

# RFID AND IOT BASED SMART TROLLEY

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## Abstract

**Background-**The main objective of our paper is to easy shopping experience of the customers. The idea is to avoid the time for standing in the billing section. So, we developed an embedded system combination of RFID and IOT to make a smart trolley.

**Results-**The implementation focuses on the system will be placed in all the trolleys that will consist of RFID reader. All the products in the mall will be equipped with RFID tags. The code simulated in the trolley will be detected and the price of those products will be stored in memory. As we put the products, the billing will be done in the trolley itself and will be displayed on LCD. Finally, at the billing Counter the total bill data will be transferred to PC by wireless modules using IOT.

**Conclusion-**The idea of making smart trolley reduces human power and time. All the data will be stored in IOT efficiently. Instead, of using bar code scanner in the billing section the usage of RFID in the trolley will be low in cost and highly effective.

## 1 BACKGROUND

The dynamic growth and the advent of new and exciting development in the field of IOT (Internet of Things) have paved the way for unique ways of using technology in a lot of fields. Wireless communication combined with radio and frequency sensing gives a whole new dimension to the way people interact with devices and use them in their daily routine. Nowadays, supermarkets and shopping complexes have become so commonplace, that they are no longer a luxury afforded only by urban cities. They have expanded beyond the domain of big cities and ventured into rural areas as well. Anybody can go to these stores and buy products that they need, but they are not entirely convenient, especially when a customer has to wait for hours in queues on busy days. In recent times, the RFID technology has been developing rapidly, and we're seeing its applications in a variety of industries, from employee ID cards being scanned in the office to the issuing of books in libraries. RFID stands for Radio-Frequency Identification, where information is digitally encoded into tags which can be used to uniquely identify a product. The RFID tags are generally captured using radio waves and the captured data is stored into a database. The RFID tags are somewhat similar to the traditional bar codes in their purpose and functionality, as they are used for data processing. However, there are a few key differences between the two. Bar code usually requires a bar code reader to visually register the

code in order to obtain information, while in the case of RFID, the use of radio waves as a means of

recording data means that no line of sight is required. Since RFID tags can be attached to physical money, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns. RFID enabled shopping cart makes it a state-of-the-art system for shopping. On completion of the customer's shopping, he/she will press the button present on the trolley, which will lock it through the help of a servo motor installed on the trolley to provide security and prevent theft and the final bill will be generated. The customer simply has to put a product in the trolley and let the reader scan the product for information. By fitting the trolley with a touch-enabled LCD that can display product information, it also gives us a feasible system of providing the customer with all the information like manufacturing date.

## 2 IMPLEMENTATION

The idea is to develop a smart shopping cart fitted with facial recognition and information retrieval features. They have also used an automated billing system to avoid queues during checkouts to provide a comfortable shopping experience with the integration of the Internet of Things into the cart

for a smart system that assists the customers. The system allows a customer to scan the items and the trolley automatically updates the total cost and bills the customer. It also has the provision of setting a budget, which when exceeded, sounds an alarm, as well as the removal of products and their cost from the total bill if a person deems it unnecessary. The system is built such that billing information is sent to a central server in real-time using the ESP8266 Wi-Fi module which tracks all the shopping trolleys and allows the client to log into the integrated app to track purchase and make payments digitally on the spot.

## 2.1 COMPONENTS ANALYSIS

**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 its range and 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. The RFID reader signals are everywhere with its proximity to detect a tag. When a RFID tag comes in the proximity of the RFID reader the tag detects the readers signal through a coil present in it which converts the received RF signal into a electrical signal.

**RFID tags:** 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.

**Motor driver:** Motor driver could be a setup that has 2 input offer and a ground. One offer for circuit and alternative to pass to the motor. We have a tendency to used driver circuit that is capable of dominant motor rated up to 12volts. Purpose of motor driver circuit is to regulate the motor.

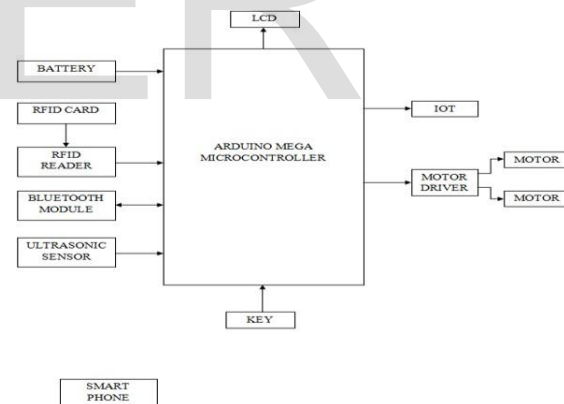
**Micro-controller:** ATMEGA32 is employed wherever it's an eight bit AVR based architecture machine. It operates at 4.5 to 5.5volts DC. It's a 40 pin PDIP with xxxii programmable I/O lines. It consists of non-volatile 32kB of in-system and self-programmable flash, 1024B variant EEPROM and 2kB variant of internal SRAM. Its options like timers, A/D converters, PWM and serial interface. Process speed ranges zero to 16MHz. thus it stores the directions and method consequently. Purpose of microcontroller is to regulate the full method continuously in a repeated manner.

