# Secured Shopping Using Smart Trolley For Super Market (IOT)

**Santhosh M[1], Sebastin Satheesh S[2] ,Sivaraj N[3] ,Surya A[4] ,Ravikumar S [5]**
[1, 2, 3, 4] Dept of Information Technology
[5] Assistant professor, Dept of Information Technology
[1, 2, 3, 4, 5] Valliammai Engineering College, TamilNadu, India

***Abstract-*** *The Basic idea is to make auto billing in super markets with the smart trolley. A shopping mall or super market is a place where people buy products for their regular use and some of the issues faced by customer while shopping are Wastage of valuable time while standing in long queues at the billing counter and no track of expenditure. The issues are overcome by the smart way of using smart trolley. Here the trolley is provided with Graphical Liquid Crystal Display (LCD) and that can broadcast the product information using Radio Frequency Identification (RFID). In the system the RFID tags are used instead of barcodes. This RFID tags will be attached to the product. Whenever the customer drops a product into the trolley it will get scanned by RFID reader and product price will be displayed on LCD. The Weight sensor is fitted at the bottom of trolley and is used to calculate the weight of whole product and it is used to avoid deception. The offer card is provided for regular customer to reduce the offer amount from the total cost of product. The smart trolley is connected to the system for billing using ZIGBEE. In system, Visual Basics UI helps to monitor the purchased items and the billing details are transmitted to the IOT server using internet. The stock updating is made after each time of billing and this helps to monitor inventory. So it creates a better shopping experience for the customers by saving their time and it also minimize the man-power required at the shopping mall..*

***Keywords***- RFID (Radio Frequency Identification), LCD (Liquid Crystal Display), Smart Trolley, ZIGBEE, Weight sensor.

## I. INTRODUCTION

The internet of things may be a hot topic in the industry but it is not a new concept. The concept was simple but powerful. If all objects in the daily life were equipped with identifier and wireless connectivity, these objects could be communicated with each other and be managed by computers. IOT describes a system where items in the physical world, and sensors within or attached to these items, are connected internet via wireless and wired internet connection. These sensors can use various type of local area connection such as RFID, NFC, WIFI, Bluetooth and Zigbee. Sensors can also have wide area connectivity.

The internet of things will:

- Connect both inanimate and living things yearly trials and deployment of internet of things network begins with connecting industrial equipment. Now a day the scope of IOT has expanded to connect everything from industrial equipment to every day electronic object. The type of items range from gas turbines to automobiles to utility meters. It can also include living organisms such as plants, farm animals and peoples.

- Use sensors for data connections, the physical objects that are being connected will possess one or more sensors. Each sensor will monitor the specific condition such as location, vibration, motivation and temperature. In IOT, all type of sensors will connect with each other and to systems that can understand or present information from the sensors data feeds. These sensor will provide new information to a company systems and to people.

IOT data differs from traditional computing. The data can be small in size and frequent in transmission. The number of devices, or nodes, that are connecting to the network are also greater in IOT then in traditional PC computing. Machine to Machine communication and intelligence drawn from the devices and the network will allow the business to automate certain basic tasks without depending on central or cloud based application and services. These attributes present opportunities to collect a wide range of data but also provides challenges in terms of designing the appropriate data networking and security.

The Three Cs of IOT

- Communication
- Control and automation
- Cost savings

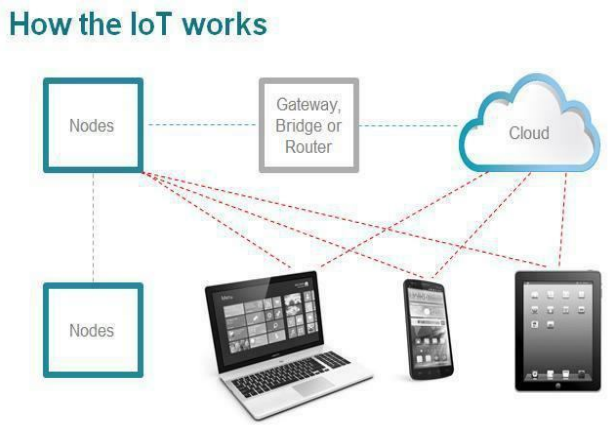


Figure 1.1 concept of IOT

The nodes acts like the sensor where it collects the information and moves to another nodes of sensor, it is also capable of moving the information through microcontrollers.

