



## IoT APPLICATION ON SMART AND SECURE SHOPPING SYSTEM USING RFID

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### ABSTRACT

The IoT based smart trolley is designed using Arduino . The system eliminates the unnecessary time at a queue. In shopping mall shopping is a daily activity in metro cities. User will have to various products and keep them into the trolley & will have to go to the counter for bill payment of all the products. By using barcode reader the cashier will make the bill at the billing counter. To make a system that can be used to solve the difficulties of costmomer and save the valuable time of users is the main aim of this project. In the shopping mall all the goods will have beset with RFID tags. When a user will keep the products in the trolley, the code and the weight & the name of product will be detected and the total amount of those products will be saved in system memory, the name of product and total amount is shown on server and it will be sent to cashier counter by wirelesses ESP modules. It would reduce the rush at shopping mall & save the unnecessary time at billing counter. Automatic billing is done through the RFID tag

### Introduction

Shopping mall is a place where people get their daily necessities ranging from food products, clothing, electrical appliances etc. Sometimes customers have problems regarding the incomplete information about the product on sale and waste of unnecessary time at the billing counters. Continuous improvement is required in the traditional billing system to improve the quality of shopping experience to the customers. Nowaday's numbers of large as well as small shopping malls has increased throughout the global due to increasing public demand & spending. At the time of festivals, special discounts, holidays, etc. there is a huge rush in shopping malls. The use barcode reading

technique in such situations always results in waste time since customer has to wait till whole items get scanned. These advantages can be avoided by using IOT based intelligent trolley proposed in this paper .

### Objective

In the present-day shopping system one of the difficulties is to follow queue through the billing process which is time consuming. Hence this project aims to reduce the average time spent by the customer at the shopping mall by implementing automatic billing system using Rfid technology.

## Problem Definition

In shopping malls various technologies are used like Barcode system, Mobile technology (using Android App), etc. In these system customers have to wait in long queue for billing. Hence, we proposed the new idea using IOT (Internet of Things). In this system RFID (Radio Frequency Identification) Technology is used. Every item or product is attached with a RFID tag and this product is scanned using RFID reader which is attached with a trolley. Customer purchase different items and put them in the trolley. Price of that total items and also names will be displayed on LCD (Liquid Crystal Display) screen which is also attached with a trolley. If a customer wants to remove some items, they have to rescan the item which will delete it from the total bill. In this system, customer's time is reduced at the time of shopping in the malls.

## Keywords

IoT, LCD, RFID Tag, antenna, RFID reader

## Related Work

Pritha N , Sahana S , Selvin Stephy N , Shiny Rose S , Unnamalai S et al has presented , Smart Trolley System for Automated Billing using RFID and IoT. 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.

Shraddha Nitaware, Geeta Pawar, Kanchan Gavade et al has presented Smart Trolley using IOT. The IoT

based smart trolley is designed using ARM processor. The system eliminates the unnecessary time at a queue. In shopping mall shopping is a daily activity in metro cities. User will have to various products and keep them into the trolley & will have to go to the counter for bill payment of all the products. By using barcode reader the cashier will make the bill at the billing counter. To make a system that can be used to solve the difficulties of costmomer and save the valuable time of users is the main aim of this project. In the shopping mall all the goods will have beset with RFID tags. When a user will keep the products in the trolley, the code and the weight & the name of product will be detected and the total amount of those products will be saved in system memory, the name of product and total amount is shown on the LCD and it will be sent to cashier counter by wireless ESP modules. It would reduce the rush at shopping mall & save the unnecessary time at billing counter. Automatic billing is done through the RFID tag.

Vishwas B et al has presented, IoT Application on Secure Smart Shopping System. Internet of Things (IoT) is an emerging technology in today's industry, which has a greater impact on society. IoT is a network of physical devices, sensors, embedded software which enables the devices to exchange data between them. The main aim of any technology is to make human life as simple as possible. In today's modern life, shopping in a mall or a supermarket has become an everyday activity, where the customer has to spend a lot of time in the queue at the billing counter. Our major objective was to reduce the customer's waiting time, by generating an automatic bill. Our proposed Secure Smart Shopping System creates a better shopping experience for the customer. This system is based on Radio Frequency Identification (RFID) technology. RFID technology makes use of radio waves to transfer the data between the reader and the movable RFID tag or card. RFID technology was invented during early 1940's but it entered the mainstream during 1990's and RFID tags were used for item tagging during 2007 and beyond. RFID technology consists of three parts

1. The antenna
2. The reader
3. The RFID tags which contains information.

Chithra G, Sunil P V, Sneha M, Shruthi R, Sowmya L et al has presented, IoT Based Futuristic Trolley for Intelligent Billing with Amalgamation of Rfid And Armlpc2148. Shopping mall is a place where people get their daily necessities. There has an emerging demand for quick and easy payment of bills in shopping malls. Quite often, When Shopping in a supermarket shopper are frustrated at locating the items on the shopping list and no assistance is available. So, we designed the mobile application and also provides a centralized and automated billing system using RFID. Each product of shopping cart is implemented with a product Identification Device(PID) that contains Microcontroller, LCD, an RFID reader. Purchasing product information will be read through a RFID reader on shopping cart and it is displayed in LCD which is interfaced to the controller. At the billing counter, the total bill will be transferred.

