Arduino Smart Billing Cart

G. Chaitanya Prakash[1], SK. Aslam[2], B. Manoj Kumar[3],
K. Yashvanth[4], K. Sasi Bhushan[5]
Student[1] , Student[2] , Student[3] , Student[4] , Sr. Associate Professor[5]
Department of Electronics and Communication,
Lakireddy Bali Reddy College of Engineering, Vijayawada, India

Abstract — Large grocery stores are nowadays used by millions of people for the acquisition of an enlarging number of products. Product acquisition represents a complex process that comprises time spent in corridors, product location and checkout queues. On the other hand, it is becoming increasingly difficult for retailers to keep their clients loyal and to predict their needs due to the influence of competition and the lack of tools that discriminate consumption patterns. Now days purchasing and shopping at big malls is becoming a daily activity in metro cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discount. People purchase different items and put them in trolley. After total purchase one needs to go to billing counter for payments. At the billing counter the cashier prepares the bill using bar code reader which is a time-consuming process and results in long queues at billing counters. Our aim is to develop a system that can be used in shopping malls to solve the abovementioned challenge. The system will be placed in all the trolleys. It will consist of a RFID reader. All the products in the mall will be equipped with RFID tags. When a person puts any products in the trolley, its code will be detected and the price of those products will be stored in memory. As we put the products, the costs will get added to total bill. Thus, the billing will be done in the trolley itself. Item name and its cost will be displayed on TOUCH SCREEN. All the products can be seen in the application in our mobile by using a WIFI-MODULE. In this project it is presented the proposal of an architecture and solution of an innovative system for the acquisition of products in grocery stores (Intelligent Cart). The Intelligent Cart explores emerging mobile technologies and automatic identification technologies (such as RFID) as a way to improve the quality of services provided by retailers and to augment the consumer value thus allowing to save time and money.

Index Terms—RFID-Reader, RFID-Tag, Wi-Fi Module, Arduino UNO.

Introduction

Now a day's interest in shopping malls is widely increasing among people. In the present shopping malls, customers find various difficulties. Those difficulties are mentioned below. One third of major shoppers buy groceries on a budget. Most of the times, it is only at the end of purchase shoppers come to know that the overall purchase total is greater than their budget. Then they spend much time in searching for their desired products and finally overall shopping process becomes more time consuming too. Due to this, several times shoppers couldn't buy all their desired products and miss out few items. Another major problem faced by users is that they have to wait in long queues for billing. Thus, the proposed system overcomes all these drawbacks faced by shoppers in shopping malls. In the first step of this project, a mobile application is developed to make shopping process easy. This application is designed in such a way that it holds information about all the products available in the shopping mall with price. As soon as the shopper opens the app, list of items with price gets displayed. The customer goes through the items and will select the desired items. After selecting, this application sorts the Selected items and displays them rack wise i.e. rack1 items first, rack2 items second and so on. Each item in Supermarket is tagged with a unique RFID label. Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, an RFID reader. RFID Reader recognizes the products put in the cart. As soon as each item is placed, various information like item name, price of the product is displayed in the LCD display placed in the cart. Along with this total sum is also displayed. The total bill amount will reach the bill counter immediately through Bluetooth technology. Then the user has to pay just the total amount and can walk away. Thus Item-level deployment of RFID technology allows for quick checkout aisles that scan all products at once and generates total automatically, eliminating different sectional counters and long queues, which are consistently reported as one of the most negative aspects of supermarket shopping.

Proposed Method

Technological developments have opened up new opportunities for the company to conduct its business activities. According to their port published by techinasia, there are several smart phone technology bases that have been popular among people and it plays a big part of a day to day necessity. The development of mobile technology is very rapid and it enables a new approach to e-marketing. Today's consumers are surfing more, shopping more and socializing more on their mobile devices. In this paper, a mobile application is used. It displays the list of products present and its cost. The user is asked to select the products. Once the selection process is over, the products are sorted and displayed based on its location. Radio Frequency Identification (RFID) is becoming referable technology as an alternative to barcode systems. RFID systems provide an automatic identification method, relying on storing remotely retrieving data using RFID tags or transponders. An RFID tag is an object that can be attached to or incorporated into a product, animal, or person for the purpose of identification using radio waves. Chip-based RFID tags contain silicon chips and antennae. In this paper, we have

developed a smart shopping cart system that allows customers to manage their shopping list while shopping and only pay the bill at the checkout counter. The shopping cart has the ability to calculate automatically and display the total prices of all the products inside it. This makes it easy for the customer to know how much he or she has to pay while shopping and not at the checkout counter. This way the customer can receive faster service at the checkout. The advantage for the shop owners is that they would need fewer cashiers, which would result in a large cut in their costs and through initialization of wi-fi module all the items that have been purchased can be seen in the mobile app.

