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## RFID Based Wireless Intelligent Cart Using ARM7

Suraj.S, Vishal Guruprasad, Udayagiri R Pranava, Preetham S Nag

U.G. Students, Department of Electronics and Communication, BNM Institute of Technology, Bangalore, India

**ABSTRACT:** This paper “RFID BASED WIRELESS INTELLIGENT CART USING ARM7” put forth an architecture and solution of an innovative system for the acquisition of products in shopping malls. The Intelligent Cart explores automatic identification technologies like RFID as a way to improve the quality of services provided by retailers and to augment the consumer value thus by using modernized techniques which also results in saving time. Shopping at big malls or any shopping precincts is a daily activity in metro cities. People from all walks of life purchase different materials and put them in the cart. Once the purchase is done, the billing counter has the cashier to prepare the bill using bar code reader which is a time consuming process and lead to long queues at billing counters. Our aim is to develop a system that can be used to solve the mentioned challenge. The system will be placed in each cart. It will consist of a RFID reader. All the products in the mall will be equipped with unique RFID tags. When the consumer tries to put any products in the trolley or cart, tag will be detected and the name and other details of the products will be displayed on LCD. As we put the products, the costs will get added to total bill. Thus the billing will be done in the trolley itself. At the billing Counter the total bill data will be transferred to computer via ZigBee module.

**KEYWORDS:** RFID, RFID tags, ZigBee.

### I. INTRODUCTION

Shopping precinct or shopping center is a place where most people will get their daily necessities. The count of shopping malls keeps on increasing over the years throughout the globe due to the demand of the public. Thus, the level of advancement of shopping mall system and infrastructure also accelerates. For shopping mall system, there are still plenty of spaces for improvement in terms of providing quality shopping experience to the consumers. Consumers often face few problems and inconvenience while shopping. These problems include worrying that the money brought is not enough for paying all the items wanted, insufficient information of particular item that are for sale and also wasting unnecessary time at the cashier. There are some existing methods to solve these issues which are enlightened in this paper.

Certain techniques to solve above challenges are substituting the conventional way of keying item per item by hand to the cash register with the technology of barcode scanning where the price are stored in the barcode, and also set up a customer information counter to help the consumer if there are any enquiries about the items at shopping mall.

The problems stated above might eventually be solved or else improved by the implementation of RFID technology in shopping mall. This can be done by simply attach an RFID tag to all the items in shopping mall and attach a RFID reader with a LCD display on the shopping trolley can reduce the intensity of all the problems above. With the implementation of this system, consumers can know the price of every item that are scanned in, total price of all the items, and also brief details of the item such as the weight or expiry date.

### II. LITERATURE SURVEY

Dr.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.

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

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. 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. BLOCK DIAGRAM OF TRANSMITTER

In this unit the ARM processor is attached to a RFID reader. As the user puts the items in the trolley the reader on the trolley reads the tag and sends a signal to the ARM processor. The ARM processor then stores it in the memory and compares it with the lookup table. If it matches then it shows the name of item on LCD & also the total amount of items purchased.