Dr. Suryaprasad J in "A Novel Low-Cost Intelligent Shopping Cart" is proposed to help the customers for the selection of the products and also inform the

### Existing System

In existing system, When a person goes for shopping mall then he take trolley and after complete shopping he has to pay bill on billing counter. Billing is done by using barcode reader. It is more time consume process. In Barcode technology, there is need to scan each and every item based on position of that barcode label attached to that item .It requires more human labor as they need to scan manually. It does not read from long distance.so our aim is to design automatic billing trolley which is based on RFID technology.

### Disadvantages

Traditional Billing currently involves the use of

customer any offers present on the products as they move all over the shopping malls. "Developing a Multitasking Shopping Trolley Based on RFID Technology" was developed by Satish Kamble which is used to help a person in shopping for reducing time while purchasing products. The main aim of proposed system is to provide a technology oriented, lowcost, easily scalable, and strong system for helping customers in shopping.

The purpose of the "Smart Shopping Cart with Automatic billing System through RFID and Zigbee" was to devise a system with automatic billing which is proposed to Mr. P. Chandrasekar. This avoids the long queues in supermarkets and shopping malls. Customers can pay their bill through credit/debit cards. The limitations are I2C protocol was not supported and another one is not specifying how they can access their database to read and write data. Dashmir Istrefi, Betim Cico presented the "mobile payment through integrated NFC module on Smart phones" examined the idea of implementing additional security layer that will enable protecting NFC transactions. Also, idea for improving customer's online shopping experience has been has been proposed. The disadvantage is applicable only for smart phone users.

barcodes. Products must be scanned through the barcode scanner by the cashier which gives us the total bill. But this becomes a monotonous which, when lots of products are to be scanned will result in long queues, making the billing process slow and time consuming. While doing a survey, we found that most of the people prefer to leave the shopping mall instead of waiting in long queues to buy a few products. Recent years have seen the advent of several modern technologies for hypermarket assistance. All such solutions share similar objectives: save consumers time, money and help the retailers to win loyal clients.

## Proposed System

This IOT based Trolley has following applications: 1) Automatic billing at shopping mall 2) Helps to owners. It has two sections transmitter section and receiver sections. First initialize the power of kit then it is ready to use for customer. If customer wants to purchase any product then he/she has to put the product in the trolley. As soon as the product falls in the trolley the RFID reader read the RFID Tag place on the product. This RFID reader is connected to the microprocessor. Microprocessor crosschecks the information get from RFID reader and information in the memory of microprocessor. If the information get match then the cost of product, name of product and the total bill display on the LCD. If user wants to remove any product then he/she simply remove that product from the trolley then LCD again display the name of product, cost of product and the total bill. Trolley is provided with ESP which has same functions as Zigbee and Ethernet. ESP transfer the information to the main server which is in the range. This main server has its own cloud from that owner can access the information from anywhere and anytime with the help of user ID and password. This is the concept of Internet of thing (IOT).

## Advantages

- ✓ Does not need any special training.
- ✓ Customer can get throughout information at the time of shopping.
- ✓ Can guess exact amount at the time of shopping.
- ✓ Save time
- ✓ More efficient because use of RFID
- ✓ Reduce rush at billing counter.
- ✓ Freeing staffs from repetitive checkout scanning

## Module Description

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program.

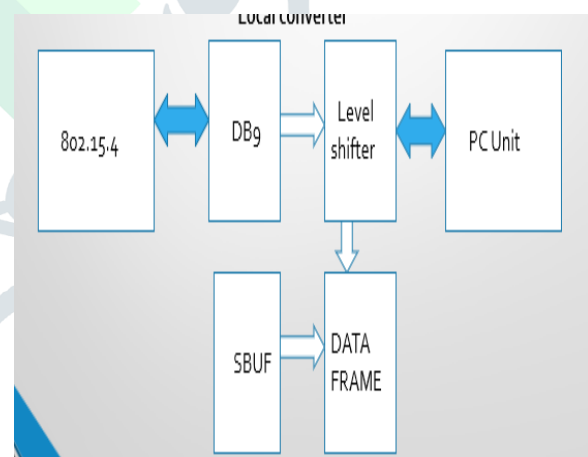
## ARDUINO UNO

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P. The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

## RFID

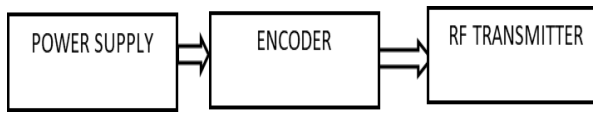
### RFID TAG

These tags comprise of a semiconductor device for storage of its distinctive range and a coil that acts as an antenna for diverging its hold on information. It should or might not have electric battery relying upon its sort either active or passive severally. Passive tags are used that doesn't have electric battery. As presently because the tag comes within the RFID reader coverage vary, Reader emits radio signals which supplies power for passive tags and it re-emits the radio based signal with information to the reader. Purpose of RFID tags is to unambiguously establish merchandise.

