

## “IOT-BASED SMART SHOPPING CART USING RADIO FREQUENCY IDENTIFICATION, BLUETOOTH & GSM MODULE”

**Dr. M.A. Thalor<sup>\*1</sup>, Jyoti Chinchane<sup>\*2</sup>, Sonal Randave<sup>\*3</sup>, Aarti Hake<sup>\*4</sup>,  
Pornima Lokhande<sup>\*5</sup>**

<sup>\*1</sup>Head Of Department, Information Technology, AISSMS Institution Of Information Technology,  
Pune, Maharashtra, India.

<sup>\*2,3,4,5</sup>Student, Information Technology, AISSMS Institution Of Information Technology,  
Pune, Maharashtra, India.

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### ABSTRACT

Humans now enjoy a higher standard of living thanks to contemporary technology. Shopping centres experienced heavy crowds as a result. We need to speed up the billing procedure to handle the enormous audience. This is accomplished via an RFID-based smart shopping system. The bill is generated and shown once each item in a smart shopping cart is read individually. The customer pays the bill using the pre-charged cards that the shopping centre has provided after the final bill is generated. The goal is to cut down on the amount of time required for the billing system.

**Keywords:** Android, RFID, Arduino Nano, Bluetooth.

### I. INTRODUCTION

Project goal: Following the billing queue through the lengthy billing procedure is one of the challenges in the current shopping system. Therefore, the goal of this project is to decrease the average amount of time that a consumer spends at a mall by establishing an automatic billing system that uses RFID technology. 1.2 The project's outline The project's major goal is to please the client and cut down on the time spent on the billing process, which is accomplished by finishing the billing procedure in the trolley rather than standing in line even for a few items. After a quick scan, the clients must add the items to the cart, and once their purchasing is complete, the total will be shown there. The shop gave customers with pre-recharged customer cards so they could pay their bills. Finally, the entire information will be sent to the mall's central PC.