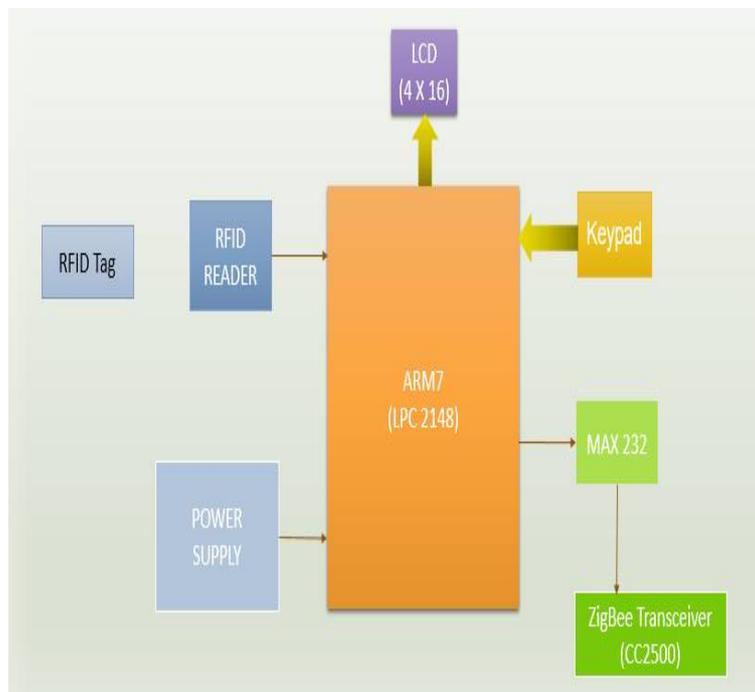


FIG 1: Transmitter block diagram

The AC supply is applied to 12V and 5V step down transformer. The transformer output is the 12V/5V AC which is rectified using a diode bridge. The output of Diode Bridge of 12V/5V DC is filtered by capacitors.

Tags are of two types: passive tags which have no battery life and active tags which have battery life. RFID tags released for automatically identifying a person, a package or an items. These are transponders that transmit information. RFID tag contains two parts. One is integrated circuit for modulating, storing and processing information and demodulating radio frequency (RF) signal. The second is an antenna for receiving and transmitting signal. RFID reader consists of an RF module that acts as a transmitter and receiver of radio frequency signal. Transmitter consists of

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an oscillator to create the carrier frequency; a modulator to make impact on data commands upon this carrier signal and a receiver that contains demodulator to extract the data returned.

IR sensor is used for detecting a select light wavelength in the infra-red (IR) spectrum by using a specific light sensor. In IR sensor, LED is used that produces light at the same wavelength as what the sensor looking for. When an object is brought close to the sensor, the light from the LED reflects from the object and bounces into the light sensor.

LCD has the ability to display numbers, characters & graphics. The display is interfaced to I/O port of micro controller. The display is in multiplexed mode i.e. only one display remains on at a time. Within 1/10th of a second the next display switches on. In this way sequentially on and off display will result in continuous display of count due to persistence of Vision.

A 4x4 matrix keypad is used to provide the provision to enter the stock. The keypad interfacing is used with a hardware interrupt INTO. This makes the microcontroller to scan the keypad whenever a key is pressed.

## IV. BLOCK DIAGRAM OF RECIVER

As soon as the shopping is over the user comes near the billing section .The total bill will display on the billing computer. Thermal printing is a digital printing process which produces a printed image by selectively heating coated thermochroic paper. The coating turns black in the areas where it is heated, producing an image. Two-colour direct thermal printers can print both black and an additional colour (often red) by applying heat at two different temperatures. Thermal transfer printing is a very different method that uses a heat-sensitive ribbon instead of heat-sensitive paper.