The microcontroller provides the bridge, gateway or router to move the data in required designation. Cloud is an reliable storage of data where it can be accessed from any place at any time with internet connection on personal computers, mobile, laptops etc.

## II. OBJECTIVE

The Internet connection has been an emergences in various fields. In such a way the Internet connectivity is an predominant requirement in modern era. Thus the IoT has given a different platform to improve the usage of internet in sensible way. In such way, this project provide objectives like

- To develop the intelligent shopping.
- It reduces the man power required at the shopping mall.
- To ensure the secured shopping with no secondary or cross check billing process.
- Reduce rush at billing counter.
- Can guess exact amount at time of shopping.
- Stock details can be updated after each shopping.

## III. PREVIOUS WORKS

In existing system, billing counter is a biggest challenge for shopping mall and super market. This makes a problem at the cash counter because of increasing number of consumers. The customers have to stand in the billing lines for a lot more time than actual shopping time sometimes. Seeing the general Indian population and way of thinking, In existing, in the mall every person takes product put into trolley. After the shopping is done that person have to stand in the queue for billing. In the billing process a sell person scan barcode of each and every product and gives final bill. This process takes more time and it becomes worst on holidays or weekends.

### LIMITATIONS

Some of the limitations in the existing system are listed below,

A. Time consumption in paying the bill

B. Mental stress in searching the details of the product and purchasing expired products

C. Reduction in shopping by the aged peoples and handicapped person.

## IV. SYSTEM OVERVIEW

The proposed system consists of two modules,

[1] Sensing module
[2] Communication module

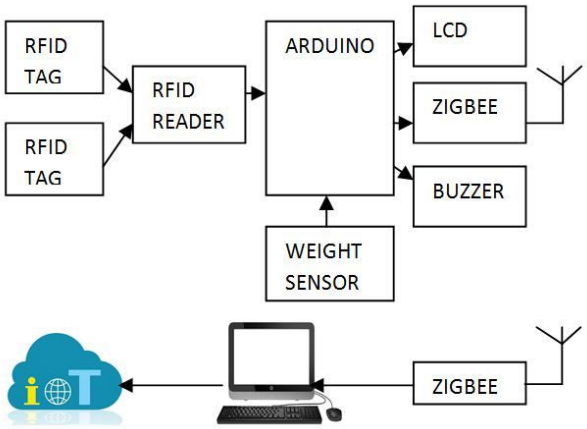


Figure 3(a) Architecture diagram

In this system RFID is used as an replacement of barcode. RFID is attached with each product and it is senses using RFID reader. The product details can be transmitted to billing system from trolley using ZIGBEE transceiver.

## V. TECHNICAL BACKGROUND

### 5.1 ARDUINO

Arduino is an open-source electronics prototyping platform it is based on a flexible, easy-to-use the hardware and software. It is intended for artists, designers, hobbyists and anyone interested in creating the interactive objects or environments.

### 5.1.1 ARDUINO UNO

The Arduino Uno is a microcontroller board based on ATmega328 (datasheet). Arduino UNO has 14 digital input/output pins and among them 6 can be used as PWM outputs, 6 analog inputs, USB connection, power jack, an ICSP header, and reset button. It is a Stronger RESET circuit.

