

Smart Trolley Based on RFID



Meyyappan Chindamani, C. Keerthi, M. Madhumitha, and P. Khreethi

Abstract In this present scenario, the purchasing and shopping have become a routine practice for the people all over the world. After the completion of shopping the bill will be prepared by the cashes using the bar code reader. This process consumes lot of time has led to the long queue in the shopping malls and markets. The short reading distance, visibility, changes to be impaired by the moisture operation, packaging counters, reduces the reliability of the bar code. In spite of these detriment, requirement of the human resource adds to the overall expenses of the existing system. To overcome these defects, we have proposed “Smart Trolley based on RFID” to assist people in shopping. The Automatic billing of product is a low cost technology which is easily scalable and rugged also. The proposed system consists of EM-18 RFID reader, At mega 328 micro-controller, GSM SIM800 module, LCD display. RFID tag has unique number which is confined to each product in the market. Once these information are fed to database RFID becomes readable and are read by the reader and information is displayed in LCD through micro-controller. At the each time when product is added to the cart, the amount of the product gets added to the bill. Finally the total bill is sent to the buyer’s registered number. So that the buyer can pay their bill in cash counter and check out. Thus saves the time for both seller and buyer. The time to time upgradation of the bill is shown in the LCD display which makes the shopping feasible. The prototype developed can be commercially deployed.

Keywords ATMEGA328 · EM-18 RFID reader module · GSM SIM800 modules · Smart trolley · Shopping feasible

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1 Introduction

Gathering of people at a common place or shop for buying the products of their need is known as shopping. The shopping method have evolved over the years. In olden days it is the manufacturer or seller user to take products and roam in search for the buyer. But in present with the growing demand of the people and advent of technology the shopping pattern have changed largely. The concept of shopping paved the way for the growth of the business. From such traditional practise, today the mode of shopping has gained new form and process. In the past the number of shops was much lesser. The cheaper availability of the product and the increasing purchasing power of the man kind laid foundation for the growth and blooming of the markets. Then due to such increasing markets, increased the theories and researches in the field of shopping. People started crowding at the stores, the managerial level started to identify the smart way to control and manage these huge people in a efficient manner. Thus the different techniques were used at the stores to save time of the customer and owner such as door delivery [1]. This system is more advantageous because it is easy to implement, account information, transmission is secured, disputes related are easy. The proposed system can be made to interface with wireless technologies [2]. In 1970s arrived the new concepts of clustering the stores in a building called malls with that came into existence the bar code technology. This made a vital change in the existing system. The efficiency of the system increased [3]. Since the effective technology is combined with the wireless network the system has been produced with reliability, eliminating an overhead to the communication. LCD can be provided to get the exact information of the product.

It greatly helped the industries in the movement of the goods from one place to another. It made a convenient way to maintain records in digital and software format. As it was used friendly, many companies relied upon this. With the advent of supermarkets in the large cities to sophisticate the shopping, the trolleys were introduced. Shopping became as one regular chore of the human in which he spends his considerable amount of time. As per the report of US Bureau of Labour [4] on an average human being spend 1.4 h everyday on shopping. A survey by Visa in 2005 points out that an amazing 70% customer will walk out of the queue if the line is too long, and 10% are “seriously annoyed” the moment they step in queue [5]. In the current scenario shopping classified into two types as Shopping in-person and shopping in absentia. The later represent the internet shopping, tel-shopping etc. It is the type of shopping where the physical presence of humans are not required. Shopping in person means personally approaching a shop to buy various products based on the needs, convenience, etc. The proposed system assist people in shopping by minimizing the time spent in the shopping and assist the management of the larger shops with the faster update of the product information. The new technologies such as RFID, GSM module, makes the process of the shopping easier, efficient and reliable. To overcome the such mentioned problems during shopping, we have proposed this system that can be employed in the shopping malls. For the identification of product the RFID is employed. To aid the customer in the server related into GSM module is

used. The LCD display is equipped in the smart cart to assist the shopper in product related information such as name, price and bill. During the purchase of the customer, whenever he/she drops or picks out product from the cart, the RFID scanner quickly detects the product. Then according to the will of the customer that product can be added to the bill or eliminated from the bill. As soon as customer finishes his/her shopping, the end button can be pressed which indicates the end of the shopping. After this the total bill will be displayed in the LCD and same will be sent to the customer's registered mobile number and the server of the shop. Thus shopping completes by just making the payment. "This shopping cart will change the way people shop as radically as ATM's changed banking". The expected positive outcomes are that it would reduce the number of staff, increase the operational efficiency of the shopping process friendly, time saving, and even smarter.