Block Diagram

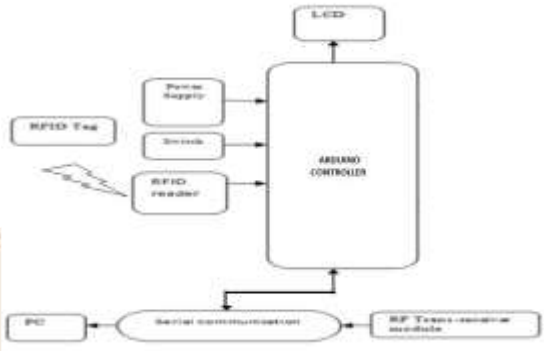

Fig.1 Block Diagram

Block diagram explanation:

1.Arduino Micro-Controller –For this project, we use a very easy to use microcontroller called Arduino. Arduino is an open source project based the programming language is a variant of C which is straight forward, and the system library is very rich. With little fuss you will be able to learn a great deal about how microcontrollers work and how to program them (The actual microprocessor chip the Arduino uses is made by Atmel, which is based in San Jose, California.) Below is an enlarged photograph of the Arduino microcontroller module (technically the Uno R3 module).

Fig.2 Arduino UNO Micro-Controller

Arduino has 14 input/output pins on one side (labelled 0 through 13) and 6 input/output pins on the other (labelled A0 through A5). It is these pins that allow external information flow in and out of the microcontroller. In this lab, you will primarily be concerned with these input/output pins. The six pins labelled A0 through A5 have the analog to digital conversion (ADC) capability. This means that you can measure an analog voltage (between 0 and 5V) on these pins to a certain degree of precision. In the case of the Arduino, the precision is 5/1023 or about 5 mV.

2.RFID Reader - Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. Unlike ubiquitous UPC bar-code technology, RFID technology does not require contact or line of sight for communication. RFID data can be read through the human body, clothing and non-metallic materials.

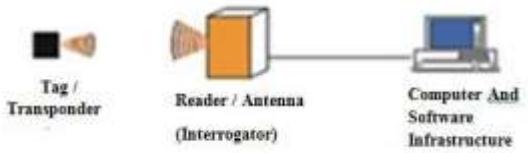

Fig.3 RFID Scanning

RFID consists of two parts:

i. RFID tags - Passive RFID tags for products-Passive RFID tags are attached to the products and are scanned by the reader attached to the cart. The data (product name, RFID number and cost) corresponding to respective card gets displayed on the LCD.
Passive RFID tags for user – RFID credit cards are of great advantage because they permit contactless payment transactions which are fast, easy, can be more reliable than magstripe transactions, and require only physical proximity (rather than physical contact) between the credit card and the reader. RFID based credit cards are issued to the user at the time of registration and the card is recharged with money.
Other important user information like customer name, contact number, email id, RFID number and balance are also entered.

ii. RFID Reader - RFID reader (EM-18) is installed in the cart which scans the products which pass through the inlet and are entered to the cart. After reading the RFID number corresponding data about the product gets displayed on the LCD.

3. LCD – LCD displays the information i.e. cost, RFID product number and name of the product when the product is scanned by the RFID reader. Up/down switches are interfaced with the microcontroller which can be used to view all the purchases (Refer Fig. 4)

