

SMART TROLLEY USING RFID AND ZIGBEE

¹E.Prasanth, ²B.Surendra Rao, ³M.Dorababu, ⁴R.Siva Sai Teja, ⁵Y.Sandeep

¹Student, ² Student, ³ Student, ⁴Student, ⁵Student

Department of Electrical and Electronics Engineering
Pragati Engineering College (A), Andhra Pradesh, India.

Abstract : A shopping mall or complex is a place where people buy product/s for their regular use. The customers have to wait in long queues to get their products scanned using barcode scanner and get it billed. To get rid of this, we have proposed a new 'Smart Shopping Trolley using RFID (Radio Frequency Identification)'. This implementation is used to assist a person while shopping and also to avoid standing in long queues and thus saving time. The smart shopping trolley would consist of a microcontroller, Android Device, RFID Reader and an Electronic Display. The products in the shopping centers will have RFID tags to retrieve/access information about it. When a customer places a product in the smart trolley, the RFID Reader will read the Product ID and the information related to it will be stored in controller. There will be communication between android device, main server and billing system (gate system) via ZigBee module. The total amount of the products in the trolley will be calculated using android device and will be updated on server and the Central billing System

Index Terms – RFID Reader, RFID Tags, ZIGBEE module, Trolley.

I. INTRODUCTION

Humans have always invented and developed a technology to support their needs ever since the beginning of mankind. The basic purpose of advancement in technology has been in minimizing tasks and making everyday chores easier and faster, irrespective of the various domains available. A major task on which human beings are found spending considerable amount of time is shopping. According to a Survey, approximately most of the humans spend 1.5 hours daily on shopping. A large number of customers will always tend to walk out of a queue if the queue is very long. The current shopping environment can simply be classified into two categories (1) Shopping in-person and (2) Shopping in absentia. Shopping in-absentia is supported in many ways including online shopping, tele-shopping, etc. wherein a shopper or a customer does not have to be present physically in the shopping arena. Shopping in-person involves a personal visit of a person to the shopping malls or centres and selecting the product/s based on the various factors including need, fashion, convenience, brand, etc.

An automated smart shopping system is formed by introducing the concept of IoT to connect all items in the grocery shop. In this system, an inexpensive RFID tag is embedded within each product. When the product is placed into a smart cart, the product detail is automatically read by the cart equipped with an RFID reader. Hence, billing is made from the shopping cart itself preventing customers from waiting in a long queue at checkout. Also, expiry date of the product is displayed and the damaged products can be identified with respect to its weight. Thus, expired and damaged products will not be considered for bill calculation. In addition to that, smart shelving is added to this system by introducing RFID readers that can monitor stock, perhaps updating a central server. Thus, inventory management becomes easier. Finally, the checkout points can validate the purchase made by a client. A prototype of a smart shopping system is also presented in this paper.



FIG.1.SMART TROLLEY

II. LITERATURE SURVEY

1.Suryaprasad J in "A Novel Low-Cost Intelligent Shopping Cart" proposed to develop a low-cost intelligent shopping aid that assists the customer to search and select products and inform the customer on any special deals available on the products as they move around in the shopping complex.

2.Mine Karmouche in "Aisle-level Scanning for Pervasive RFID-based Shopping Applications" proposed to develop a system that is able to scan dynamic and static products in the shopping space using RFID Reader antennas. Instead of conducting the RFID observations at the level of individual carts, aisle-level scanning is performed.

3.Satish Kamble in "Developing a Multitasking Shopping Trolley Based on RFID Technology" proposed to develop a product to assist a person in everyday shopping in terms of reduced time spent while purchasing. The main aim of proposed system is to provide a technology oriented, low-cost, easily scalable, and rugged system for assisting shopping in person.

4.Mr. P. Chandrasekar in "Smart Shopping Cart with Automatic billing System through RFID and ZigBee" proposed to develop a shopping cart with a Product Identification Device (PID) which will contain a microcontroller, a LCD, an RFID reader, EEPROM, and ZigBee module. Purchasing product information will be read through a RFID reader on shopping cart, meanwhile product information will be stored into EEPROM attached to it and this EEPROM data will be send to Central Billing System through ZigBee module. The central billing system gets the cart information and EEPROM data, it access the product database and calculates the total amount of purchasing for that particular cart

III.SYSTEM OBJECTIVE

To develop a low-cost intelligent shopping aid that assists the customer to locate and select product/s and inform them on the product/s details dynamically as they move in the shopping arena. Additionally, with each product identified uniquely and usage of centralized server, support billing and inventory updates.

3.1.System Goals

The proposed smart shopping system should achieve the following major goals:

- 3.1.1.Items reading: The smart cart should be able to accurately read items put into or removed from the cart. An item put into one cart should not have the ability to be perused by another cart nearby.
- 3.1.2.Items tracking: The server should maintain the state of items in the store. With RFID readers installed on the shelves, the items can be monitored and the item stock can be updated to the server.
- 3.1.3.Payment verification: RFID readers installed before the exit door can scan all the items in the smart cart and check with the server if everything in the cart has been paid. If an unscrupulous shopper tries to leave the store without making a payment, he will not pass the verification.

Producer number	Product number	Product name	weight	Expiry date	HMAC
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3.2 System Architecture

Each trolley is attached with Product Identification Device (PID). Through ZigBee communication, PID device sends its information to automated central billing system, where the net price of all the purchased products is calculated. Customer can get their billing information at the billing or packing section according to their trolley Identification Number. Even there is no need for a cash collector, if in case a customer uses their debit/credit for the net bill payment. The automated central billing system consists of a ZigBee transceiver and a server/system connected to access product database.