**SPECIFICATION**

| Microcontroller | ATmega328 |
|---|---|
| Operating Voltage | 5V |
| Input Voltage (recommended) | 7-12V |
| Input Voltage (limits) | 6-20V |
| Digital I/O Pins | 14 *(of which 6 provide PWM output)* |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 40 mA |
| DC Current for 3.3V Pin | 50 mA |
| Flash Memory | 32 KB (ATmega 328) *of which 0.5 KB used by bootloader* |
| SRAM | 2 KB (ATmega328) |
| EEPROM | 1 KB (ATmega328) |
| Clock Speed | 16 MHz |

Figure 5(a) Arduino UNO specfication

### 5.2 WEIGHT SENSOR

This straight bar load cell (sometimes called a strain gait can translate up to 10kg of pressure into an electrical signal. Each load cell is able to measure a pressure or force that applied on the bar. By using this the user is able to know the weight of an object, if an objects weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface.

**Specification:**

- Capacity: 10KG
- Rated output(MV/V): 2.0c2±0.15
- Accuracy class: C2
- Maximum number of laod cell verification intervals(N max): 2000
- Minimum number of laod cell verification intervals(Vmin): EMax/5000
- Combined erro(%RO): <±0.030
- Input resistance(Ω): 402±6
- Output resistance(Ω): 350±3
- Safe overload(%RO): 150
- Load cell material: Aluminium
- Platform size: 350x350mm

### 5.3 BUZZER

A buzzer is also called as beeper it is an audio signaling device, which may be mechanical or piezoelectric. The typical uses of buzzers and beepers include alarm devices, timers, and confirmation of a user input such like mouse click or keystroke.

### 5.4 ZigBee

ZigBee is an open global standard for wireless technology and it is designed in low-power digital radio signals for the personal area networks. IEEE 802.15.4 specification is operated in zigbee and it is used to create the networks that needs a data transfer at low rate, energy efficiency.

Specification of ZigBee

Standard : IEEE 802.15.4
Frequency : 2.4 GHz (home automation), 784 MHz, 868 MHz and 915 MHz (country specific)
Range : 10 to 100 meters (line of sight)
Data Rate : 20 kbps to 250 kbps
Network type : Mesh networking and device to device communication

### 5.5 RFID

RFID stands for radio frequency identification reader (RFID reader) is a device used in gathering the information from an RFID tag, which is also used to track individual objects. Radio waves are used in transfering the data from the tag to a reader. RFID technology (i.e) similar in theory to bar codes.

### 5.6 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

## VI. MODULE DESCRIPTIONS

The modules of the proposed system are Sensing module and Communication module.

- Interfacing RFID tags and reader
- Using RFID tags and displaying details of products
- Transferring of data from cart to administrator system
- Billing Session
- Internet of Things (IoT)

### 6.1 INTERFACING RFID TAGS AND READER

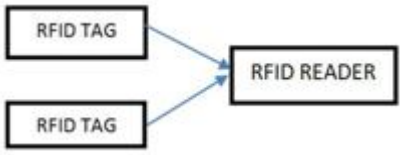


Fig 6(a) Interfacing RFID tags and reader

**DESCRIPTION**

- The antenna emits radio signals to activate the tag and to read and write data to it. The reader emits radio waves up to 10cm or more, depends on power output . When an RFID tag passes through the electromagnetic range, it get detected and activated using RFID reader.
- The purpose of an RFID system is to enable data to be transmitted by a portable device, called a tag, which is read by an RFID reader and processed according to the needs of a particular application.
- The data presented in the tag are transmitted to the RFID Reader may provide product details, such as product price, product name, date of expire, etc

**6.2 USING RFID TAGS AND DISPLAYING DETAILS OF PRODUCTS**


Fig 6(b) Using RFID tags and displaying details of products

**DESCRIPTION**

- RFID reader is fitted in the smart trolley and RFID tag is attached with the product.
- Once the RFID tag is brought closer to the RFID reader. It will reads the information after pressing the start button.
- RFID reader sends Radio Frequency signal (magnetic field) to detect the tag and read the information of each tag.
- This passive RFID tag contains the product information like product name, product price, expired date.
- LCD display fitted in the trolley helps to view the details of the product as well as the price.
- It is very difficult to find the MRP tag in the product hence we making it simpler, that will be showed in the LCD.

