Smart Shopping Trolley Using Rechargeable Smart Card

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Abstract— **In today's accelerating world, shopping at malls or supermarkets have become lifesaver for people, if time is concerned as one of the important factors. Innovation in technology is basically aimed towards making day to day life of people easier and faster. In metropolitan cities we see big rush at malls on holidays and weekends. People buy different products and put them in trolley. After completion of selecting the goods, one needs to go to billing counter for payment. There the price on each product encoded in barcode tag is read and the bill is prepared. This is very time consuming and results in long queue at counter. In this paper, we discuss a product "Smart shopping trolley using rechargeable smart card" being developed to help a person in everyday shopping in terms of reduced time spent while purchasing. The main objective of proposed system is to provide a technology oriented, low-cost, easily handled, and efficient system for assisting shopping in person. The main facility that the proposed model provides is the user only needs to carry a smart RFID card, which can be recharged from time to time. When this card is swiped at the trolley, the payment is made right there and thus eliminating the need of standing in queue at counter and saving large amount of time.**

Keywords—**Radio Frequency Identification tags, RFID reader, Smart card module, RF transmitter, RF receiver**

I. INTRODUCTION

Recent advancements in technology and communication have caused revolution in all fields. In this new era we need to implement smart technology by bringing about automation in system. Challenge is not to develop such system instead to handle the problems aroused due to automation like energy consumption, cost, efficiency etc

Problems faced in present shopping system

a) Long queues for billing

b) Large manpower needed

Awati and Awati [2], describe a Smart Trolley design that concentrates on how to get the customers rid of dragging heavy trolleys and to automate billing, but it assumes all the customers to be honest and hence does not tackle cases of deception, if there are any. Further, Yew et al. [3] propose a smart shopping for future where the barcodes are completely replaced by Radio Frequency Identification (RFID) tags and scanners.

RFID tags are simply called as advanced barcode. It is nothing but small transponder which transmits an identifier or serial number to a reader. RFID is the special type wireless card which has inbuilt embedded chip along with loop antenna. The inbuilt embedded chip represents the 12 digit card number. RFID reader is the circuit which generates 125KHZ magnetic signal. This magnetic signal is transmitted by the loop antenna connected along with this circuit which is used to read the RFID card number. In this project RFID card is used as security access card. So each product has the individual RFID card which represents the product name. RFID reader is interfaced with microcontroller. Here the microcontroller is the flash type reprogrammable microcontroller in which we have already programmed card number. The microcontroller is interfaced with keypad.

This paper presents the use of smartcard along with RFID card which will facilitate the billing on trolley itself and thereby making system even faster. In this system every customer will be provided with smartcard which will be pre-recharged with certain amount. Once the entire shopping is done user will be asked for payment mode wherein there will be two modes

a) Smartcard payment

b) Cash payment

The proposed system has following important modules:

1. LCD interface for displaying shopping and billing details
2. RFID tags for project identification
3. Transreceiver for achieving wireless communication with server

In this paper we discuss in detail system design, working, testing and conclusions. In conclusions we discuss about advantages and disadvantages and future scope of proposed system. The Smart Shopping Cart has the potential to make the shopping experience more pleasurable and efficient for the shopper and the inventory control easier for the store management.

II. RELATED WORK

As we studied the idea behind smart shopping trolley we found that to overcome the problems of long queues earlier barcode were used which had their limitations.

First is line of sight interaction with product but it could not help to reduce long queues. Later on barcodes were replaced by RFID whereby billing is done at trolley itself. RFID's were successful to some extent to solve the problems. But although billing is done at trolley customer is supposed to pay the bill at counter which certainly takes time Also there was No facility to delete the products before billing. So idea was to overcome the queues at counter completely and provide function to delete the products if needed.

III. PROPOSED MODEL

We came up with the idea of using Smart card along with RFID. Every customer is provided with Smart card which has certain amount in its balance. Once billing is done at trolley smart card is swiped to make payment it thus completely eliminates queues at counter.

