ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE) Vol 3, Issue 6, June 2016

Intelligent Shopping Trolley with RFID and Wireless Technology

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***Abstract*- The RFID (radiofrequency identification) technology offers the ability to provide many new services and conveniences in the retail environment. A huge crowd is seen at shopping malls on holidays and weekends. People purchase different items and drop them in their trolleys. After the purchases, one needs to go to the billing counter for payments. At billing counter the cashier bills the products using bar code reader which is time consuming and results in long waiting queues. In this paper, a product is being discussed which assists a person in everyday shopping in terms of reduced time spent while purchasing. The system consists of three key components/modules RFID reader with Bluetooth, RFID tags, user interface and display unit and GSM component. Smart cart equipped with RFID tags can verify the purchase of the products as they are dropped in the cart and communicate with the display unit through Bluetooth to automatically display the billing list of the purchases made.**

Keywords: **Radio Frequency Identification (RFID), Wireless Bluetooth Module, RFID tags, Microcontroller, Server database, GSM**

I. INTRODUCTION

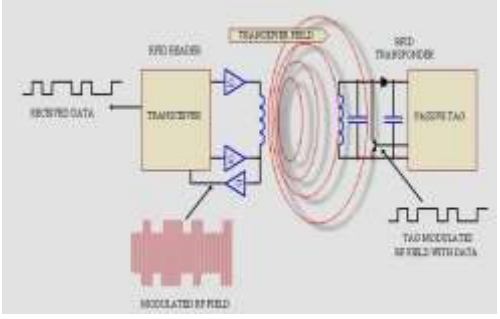
RADIO frequency identification (RFID) is expected to play important roles in the future computing. As a wireless technology, RFID is used for automatic item identification and data gathering. RFID enabled systems have been applied in various areas such as supply chain, military, healthcare, and crisis management, just to name a few. Major retailer chains such as Wal-Mart and Target has mandated that all suppliers introduce RFID. At the basic, RFID systems consist of small transponders or tags, attached to objects. When interrogated by RFID readers, the tags respond with some identifying information that may be associated with arbitrary data records. Thus, RFID systems are one type of automatic identification system, similar to optical bar codes.

Shopping mall is a place where people purchase their daily necessities ranging from food products, clothing, electrical appliances etc. Now-a-days, number of shopping malls has increased globally due to increasing public demand & spending. Sometimes customers have problems regarding the product information and unnecessary time spent at the billing counters. To overcome these problems in the existing system, we have developed a SMART TROLLEY USING RFID. This can be done by simply affixing RFID tags to the products and using an RFID reader with a display unit on the shopping trolley. This system will acknowledge the customer with a brief billing information about the product immediately instead of standing in the long queues for the same. This will save time of customers and manpower required in mall.

RFID reader - Radio frequency identification (RFID) is a term that is used to describe a system which transmits the identity of an object or person wirelessly, using radio waves. Unlike UPC bar-code technology, RFID technology requires no contact or line of sight for communication.

II. WORKING OF RFID

Every RFID system tags contain information. Information can be as little as a single binary bit or large arrays of bits like an identity code or literally any type of information that can be stored in digital binary format. The RFID technology makes use two components – the reader and the tag. The reader contains two parts – a transceiver and an antenna. The transceiver produces a weak radio signal that may have a range from a few centimetres to a few yards. The signal is necessary to *activate* the tag and is transmitted through the antenna. The signal is the form of energy that powers the tag.



ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE) Vol 3, Issue 6, June 2016

III. PROPOSED METHOD

The major functionality of the trolley is to guide the user through various aisles, stop at the required product and also when an obstacle is detected. For the prototype and experimentation, we assumed each aisle contains two categories of products.

The components involved are:

1. ***RFID Reader*** - RFID reader (EM-18) installed in the cart scans the products which pass through the inlet. After scanning the RFID number, corresponding data about the product gets displayed on the mobile device. The range is 3cm.
2. ***RFID Tags*** - Every product in the mart will have an RFID tag attached which contains unique ID. These IDs are fed in the database in correspondence to the products. The size of a tag also depends on its area of use.
3. ***Display unit*** – An Android based mobile device displays the information i.e. cost, RFID product number, name of the product, manufacturing date and expiry date 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.
4. ***Bluetooth*** – BT HC-05 model is interfaced with the microcontroller for the wireless communication between the RFID reader and the mobile device. The read information from the RFID is transferred to the display unit through Bluetooth.
5. ***Arduino UNO*** - The microcontroller is the heart of the system. It interfaces all other components and communicates with each other. The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal. Operates at 5v with Flash memory of 32 KB

Stock from various suppliers arrives at the store. Products are added to the stock and are registered by using the product registration form, wherein information about the product like product name, product brand, colour, RFID tag number, cost and product ID number are added.