**6.3 TRANSFERRING OF DATA FROM CART TO ADMINISTRATOR SYSTEM**


Fig 6(c) Transferring of data from cart to administrator system

**DESCRIPTION**

- In these Modules once the shopping completed, theproduct details will be transferred to Billing countersystem using ZIGBEE protocol.
- ZIGBEE transmitter is fitted in the trolley and iscontrolled using arduino and ZIGBEE receiver placed in the system.
- In the system Visual Basic is used to monitor the billing details.
- After checking the information the administrator generate the bill. If the customer have a offer card then the offer cost can be reduced from the total cost while shopping itself.

**6.4 BILLING SESSION**


Fig 6(d) Billing Session

**DESCRIPTION**

- Visual Basic is used for billing process, where ZIGBEE receiver is connected with the system and the product details from the trolley is transferred tothe billing counter.

- After billing, the stock details can be updated in the visual basic itself.and then the data can be stored in the cloud for later use.

**6.5 INTERNET OF THINGS (IoT)**

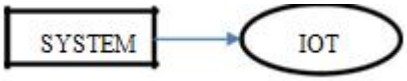


Fig 6(e) Internet of Things (IoT)

**DESCRIPTION**

- The Internet of Things (IoT) is a system of interrelated computing devices and able to access the data from other system using the internet.
- The System can transfer the data from billing counter to the administrator using internet. The data which are viewed in a billing counter can be also viewed in portable manner. The administrator can able to view from anywhere at any time using internet.
- Hences, the output can be viewed in the IoT.

## VII. CONCLUSION

The smart trolley enhances the modern shopping method and helps both the customer and shop keeper. To improve the easy shopping for even the common people using technology, the shopping cart is utilised with great effect. The main goal of this smart trolley is to minimize the time of shopping for the customer and to make the billing process easier for the shop keepers. Thus this project keeps its main goal simple and vital for the common day usage of most of the people. Concentration of this project is to use the trolley in severe effect with covering the all commodities of the shopping like security, inventory management and offer card management. So it helps in improvised smart shopping with friendly and easy to handle technology for common people.

## VIII. FUTURE ENHANCEMENT

Attention is needed on the RFID tag usage as the cost efficiency is more important while adopting the RFID tags. These tags can be useful to pass the parameters but this cannot be done using the barcode. So even the barcode is cost efficient the parameters like item description cannot be passed on it. The concentration of using the RFID in cost efficient way is more important. The weight sensor utilization can be increased in each item weight detection in accurate manner where here the comparison is made with total weight of the product billed and total weight in the trolley to maintain the security for stealing. In stock management we have concentrated less as of the smart trolley is our main goal so in future the stock maintenance can be improved likewise the automated stock ordering after reaching the minimum threshold.

## REFERENCES

[1] Tianyi Song, Nicholas Capurso, Jiguo Yu, JasonCouture, Xiuzhen Cheng, “IoT Applications on Secure Smart Shopping System” Ruinian Li, IEEE Internet of Things Journal-2017

[2] Kamruddin Nur, Marc Morenza-Cinos, Anna Carreras, “Projection of RFID Obtained Product Information on a Retail Store‟s Indoor Panoramas”, IEEE Computer society-IEEE INTELLIGENT SYSTEMS,2015.

[3] Ms. Rupali Sawant, Kripa Krishnan, Shweta Bhokre , Priyanka Bhosale , “The RFID Based Smart Shopping Cart”,
International Journal of Engineering Research and General Science Volume 3, Issue 2, March-April, 2015.

[4] Dr.Suryaprasad J, Praveen Kumar B O, Roopa D & Arjun A K “A Novel Low Cost Intelligent Shopping Cart”,2014
IEEE.

[5] Mr. Yathisha, Abhishek, Harshith, Darshan Koundinya &Srinidhi “Automation of shopping cart to ease queue in malls by using RFID” International Research Journal of Engineering and Technology, Volume 2 Issue: 03, June-2015.

[6] Sapna Kataria, Poonam Singh, Prachi Ahlawat, “Wireless underground positioning System”, International Journal of of Computer Application, Volume 130-No.1, November 2015.