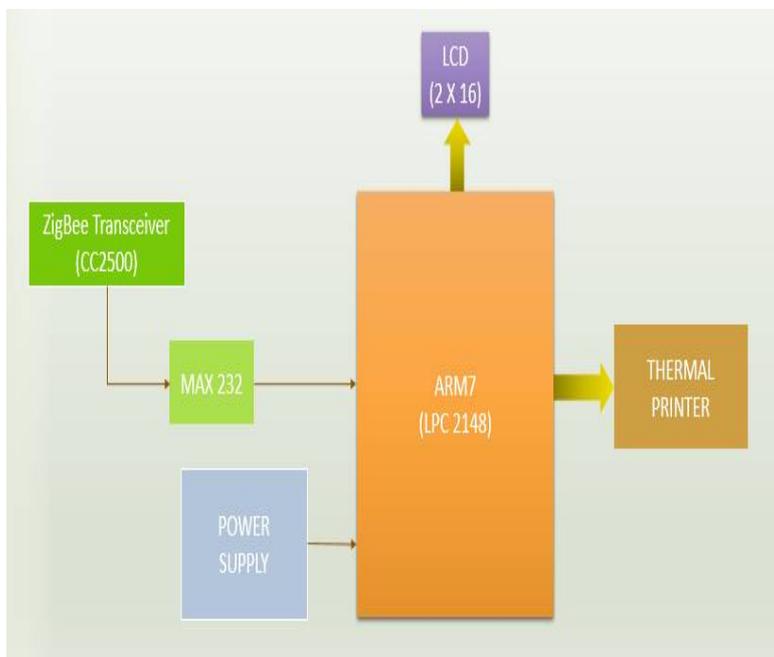


FIG 2: Receiver block diagram

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios. The CC2500 which was implemented here, is a low-cost 2.4 GHz transceiver designed for very low-power wireless applications. The circuit is intended for the 2400-2483.5 MHz ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) frequency band.

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ZigBee is low-cost and low-powered mesh network widely deployed for controlling and monitoring applications wherein it covers 10-100 meters within the range. This system is found to be less expensive and simpler than the other proprietary short-range wireless sensor networks such as Bluetooth and Wi-Fi.

## V. SOFTWARE IMPLEMENTATION

The system designing requires the following software's

- Keil Software
- Flash magic

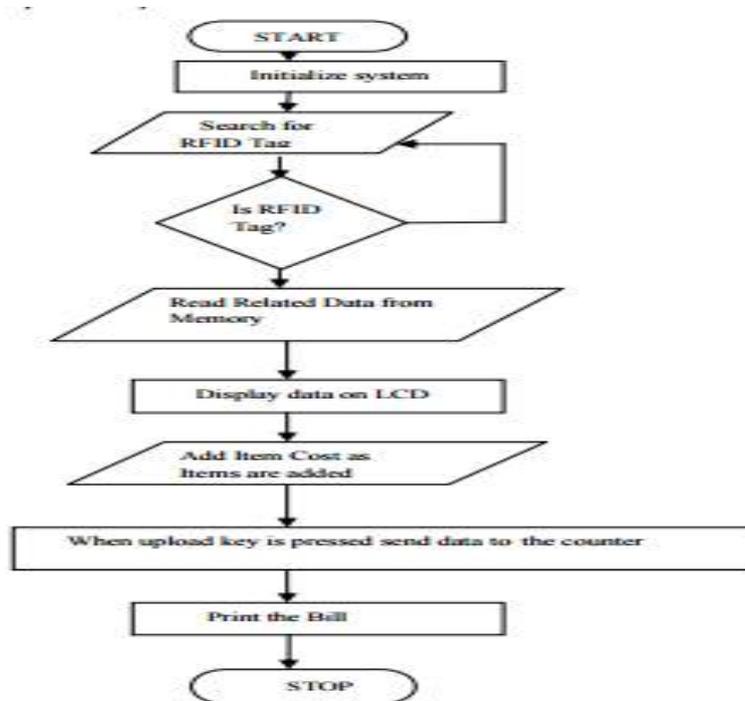


FIG 3: Flowchart

## VI. METHODOLOGY

A customer enters into a shopping mall. On entering, she/he first picks up a Trolley. Each trolley is associated with a RFID reader. When the customer purchase a product, she/he first scans the RF tag of the product using the RFID reader and then places it into the trolley. While the customer is scanning the RF tag of the product, a price of the product is taken and stored in the system's memory.

Information stored in system's memory is compared with the lookup table. If matches are found then cost, name of respective product gets displayed on the LCD. At the same time ARM processor sends the same information to computer for billing purpose with the help of RS232 protocol.

Here we have used IR sensor for counting purpose. This works as the IR sensor continuously emits IR rays. If we put a product in a trolley and at that time there is obstacle for IR rays, then it would result in interruption in counting of products in trolley. This recorded data is stored in arm processor.