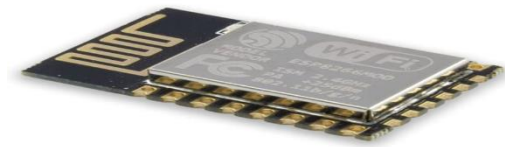


## RFID READER

EM-18 is employed that operates at 5volts DC and fewer than 50mA. The frequency at that it works in 125 kHz. It will cover a distance of 10cm. It ceaselessly emits RF signals throughout itsrangeand whenever an RFID tag is within its area, it retrieves the knowledge held on within the tag. Purpose of RFID reader is to retrieve the merchandise information from their RFID tags.



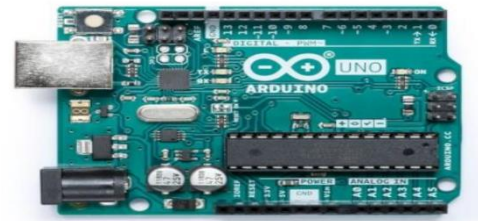
**Esp8266 Wifi Module**



**ESP8266 WIFI**

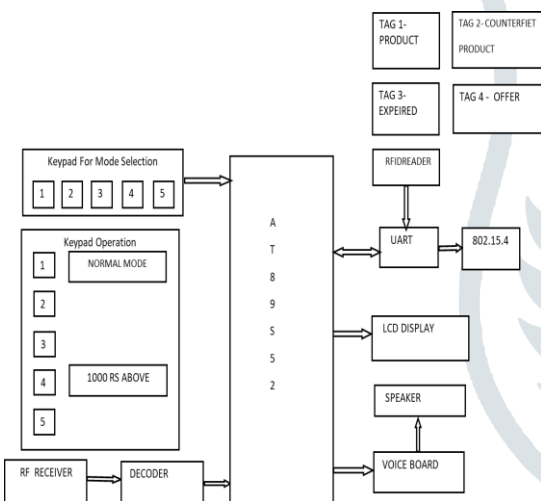
The ESP8266 arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language. This device is produced by Shanghai-based Chinese manufacturer, Espressif Systems.

**Arduino Uno**



**Results and Discussion**

**Rfid Tag**



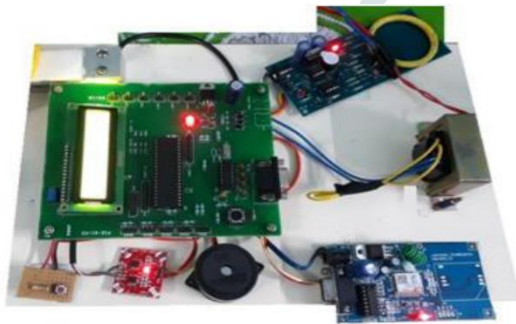
**Rfid In Trolley**

**Rfid Reader**





### LCD Display



### Conclusion and Future Work

We propose a secure smart shopping system utilized RFID technology. This trolley make it user friendly. Automatic billing is done in trolley so it save the time of customer and reduce rush at billing counter. Using of IOT will also helpful to owner for various purpose. It is concluded that this trolley make it user friendly. Lcd display the name of product, weight, expiry date and cost of product for billing. Smart trolley can be implemented with microcontroller and provides various functionality such as billing, information, weighs of purchased items. Also the system will reduce the rush at the billing counter and save the valuable time of customers.

### References

[1] P. Castillejo, J.-F. Martinez, J. Rodriguez-Molina, and A. Cuerva, "Integration of wearable devices in a wireless sensor network for an e-health application," *IEEE Wireless Communications*, vol. 20, no. 4, pp.

38–49, 2013.

[2] N. Mitton, S. Papavassiliou, A. Puliafito, and K. S. Trivedi, "Combining cloud and sensors in a smart city environment," *EURASIP journal on Wireless Communications and Networking*, vol. 2012, no. 1, p. 1, 2012.

[3] T. Song, R. Li, X. Xing, J. Yu, and X. Cheng, "A privacy preserving communication protocol for iot applications in smart homes," in to appear in *International Conference on Identification, Information and Knowledge in the Internet of Things (IIKI) 2016*, 2016.

[4] F. Xia, L. T. Yang, L. Wang, and A. Vinel, "Internet of things," *International Journal of Communication Systems*, vol. 25, no. 9, p. 1101, 2012.

[5] S. Shepard, *RFID: radio frequency identification*. McGraw Hill Professional, 2015.

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