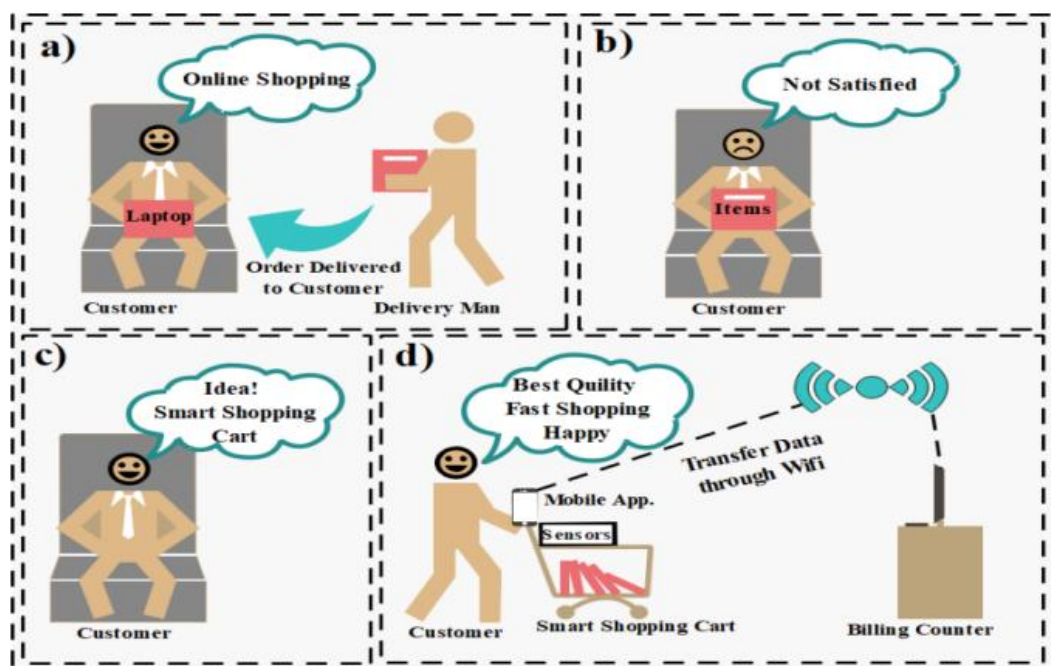


Fig 1

An electronic tag attached to an object and a reader work together to exchange data via radio waves as a means of identification and tracking. This technology is known as RFID. It's likely that in the not-too-distant future, RFID technology may continue to permeate our daily lives in a similar way to how bar code technology did in the forty years prior to the turn of the twenty-first century, bringing about subtle but significant changes at the time. The transponder Tags in any RFID system have information on them. The shop gave customers with pre-recharged customer cards so they could pay their bills. Finally, the entire information will be sent to the mall's central PC.

Any type of information that can be stored in digital binary format, including a single binary bit or a large array of bits representing things like an identity code or private medical information, can be included in this data.

## II. MOTIVATION

The goal of our suggested approach is to offer an alternative to the laborious billing process and eliminate the burden of having people wait in line for longer. Additionally, it gives business owners the ability to manage their entire store or shop with the bare minimum of staff. This will encourage more people to return to the fast dwindling store experience. The usage of barcode scanning, which relies on line-of-sight communication, is another significant flaw in the current retail systems. When we conduct a poll, the number of people performing outdoor shopping is rapidly decreasing in comparison to online buying, primarily due to the former's painless and time-saving benefits.

## III. PROBLEM STATEMENT

With the current system, customers must perform a lot of manual handling. Although it provides nothing for the customer, it aids in the tracking and identification of trolleys, which is useful for shop management. It does not offer a practical way to shorten the time a consumer spends in the business, particularly while waiting in line for billing and payment. Due to signal interception concerns and a lack of other payment methods, collisions are a problem. The biggest disadvantage is the customer's lack of contentment and ease of usage. Shopping and making purchases at large malls is now an everyday pastime in major cities. On weekends and holidays, there is a significant rush at the malls.

## IV. SYSTEM ARCHITECTURE

Understanding radio frequency transmission is crucial before RFID can be fully understood. The transmission of data via electromagnetic waves is the basis of RF (Radio Frequency) communication. When a particular electromagnetic wave is produced at the source, its effect can be felt at a receiver located distance from the source, allowing it to be recognised and the information to be decoded. In an RFID system, the RFID tag that carries the object's tagged data emits a signal that contains the appropriate information. The RFID reader then reads this signal and may pass it on to a processor so that the processor can process the information for the intended purpose. Thus, the following three elements can be combined to form an RFID system:

1. RFID tag or transponder
2. RFID reader or transceiver
3. Data processing subsystem



Fig 2

An antenna, a wireless transducer, and an encasing substance make up an RFID tag. These tags come in active and passive varieties. Passive tags use the power generated by the magnetic field of the RFID reader, whereas active tags have their own on-chip power.

As a result, compared to active tags, passive tags are less expensive but have a shorter range (10 mts) and are more vulnerable to environmental and regulatory limits. An antenna, transceiver, and decoder make up an RFID reader, which sends out periodic signals to check on nearby tags. Any signal it receives from a tag sends that data to the data processor. The methods for processing and storing the data are provided by the data processing subsystem.

## V. WORKING

- All the items in the mall will be equipped with RFID tags. When person puts an item in the trolley, its code will be detected by RFID reader which is interfaced with processor. RFID reader is serially interfaced with at mega 16 . It requires 12V supply for operation & after receiving the tag code it gives interrupt to the controller.
- Reader send this code to at mega 16, after matching code with codes stored in memory, processor reads item's name, cost & other details. Then it displays on LCD. The item details like name, cost & total bill of items inserted in trolley are displayed on LCD.
- As we put the items, the costs will get added to total. Thus the billing is done. Simultaneously all details are displayed on LCD. LCD used is 16X2 character alphanumeric type displays. And also if we want to remove some inserted item, then that amount will be automatically deducted from the total amount and item removal message is displayed on LCD.
- To store the item price and total billing data, internal memory is used.
- LCD is interfaced with microcontroller in 4bit mode. It is used to indicate the customers the action taken by customer that is inserting of an item, removal of item, item's price and total billing cost of items in the trolley.
- The total bill data will be displayed on LCD which will be paid by customer using their RFID payment card on trolley itself.
- Once payment done successfully customer receives an conformation SMS using GSM module.
- Roving's Bluetooth module RN-42 is used to transmit the data from the sensors to the android device.