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Counting is mainly done for security purpose. If in case while wandering round the mall someone removes the RFID tag and puts the product in trolley then counting the no of items helps to get information of items purchased. Thus counting is done but there is no addition of cost respective product in bill. This shows the increase in number of products but not increase in bill.

If an unwanted product is removed from trolley then it decreases the number of products as well as bill. Double entry of product deletes the product name with respective to cost of product. After completion of shopping, a key is pressed indicating final billing of all the products. Thus the final information of all products is transmitted to a computer with the help of serial communication. Billing is done by system.

### VII. RESULTS

The smart shopping trolley application creates an automated central billing system 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. Different parameters such as the system parameters of smart trolley like products name, products cost, product weight etc. are continuously displayed.



FIG 4: TROLLEY UNIT (TRANSMITTER)

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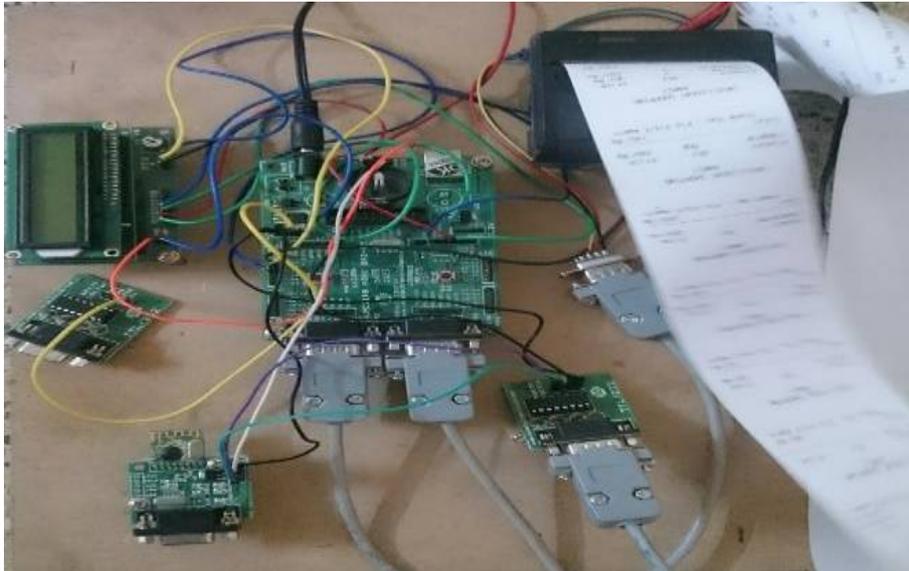


FIG 5: BILLING UNIT (RECIEVER)

Thus we can say that-

1. Automatic billing of products by using RFID technique will be a more viable option in the future.
2. The system based on RFID technique is efficient, compact and shows the better performance.

## VIII.CONCLUSION

The intended objectives were successfully achieved in the prototype model developed. The developed product is easy to use, low-cost and does not need any special training. We have also learned the architecture of the system that can be used in the shopping systems for intelligent and easy shopping in the malls to save time, energy and money of the consumers. Different parameters such as the products name, products cost etc. are continuously displayed. The decision making process is done locally within the cart, thereby eliminating an overhead to the communication between the notes. There are a few challenges/drawbacks to be resolved to make the proposed system 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. Another ZigBee module operating at the same frequency can easily intercept the transmitted data. This issue will have to be resolved specifically with respect to billing to promote consumer confidence

## IX.FUTURE SCOPE

Smart cart can be interfaced with wireless technologies to make it completely portable in the near future. Payment of bills using mobile can be implemented. A low cost RFID scanner can be manufactured and used which can scan multiple tags (products) simultaneously for faster processing and lesser resources. Automatic scanning & availability of products can be introduced. Showing Product Availability: Even though the system provides product location, there is no surety that the Product will be in stock and available at that time. Hence, the system can include the functionality of displaying the Product availability. There can be voice assistance included. Instead of paying through cash or credit cards a consumer can use NFC based mobile phone for online payment through Wi-Fi advertisement of products can be done. LCD display can be replaced with touch screens.

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