**LCD:** It's a type of liquid display. It consists of 2 rows and sixteen columns. Every part of display has a row or a column, that successively has eight rows and 5 columns called constituent. It has got sixteen pins wherever information is fed through eight pins only. The provision voltage ought to be 5volts. The registers confirm the correct functioning, specifically information and command. Information register takes ASCII (American Standard Code for Information Interchange) values for characters to be displayed. Command register takes values for creating useful changes like backlight distinction, pointer position etc. Purpose of LCD is for displaying information to the client like welcome note, product catalogue, product details, invoice etc.

**ESP8266EX :** ESP8266EX delivers highly integrated Wi-Fi solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry.

The gear motor has the additional ring with teeth like projections hooked up to the shaft of the motor to confirm uniform speed throughout the rotation of the rotor. Purpose of DC in motor is for correct gap and shutting of the streetcar door.

## 2.2 BLOCK DIAGRAM

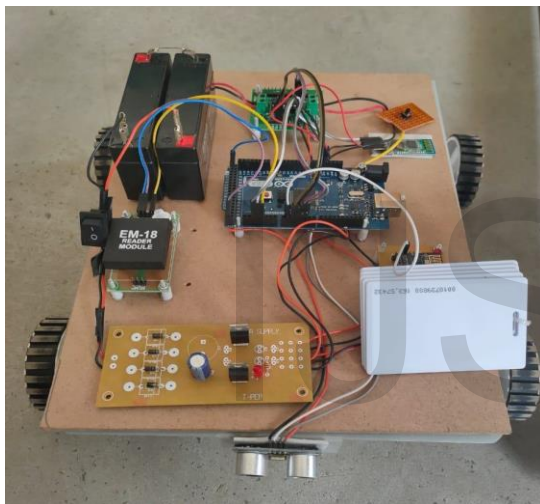


## 3 RESULTS

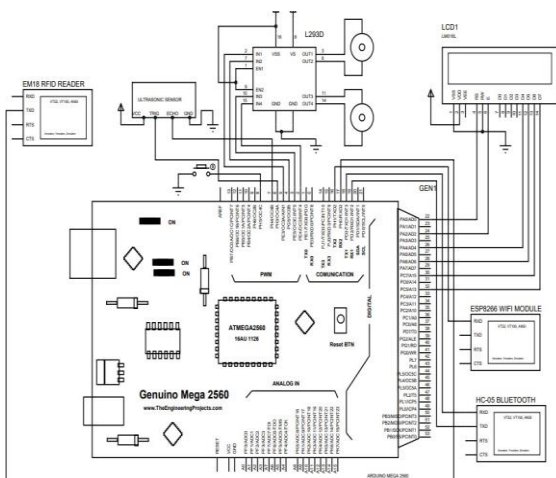
When the customer puts the product in the Smart Trolley, the Radio Frequency ID reader scans the tag and the Electronic Product Code number is generated. Radio Frequency ID reader passes the Electronic Product Code to the microcontroller. The name and price of the product obtained by the controller gets displayed on the LCD of the Smart Trolley, where client can see the item data. To store the item price and total billing data, microcontroller memory is used. LCD is interfaced with microcontroller in 4bit mode. It is used to indicate the purchaser, the action taken by the purchaser that is inserting of an item, removal of an item, item's price and total billing cost of items in the

trolley. As per the test, when putting an item into the smart cart or expelling an item from the cart, the smart cart is able to precisely read it. One astonishing outcome is that the metal outside the cart obstructs the signal to a high degree that when the reader is inside the cart, no item outside the cart can be read. This clearly indicates that an item put into a smart cart will not be perused by a nearby cart accidentally. A RFID reader is installed at the checkout point so that the items in the cart can be meticulously read. The smart trolley system architecture involves two sections such as embedded and IOT. In the embedded section, microcontroller is used to coordinate with the RFID reader, LCD and Wi-fi module to perform computing functions.

### 3.1 HARDWARE SETUP



### 3.2 SOFTWARE SETUP



## 4 CONCLUSION

In the current system, bar codes are used for scanning the product details where the customers tend to wait in long queue for generating the bill followed by payment. At times, the bar codes would have been damaged and that particular product cannot be scanned by a bar code scanner leading to confusion. Also, each and every product has to be scanned manually. Where in each trolley had an RFID reader and RFID tags were present for each product. Once the product is scanned, the information is displayed on the LCD screen to show all product related information to the consumer. The aim was to help customer evade long queues but it also posed the disadvantage of possible thefts as well as collisions. The authors of accomplished in creating a centralized system for automatic billing. The biggest advantage of this system was that enabled the customer to go cashless, thus, successfully implementing a method to avoid queues. Smart shopping trolley application creates an automated central billing system in malls. The product information are directly sent to billing system. So that customers no need to wait in a long queue. It is trustworthy, highly dependable and time efficiency. The use of LCD in this trolley make it user-friendly. LCD displays the name of product, cost of product and total bill. Automatic billing is done in trolley so it saves the time of customer and reduce the rush at billing counter. It also reduces the man power. Because, of the use of IOT it will also helpful to owner.

## 5 AVAILABILITY AND REQUIREMENTS

Project Name- RFID and IOT based Smart trolley  
Operating systems- Windows/C language in Arduino

## 6 ADDITIONAL INFORMMATIONS

### 6.1 Competing interests

The authors declare that they have no competing interests.

### 6.2 Authors' contributions

The author's performed the setup in proteus software. The software setup is included i the paper. The first author approved the final manuscript

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