storing, processing and demodulating radio frequency signals and other part is an antenna for receiving and transmitting radio signals.



Fig. 5:

D. Bluetooth Module

In this system, Bluetooth module HC05 is used. It has a range of about 10 ft. It is used to transmit the data between the microcontroller and cart application which is installed on the screen (tablet) on the trolley.

III. SOFTWARE ARCHITECTURE

Following are the softwares are required:

Embedded C is used for the programming of RFID reader that look ups the specified table of items and their price and shows the receiver information received on the screen (tablet) on the trolley.

JAVA is used for developing android applications using Android SDK in Eclipse. Using this, trolley application on which shopping details will be displayed and client application which will contain wallet, payment process, etc. will be developed.

For implementing database My-Sql is used. This database will include customer information, product information, etc. at the server side.

IV. SYSTEM WORKING

A customer enters into the shopping mall. On entering he/she need to get a trolley. Each trolley will be equipped with RFID reader and a android device with cart application. The functioning of the system is explained below:-

- 1) First the customer need to click on start button on the android application. This will start new transaction and customer will receive a transaction id.
- 2) When the customer want to purchase a product he/she will have to insert it into the trolley. The RFID code of the item will be scanned by the RFID reader and will be send to cart application via bluetooth.
- 3) The cart app then sends the RFID code to the central server central server using WiFi connection.
- 4) The server the looks up the RFID code in the product database. If a match is found then the server the name and cost of respective product is send back to cart app using WiFi connection.
- 5) The information received from the server will de displayed on the cart application in a tabular form. The table will also display the number of items and the total bill.
- 6) If the customer removes the item from the trolley, the RFID code on the product will be read by the RFID reader. Then steps 3 and 4 will be followed. Then the product is removed from the bill. Double entry of product deletes it from the bill.
- 7) The client can add more products or remove the products he/she wishes to remove.
- 8) After completing the shopping the customer needs to click on the stop button on the cart application which will end the current transaction and final bill will be created.
- 9) There is provision of application which the customer can use on his/her android phone which provides facilities like paying the bills, entering money in virtual wallet, view transaction history and view account balance.

V. CONCLUSION

The required objectives were successfully achieved in the prototype model we have developed. This system is easy to use, economical and does not require any special training to use. Also it provides customers a better shopping experience as they do not have to wait in lanes for bill payment at the counters. Also this system provides customers to pay the bills in an automated way as a wallet feature is added.

VI. FUTURE SCOPE

We can further reduce the delay by installing the swipe machines on the trolley itself for payment of bills.

Data mining techniques can be applied as the history of the purchases made by the customers is maintained in the database for taking business improvement decisions.

We can also install RFID tags at entrance/exit gates for providing security. By installing RFID gates we can ensure that no more than the number of items billed at the trolley are being taken away by the customers.

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