2 Methodology

The RFID tag is attached to every product and each RFID tag has its own unique Id. The details of the items to which the RFID tag is attached is stored in the database. So each tag is confined each product in the supermarket. The details of each item is updated in the micro-controller memory with the unique number of the RFID tags. SIM in the GSM Module acts as an owners mobile number to which the user number will be registered and the total bill will be sent. Each item in the market is attached with the RFID tag to which all the details of the product are confined. This database is stored. The micro-controller used as a storage for database. The comparison of the scanned and stored items also can be performed. It also act as a temporary storage for the bill being generated. On the scanning of the each product, the details of the scanned tag is compared to database. If the scanned item already stored it is recognized and added to the bill. If the item does not exist it will be rejected. There is a provision for the addition and delete of the items according to the desire of the customer. After the completion of the shopping, by pressing the "end" Push button the final bill is sent to the customer for the easy paying of the cash. The block diagram is shown in Fig. 1. The methodology is shown in the Fig. 2 as flow chart.

3 Implementation

3.1 Registration of Mobile Number

When the customer switches on the micro-controller and GSM the "welcome" will be displayed in the LCD screen. Then, the mobile number of the shopkeeper will be displayed in it (see in Fig. 3). The user has to send his mobile number as a message

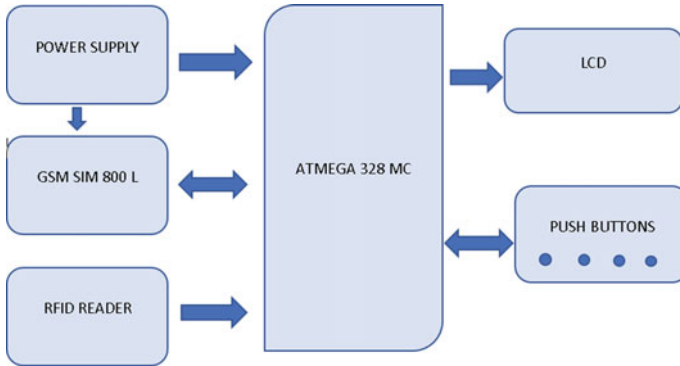
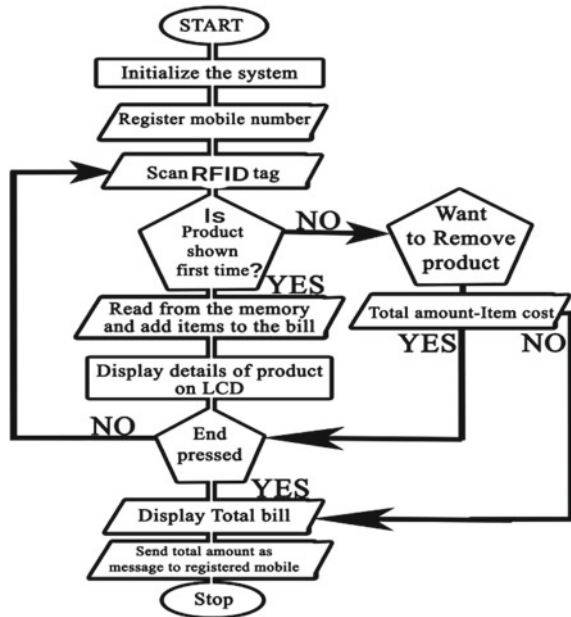


Fig. 1 Block diagram

Fig. 2 Flowchart

FLOW CHART



to the owner’s mobile number which is displayed in the LCD. The registration of the user mobile number is confirmed through a reply message as “registered” to the user mobile (see in Fig. 4).

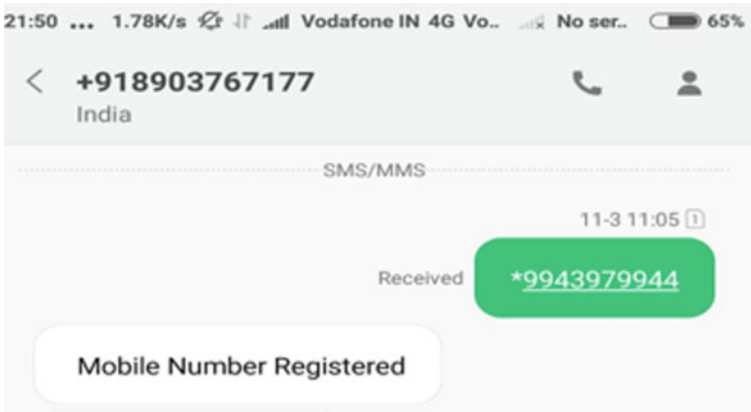


Fig. 3 Customer mobile display



Fig. 4 Implementation

3.2 Shopping Process

After the registration, the customer can start shopping. The RFID tag in each product has to be scanned in the RFID reader attached in the trolley. There is a unique ID for every RFID tag. These unique IDs contains the details of very unique product. Then these details are fed to the database. When the shopper drops any products the RFID reader detects that product with the attached RFID tag. In the LCD screen the product information is display which has been extracted from the memory. Whenever the product is added, the bill gets updated automatically. Once the tag is scanned the details of the product such as name, cost will be displayed in the LCD display. On the addition of ever consecutive products to the cart, the price of the same product will be added to the total bill. The above process is repeated until the customer completes