A. Algorithm

Each trolley is associated with a RFID reader and a smart card reader. When shoppers with the cart press "start button" the system turns ON and then all the components such as RFID reader, microcontroller and physical media start working. Every product has an RFID tag which contains unique id. These Ids's are fed in the database assigned to the corresponding products.

The functioning of the system is explained below:

Step 1: Start the system
Step 2: When the shopper drops any product in the cart then the RFID reader reads the tag.
Step 3: The information of the product is extracted from database
Step 4: display information on LCD
Step 5: Update the billing Information
Step 6: Enter next for new product and process repeats from step 2 to step 5
Step 7: Enter delete for removing product else go to Step 9
Step 8: Subtract the price of product and update the detail on LCD
Step 9: Select payment mode either cash or smart card payment
Step 10: If cash payment mode selected pay the bill and counter
Step 11: If smart card payment selected then swipe the card on reader
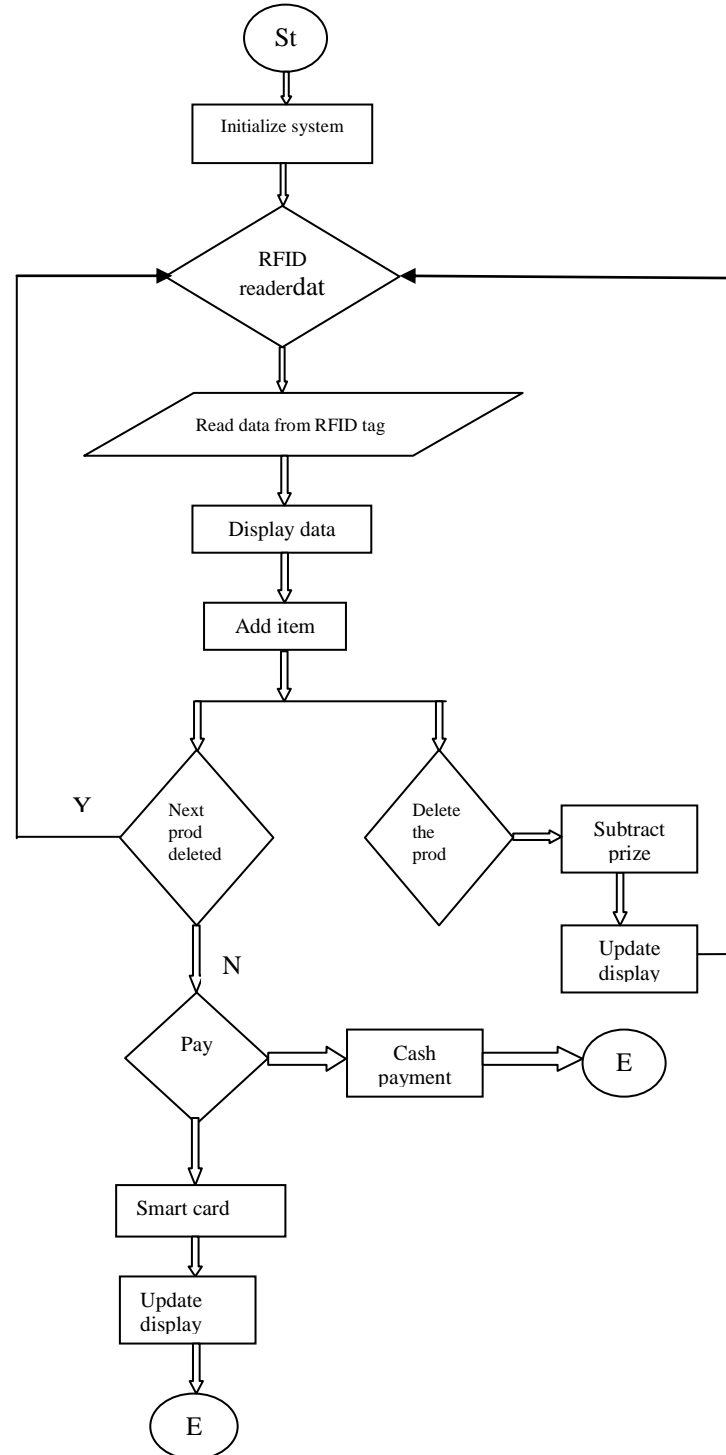Step 12: Enter the amount
Step 13: End