## VI. HARDWARE DESCRIPTION

### a. Arduino Nano

An antenna, a wireless transducer, and an Arduino Nano are the main components of an RFID tag. The Arduino Nano also offers a number of features for interacting with other microcontrollers, computers, and other Arduino devices. On digital pins 0 (RX) and 1, the ATmega328 provides UART TTL (5V) serial connection (TX).

The Arduino hardware and software were made with artists, designers, hobbyists, hackers, beginners, and anybody else interested in interactive environments or objects in mind. Arduino can communicate with switches, LEDs, motors, speakers, GPS, cameras, the internet, your phone or TV, and more.

### b. RFID reader

A device called a radio frequency identification reader is used to collect most of the data starting with the RFID tag. When it comes to RFID barcode preferences, every item, starting with the pack of goods, may be examined. Barcode, however, is unable to do this. The case information could be contained in that barcode. Since each item in the shopping centre has a barcode, the shopping centres used to use them during the exhibit times. Each and every item in our suggested system requires RFID tags rather than barcodes. When an RFID tag may have been enabled, the RFID reader, which is constantly watching for interruptions about RFID tags, filters out all nuances around the tag.

### c. Buzzer

The buzzer signals the sound. As shown in Fig. 5, a ringer, possibly a little but capable component, should have callous characteristics on our project/system. Its small size and traditional 2-pin construction make it suitable for use on PCBs, breadboards, and even individual tables, making it a common component in the majority of electrical requirements. There are two types of buzzers that are typically available that require assistance.

**d. GSM**

The Global System for Mobile Communications, or GSM, is utilised for message transmission and reception. Using the GSM library, the Arduino GSM shield enables an Arduino board to make voice calls, send and receive SMS, and connect to the internet. The shield is already compatible with the Arduino Uno.

**e. Android Application:**

A software programme called an Android App is created to operate on an Android device or emulator. The acronym APK, which stands for Android package, is often used to refer to a file.

Using Android, we build a straightforward registration and login application. Any system that requires a login verification can utilise this straightforward programme. Google created the smart phone operating system known as Android. It is utilised in many devices, including televisions, tablets, and smart phones. Android is open source software for programmers interested in creating mobile applications.

This layout suggests that every one additives utilized in difficult there kit, following are the additives

- **Power Supply:-**We want a electricity deliver for our hardware kit
- **RFID Reader:-**RFID reader examine the card
- **Buzzer:-**When we upload and do away with the product buzzer will start
- **LCD:-**Added or do away with product statistics proven on LCD
- **GSM Module:-**We use the GSM module for suggests the LCD statistics at the cellular application.