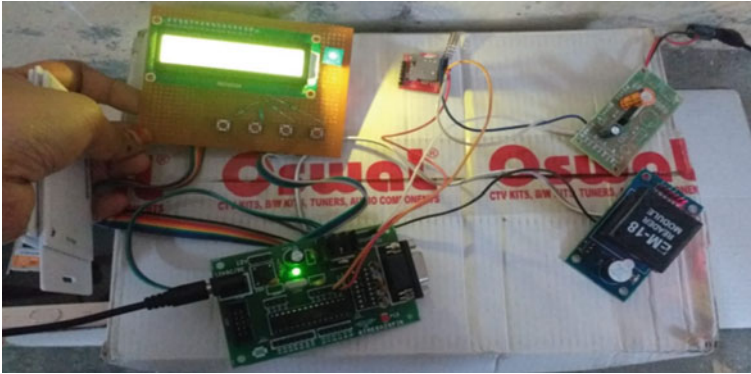


Fig. 5 Snapshot

the shopping. If the buyer wishes to delete any item from the cart then same has to be scanned again in the RFID scanner then the message will be displayed asking as “whether to remove” so that item will be removed after the confirmation.

3.3 Generation of the Bill

After the finishing of the shopping the “end” button has to be pressed. Then the total bill will be sent as a message to the customer. By showing the message the buyer can pay the bill and check out of the store. The implementation is shown in Fig. 5

4 Hardware Description

4.1 ATmega328

ATmega328 is an micro controller which belongs to the type of Advanced virtual RISC. 8 bits data will be supported to At mega 328. It is one of the cost efficiency micro-controller. As it has low power dissipation, it is employed in the many real time projects for the security purposes, programming lock is used. It has real time counter with separate oscillator which adds to its feature. All these parameters makes the Atmega328 best suited micro-controller for the proposed project.

4.2 EM 18 RFID Reader Module

The ID information that are stored in RFID tag are read by this module. Each tag contain unique information, that are not replicate of any other. It is also used like sensor module. Before switching power to the system, the mode of communication between MODULE and CONTROLLER has to be programmed to receive data from the module. For detecting the products with RFID tag this module is employed.

4.3 SM800L Module

This module is known as the GSM modem's miniature. The central part of the module is a SIM 800L GSM cellular chip. The module usually comes with a **Helical Antenna**. At the back, there is a SIM socket, an 2G micro sim card which is activated will work it. It can be used to Send and receive SMS messages. To show the status of cellular network, there is an LED on the top right side of SIM 800L cellular module. So, it is chosen for transmitting data of the bill after shopping in this project.

5 Results and Conclusion

Each RFID were used to represent the each distinct products that are being shopped. The RFID card reader reads the each RFID tags during the scanning of tags. By doing so the details of the products such as name, price will be displayed in LCD and will be stored temporarily. Once shopping is over and "end" button is pressed, the LCD will display the total bill by extracting it from memory and copy of the same is sent to the customer's initially registered mobile number (in Fig. 6).

The following test was carried out to prove the working of proposed system.

1. Identify product based on the RFID tag
2. Process of automatic billing
3. Displaying the correct details of the products
4. Complete listing of the purchased products
5. Total bill calculation and being sent to the customer
6. Automatic upgradation of bill during the addition or removal of the product from the trolley.

All these criteria were successfully tested. The developed system is friendly to adapt and use. It doesn't require any special training for the usage. The aimed objectives were achieved in this developed prototype model. This proposed system can be used in malls, supermarkets and can be employed in both retail and wholesale stores as it saves time, energy for both customer and shop owners.

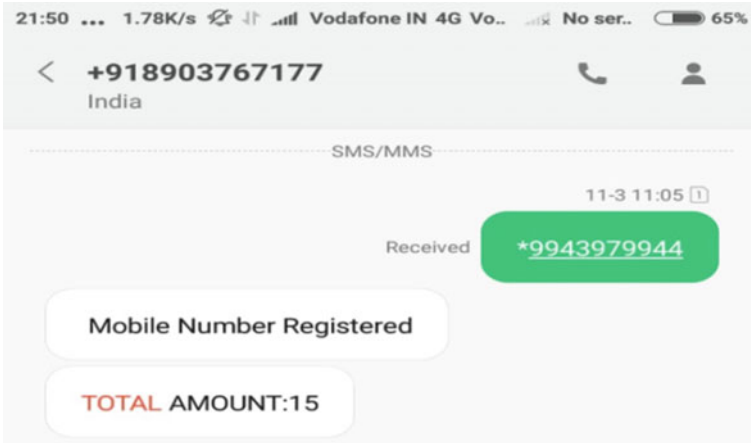


Fig. 6 Output

References

1. Gupta S (2013) Arduino based smart cart. Int J Adv Res Comput Eng Technol 2(12)
2. Lambay MA, Shinde A (2017) Automated billing cart. IJCST 5(2)
3. Machhirke K, Goche P. A new technology of smart shopping cart using RFID and ZIGBEE. Int J Recent Innov Trends Comput Commun 5(2)
4. American Time Use Survey. <http://www.bls.gov/tus/charts>
5. http://www.cisco.com/web/about/ac79/docs/retail/Mashop-survey-metrics_UNITED-STATES.PDF