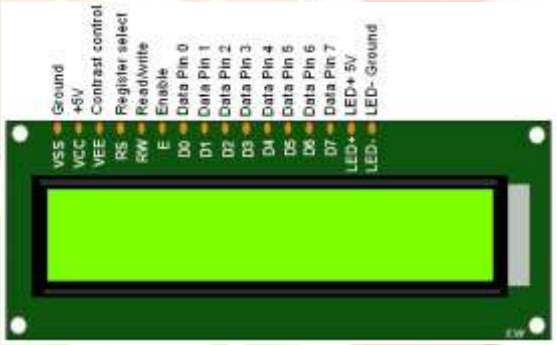

Fig.4 LCD Pin Description

Flow Chart

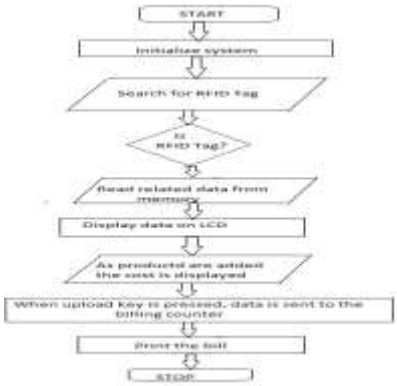

Fig.5 Control flow diagram for billing

Software Specifications- Programming Language: Embedded C

Results and Analysis-

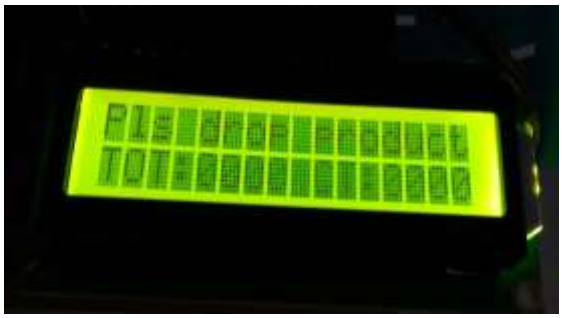

Fig.6 Initial Message

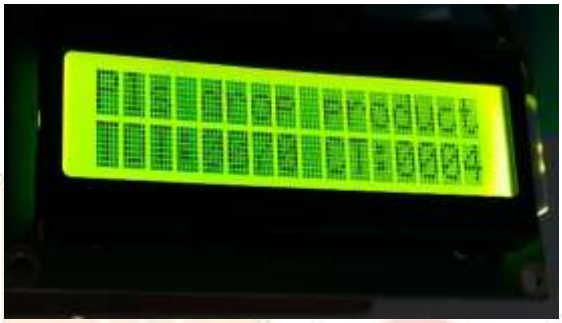

Fig.7 Message After Item Purchase

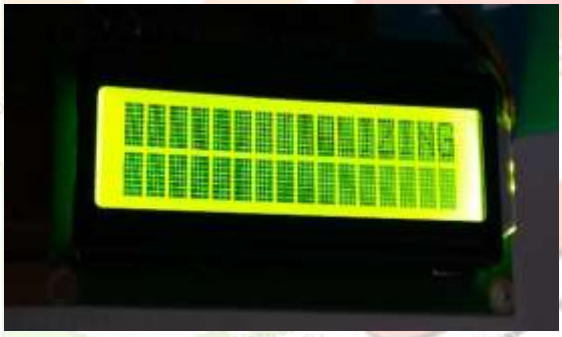

Fig.8 Initialisation of Wi-Fi

Fig.9 Hard Ware Kit

Fig.10 Message Information

Advantages-

- Improve the speed of purchase
- Improves the security performance
- Radio frequency-based identification of item cost
- Selection keys for entering item details and to set the limit
- ADD and REMOVE mode
- 2.4 GHz RF communication
- Audio indication

Applications-

We can use RFID based security system in highly secured areas such as:

- RFID based Bank security system.
- RFID based door opening and closing.
- RFID based production security system.
- Automation in modern world super markets.

Conclusion-

The desired objectives were successfully achieved in the prototype model developed. The developed product is easy to use and economical. Though the project showcases the proof of concept, there are a few aspects that can be included to make the smart shopping cart more robust. To begin with, in this project the latency time of the wireless communication with the server may need to be considered. Secondly, the communication is not very secure. It is impossible to stick RFID tag to some products. In such cases, conventional scanning of barcode is more sophisticated. Further, a more sophisticated micro-controller and larger display system can be used to provide better consumer experience. Results are verified at the loads and LCD display.

Future scope-

The movement of the cart can be made automatic by making use of sensors. In this way there is no need to pull heavy cart. Cart with LCD screens can be built which displays discount offers and total counting of the products then and there automatically. Also, the LCD can be provided with a layout of the shopping market through which the customer can get the exact information of the products present at different places. Thus, increasing the user friendliness. The communication medium can be replaced with Li-Fi which covers a large area for transmission of information, making it more efficient.

IX. REFERENCES-

[1] Dr. Suryaprasad J, Praveen Kumar B O, Roopa D Arjun A Novel Low-Cost Intelligent Shopping Cart, Proceedings of the 2nd IEEE International Conference on Networked Embedded Systems for Enterprise Applications, NESEA 2011, Perth, Australia, December 8-9, 2011.

[2] Zeeshan Ali, Prof. Reena Sonkusare, "RFID Based Smart Shopping and Billing**",** International Journal of Advanced Research in Computer and Communication Engineering, Vol. 2, Issue 12, December 2013.

[3] Larson, Bradlow and Fader, "An Exploratory Look of Supermarket Shopping Paths," International Journal of Research in Marketing, April 2005. Available: http://www.searchlores.org/realicra/PT_1006.pdf.

[4] G. Roussos and B. College, ―Enabling RFID in Retail, Computer, IEEE volume 39, no. 3, 2006.

[5] Ankit Anil Agarwal, Saurabh Kumar Sultania, Gaurav Jaiswal, Prateek Jain. RFID Based Automatic Shopping Cart, Control Theory and Informatics Vol 1, No.1, 2011.3.

[6] UditaGangwal, Sanchita Roy, Jyotsna Bapat, Smart Shopping Cart for Automated Billing Purpose using Wireless Sensor Networks, 2013.