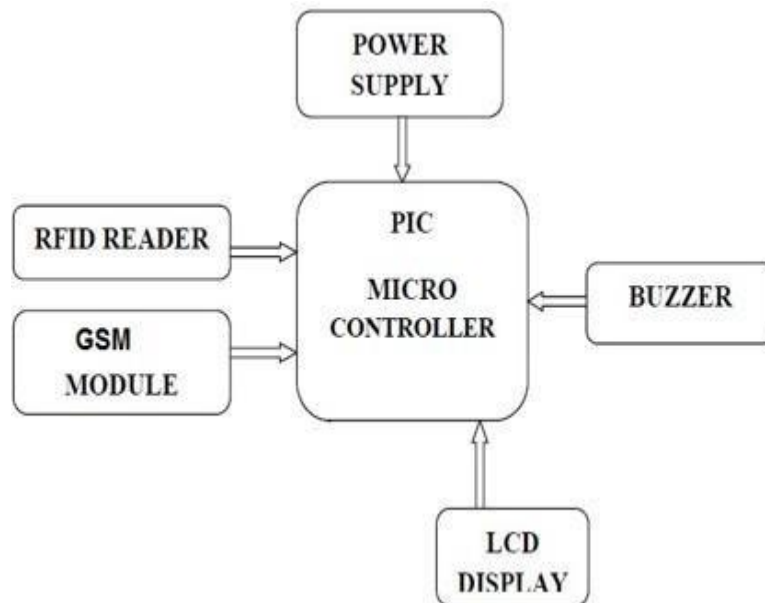


Fig 3: project design

**VII. IMPORTANT LIBRARIES /PACKAGES**

**1. Liquid Crystal I2C:**

This library lets in an Arduino/Genuino board to manipulate Liquid Crystal displays (LCDs)based on the Hitachi HD44780 (or a like minded) chipset, that's located on maximum text-primarily based totally LCDs. The library works inside both four or eight-bit mode (i.e. the usage of four or8 statistics traces similarly to the rs, enable, and, optionally, the rw manipulate traces). This library is like minded with all architectures so that you ought to be capable of apply it to all Arduino forums. This library lets in an Arduino board to manipulate Liquid Crystal displays (LCDs) primarily based totally at the Hitachi HD44780 (or a like minded) chipset, that's located on maximum text-primarily based totally LCDs. The library works inside both four- or eight-bit mode (i.e. - in four or eight statistics traces similarly to the rs, enable, and, optionally, the rw manipulate traces)

• **Wire:**

The I2C protocol entails the usage of traces to ship and acquire statistics: a serial clock pin (SCL) that the Arduino Controller board pulses at everyday intervals, and a serial statistics pin (SDA) over which statistics is

despatched among the 2 gadgets. As the clock line modifications from low to high (called the growing fringe of the clock pulse), a unmarried little bit of statistics - a good way to shape in series the deal with of a selected tool and a command or statistics - is transferred from the board to the I2C tool over the SDA. When this statistics is despatched - bit after bit -, the referred to as upon tool executes the request and transmits its statistics back - if required - to the board over the identical line. The usage of the clock sign nevertheless generated through the Controller on SCL as timing. Because the I2C protocol lets in for every enabled tool to have its precise deal with, and as each controller and peripheral gadgets take turns speaking over a singleline, your Arduino board can communicate (in turn) with many de- vices, or different forums whilst the usage of simply pins of your microcontroller.

## 2. Software Serial Library:

The Arduino hardware has integrated help for serial communicate on pins zero and 1 (which additionally is going to the laptop through the USB connection). The local serial help occurs through a chunk of hardware (constructed into the chip) referred to as a UART. This hardware lets in the At mega chip to acquire serial communicate even whilst operating on other tasks, so long as there may be room within side the 64-byte serial buffer. The Software Serial library has been evolved to permit serial communication on different virtual pins of the Arduino, the usage of software program to duplicate the functionality (for this reason the name "software program- rial"). It is feasible to have more than one software program serial ports with quickens to 115200 bps. A parameter allows inverted signaling for gadgets that require that protocol.

## VIII. CONCLUSION

The work was completed with the aid of Arduino, EM-18 reader, and RFID technology. Its goal is to shorten the time spent billing in lengthy lines so that customers benefit and inventory management is made simpler. It can be used in malls when there is a lot of foot traffic and a rush to enter malls. This automated billing system is crucial to the advancement of technology in the field of automation. The currently in use barcode system will be replaced by this technology. Therefore, this technology can assist people in simplifying their lives and saving time. It reads the product and stores the information each time it is added to the cart. After all products have been added, the server for that cart updates the bill status. The billing section is where the customer may pay their bill because it is generated automatically.

Therefore, customers' purchasing can be made simple by employing an RFID-based smart shopping cart and invoicing system because it saves time.

Science and technological advancement are ongoing processes. New products and technologies are constantly being developed. Humans may envision a future in which we might inhabit every space as technology advances daily. Consequently, this article on RFID-based smart trolley discusses how to buy the merchandise easily and comfortable.

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