When a customer arrives at the store:

- ❖ He/she can unlock the cart using his RFID loyalty card and proceed to the shopping with the smart cart.
- ❖ The shopping app on the Android device logs into the customer's account and the departments' names are shown.
- ❖ The customer chooses his desired department by tapping on the name and the cart starts to move in that direction.
- ❖ As and when the customer drops his commodities inside the cart, the RFID reader detects the product and its information and the bill is displayed on the Android device.

If the product is to be removed from the cart, it is read once again by the reader and it is eliminated from the billing list. When the customer is done with the shopping, he will move forward along with the cart to the billing counter. At the billing section cart is connected to the server via the serial port.

The data of the purchased RFID tagged products is automatically transferred to the server. The bill is computed and is sent as an SMS via GSM module.

IV. RESULT

The readings of the products as the commodities are dropped inside the trolley are displayed on the display unit as follows:

Sl. No.	Name	Wt.	Mfg. Date	Exp. Date	Price
1.	Moong -dal	2Kg	3-5-2015	2-3-2016	Rs.70
2.	Tooth paste	200g	3-5-2015	2-3-2016	Rs.60
3.	Wheat	2kg	3-5-2015	2-3-2016	Rs.70
Total					Rs.200

Fig.1: Reading the product Tooth paste

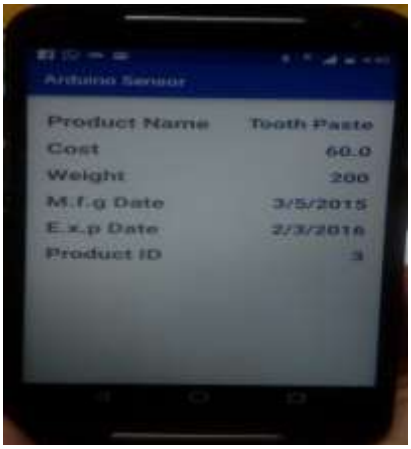


Fig.2 The billing details of Tooth paste

Fig.3 Reading the product Moongdhal

Fig.4 The billing details of the product Moongdhal

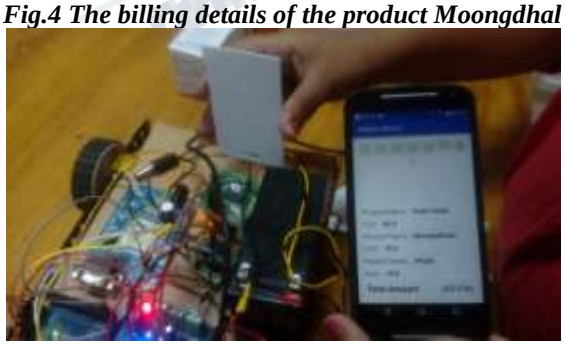


Fig.5 Reading the product Wheat

Fig.6 The billing details of the product Wheat

Fig.7 Shopping bill is sent to the customer's phone

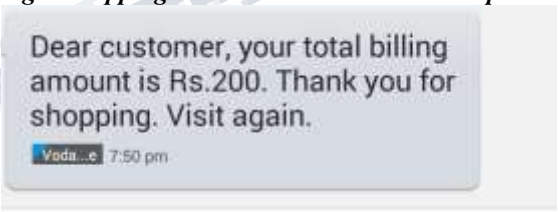


Fig.8 The message sent to customer using GSM after shopping is completed

V. CONCLUSION

The developed model is of an easy access to the consumers in the market and provides a user-friendly interface which saves the time and energy of them. There is huge potential to be gained by integrating mobile technologies into retail environments. There are a few drawbacks to be resolved to make the proposed system healthier and the project successfully exhibits the use RFID tags for developing a smart shopping system which makes the shopping experience much faster and simpler.

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