B. System Flow

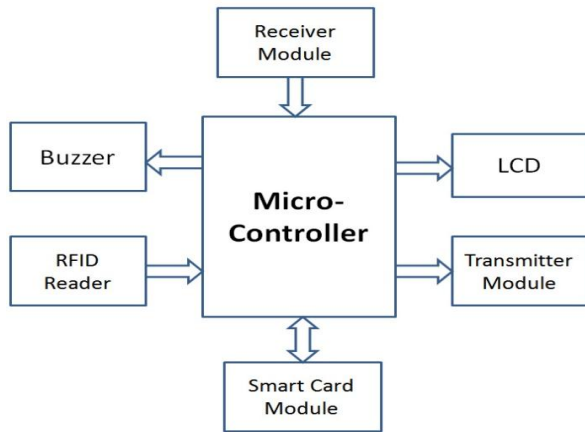**Fig 1. Flow Chart for Smart Shopping Trolley**

C. Block Diagram

Fig 2. Block Diagram for Smart Shopping Trolley

D. Working

Shopping trolley is equipped with proposed model, with RFID reader on front panel. An RFID tag is attached to each product in shopping center. After selecting a product, person has to drop the product in trolley. When the product is dropped the RFID reader scans the RFID tag on product without requirement of line of sight communication. RFID reader sends information of each scanned product to microcontroller. Price and product name is displayed on LCD on the trolley. When a person is done with the shopping, he has to press a switch. The model then asks for the entry of smart card. When user swipes the smart card in the provided slot, the total amount is displayed on LCD, and deducted from balance available in the smart card. Further this information regarding price and name of each product is transferred to the central PC. If user wants to delete some item from trolley another switch is provided, with the help of which amount of deleted items can be deducted from the total bill.

IV. SMART-CARD DESCRIPTION

A smart card is like a chip card. It is a plastic card that contains an embedded computer chip–either a memory or microprocessor type that stores and transacts data. This data is usually associated with either value, processed within the card's chip. The card data is transacted via a reader that is part of a computing system. In the proposed model, the smart card provides a predefined code and balance amount (STORED IN THE EEPROM OF the card IC). Every card has some unique code stored in its EEPROM also known as firmware, which is an integrated circuit programmed with specific data when it is manufactured.

The EEPROM (memory) on the smart card is there for security. The host computer and card reader actually talk to the EEPROM. The EEPROM enforces access to the data on the card. Smarts cards may have up to 512 kilobytes of EEPROM. The smart card uses a serial interface and receives its power from external sources like a card reader. EPROM chips can be rewritten many times. Erasing an EPROM requires a special tool that emits a certain frequency of ultraviolet (UV) light. EPROM's are configured using an EPROM programmer that provides voltage at specified levels depending on the type of EPROM used. In the smart card we used a two-wire serial EEPROM AT24C04. It is used in the circuit to store the ID code and balance amount, as the memory ensures reading of the latest saved settings by the micro controller.

V. FUTURE SCOPE

The future implications of the proposed system are very promising considering the amount of time and resources that it saves. The system can be upgraded to include interfacing with GSM which will help to get information about transaction on mobile. Also the transaction and billing system can be linked with bank account of individual user to make direct payment provided that security issues are being taken care of. Also the trolley can be further designed to search products in shelves and guide the user accordingly to the position of the exact product.

VI. CONCLUSION

The prototype model developed successfully satisfied the objectives. The system developed is highly reliable, fair, saves time and energy of customers. It is reliable and fair because of effectiveness of RFID, smartcard module and switch which provides deletion mode. The system is cost effective as it reduces the manpower needed. The project successfully demonstrated the possibility of using smartcard for developing a Smart Shopping System which makes the entire billing procedure even much faster.

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