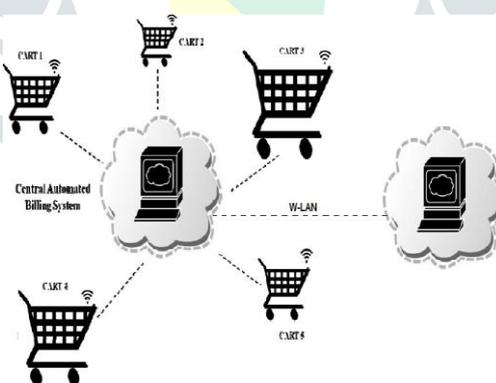


FIG.2. CENTRAL AUTOMATED BILLING SYSTEM

3.3. System Working

When the customer enters the shopping mall, he/she will receive a trolley on which there will be a RFID Reader, LCD Display and Android device. The trolley will start its processing once the vendor presses the 'START' button on the trolley which will be only seen by the vendor. Thus, now the customer can use the smart trolley for shopping. Whenever the customer places a product into the trolley, the RFID Reader will read the tag information and display the related results on the LCD Display. These steps are repeated till the customer finishes his shopping and the "STOP" button is pressed by the vendor. Once the "STOP" button is pressed there is an option provided to end the shopping with the same purchased products or to delete or remove some of the products from the trolley. This totally depends on the customer choice. At the end of shopping, the customer can straight away pay the bill and leave the shopping center. Inventory status of the products is also updated at the end of shopping.

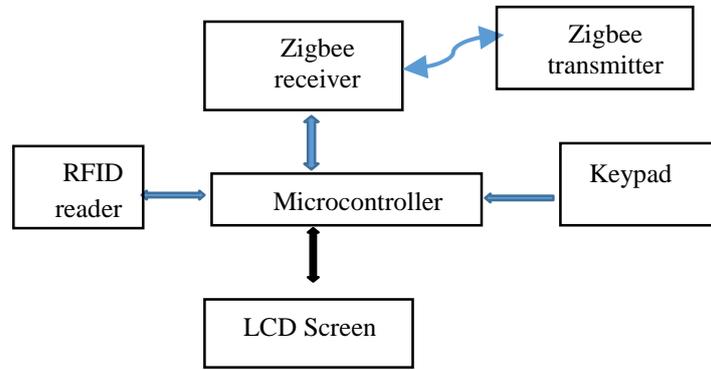


FIG.3.COMPONENTS OF SMART TROLLEY

IV. COMPARISION BETWEEN BARCODE SCANNER AND RFID READER

Existing system	Proposed system
a) Manual billing. b) Use barcode for billing c) human staff is needed for billing d) Low product cost but overall expenses are much high. e) Difficult to track the product. f) Getting product information is difficult & time consuming. g) It does not disclose any automatic way of indicating to the shopper how the total bill is affected as objects are added or removed from the cart.	a) Automatic billing b) Use RFID TAG for billing c) No need of any staff for billing d) Product is little expensive but overall expenses is much low e) Easy to locate/track the product f) Getting product information is easy and no extra time needed. g) LCD display is present which will show the updated bill every time the shopper add or remove any object from the cart.
BARCODE (existing technology)	RFID (proposed technology)

V.RESULT

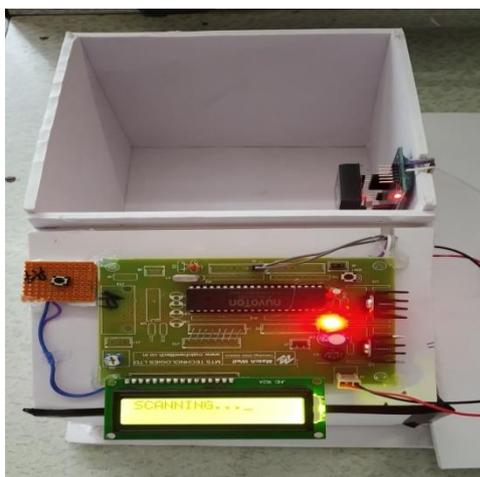


FIG.5.TROLLEY

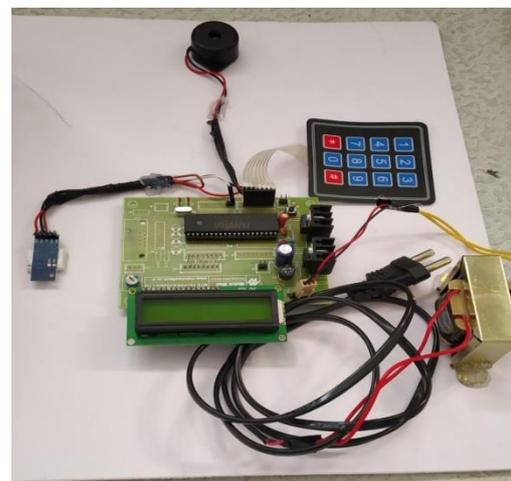


FIG.6.BILLING COUNTER

VI.CONCLUSION

The smart shopping trolley application creates an automated central billing system (acbs) for supermarkets and malls. using pid (product identification), customers will not have to wait near cash counters for their bill payment. since their purchased product information is transferred to central billing system. customers can pay their bill through credit/debit cards as well. The system proposed is highly dependable, authentic, trustworthy and time-effective. there will be reduction in salary amount given to employees, reduction in theft. also, the system is very time-efficient. In this proposed paper, a secure smart shopping system utilizing RFID technology is employed in enhancing shopping experiences and security issues. The smart shelves are able to monitor the items on the shelves by reading the RFID signals from the tags. The smart carts are able to read and retrieve information of the items inside the carts and finally, the checkout points can validate the purchase made by a customer.

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