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# ABSTRACT

In metro cities we can see you a huge rush at shopping malls on holidays and weekends. This becomes even more when there are huge offers and discounts. Nowadays people purchase a variety of items and put them in the trolley. After total purchasing one should approach counter for billing purpose. By using barcode the cashier prepares the bill which is a time consuming process. This results in long queues at the billing counters. This project presents an idea to develop a system in shopping malls to overcome the above problem. To achieve this all products in the mall should be equipped with RFID tags and smart check-out counter. First of all customer must login / signup with the system. When one puts any product on RFID reader its code will be detected automatically, the item name and cost will be displayed on the LCD, thereby the cost gets added to the total bill. You need to continue this process until you complete with scanning of all the products. After completion, you may generate the bill which would be mailed to your registered account and the amount will be debited from your registered credit card. By doing this lot of time and man power can be saved.

# ACKNOWLEDGMENT

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**Kevin Patel (17CE074)**

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# CHAPTER 1

# INTRODUCTION

## 1.1 OVERVIEW

According to present scenario now a days shopping at big malls is becoming a daily activity in metro cities. The huge rush at malls on holidays and weekends. After purchase, at the billing counter the cashier prepare the bill using barcode reader which is a time consuming process and results in long queues. Considering all this, we have implemented a system which can be used in shopping malls to solve the rush at billing counter using RFID based system.

## 1.2 PURPOSE

The fundamental motivation behind this system is to show the proposition of a design and arrangement of an inventive framework for obtaining of items in markets. This system explores rising versatile innovations and programmed recognizable proof advancements, (for example, RFID) as an approach to enhance the nature of administrations given by retailers and to expand the customer esteem consequently permitting to save time and cash. With this system an excellent opportunity will be developed which assists the customers by showing the details of products and their respective costs on LCD screen. This approach thereby helps the inventory management unit with an instinctive upgrade on each purchase of product. This system has the capability to make shopping more relaxable, comfortable and systematic for the customers as well as making easier for the store management.

## 1.3 SCOPE

In spite of the fact that the RFID can't totally supplant the standardized identification innovation because of higher cost, precision and speed is high in RFID implementation. The retailers, makers and purchaser products organizations like CVS, Tesco, Prada, Benetton, Wal-Shop and Procter and Bet are presently actualizing the innovation and investigating the effect of the innovation on their business. Others can likewise

implement RFID. The basis of accomplishment lies in understanding the innovation and different components to minimize the potential issues. It is time for the Industry ought to begin using the new innovation, for example, RFID in different applications, for example, fabricating, and storing purposes. Tags used here can be attached to the products only in the longitudinal fashion without any folds .Tags given for the reader are scanned only when placed in the range of 3 cm to 4 cm and they need to be attached to the products in a visible fashion for the reader then only the reader can detect tags without any fail. Tags used in this project are water sensitive and metal sensitive and have the capacity of reading only one side. So the trolley is now restricted to use water sensitive packaged and metal sensitive packaged products. But the problem can be rectified with the waterproof tags and metal resistant tags which are under research at present. And the multiple object RFID reader used here has the constraint of skipping the tags at sometimes. Reader which can detect less than 50tags/sec is employee according to the requirement and meanwhile cost will also be under control for implementation of system.

## 1.4 OBJECTIVE

- The fundamental motivation behind this system is to show the proposition of a design and arrangement of an inventive framework for optimizing the time and product management efficiently.
- To make shopping more relaxable, comfortable and systematic for the customers as well as making easier for the store management.
- This system explores rising versatile innovations (for example, RFID) as an approach to enhance the nature of administrations given by retailers and to expand the customer esteem consequently permitting to save time and cash.

## 1.5 TECHNOLOGY AND LITERATURE REVIEW

RFID is an upcoming innovation which has as of late pulled in light of a legitimate concern for the exploration group in view of the uncommon advantages it offers over the other existing recognizable proof and information detecting advancements. RFID is a specific term utilized for systems which use radio wave to naturally distinguish things. RFID is a technology that permit exchange of information amongst labels and reader without the need of viewable pathway over a separation up to a couple of 10 meters relying upon the sort of label engaged. For this framework the information is being swapped by radio waves and distinct tags can be scrutinized or collected normally. This part is designed to survey the current technology writing and probe the problems in the

existing RFID organisation starting from the transformation to yet in its recognition phase. From past the growth of this revolution from 1900's, aside to this expressed reliable perspectives, thus innovation likewise supports a few affairs or points. A planned motivation behind part for look at the writing identified with the above mentioned technology additionally develops scholarly analysis with giving an deal into a segment of the outstanding and noteworthy cases hindering the growth of this alteration. It ought to confront these cases with a specific end goal to give a more prominent perceivability and an enhanced item speed of the RFID innovation.

### 1.5.1 Advantages:

Though RFID is not likely to entirely replace commonly used barcodes in the near future, the following advantages suggest to additionally apply RFID for added value of identification

- Tag detection not requiring human intervention reduces employment costs and eliminates human errors from data collection.
- As no line-of-sight is required, tag placement is less constrained.
- RFID tags have a longer read range than, e. g., barcodes.
- Tags can have read/write memory capability, while barcodes do not.
- An RFID tag can store large amounts of data additionally to a unique identifier.
- Unique item identification is easier to implement with RFID than with barcodes.
- Tags are less sensitive to adverse conditions (dust, chemicals, physical damage etc.).
- Many tags can be read simultaneously.
- RFID tags can be combined with sensors.
- Automatic reading at several places reduces time lags and inaccuracies in an inventory.
- Tags can locally store additional information; such distributed data storage may increase fault tolerance of the entire system.
- Reduces inventory control and provisioning costs.
- Reduces warranty claim processing costs.

# CHAPTER 2

# SYSTEM ANALYSIS

## 2.1 USER CHARACTERISITICS

### 2.1.1 Retailer Side:

- First of all, retailer must install this system setup in his shop/mall.
- Each item must be equipped with RFID tags (13.6 MHz).
- Retailer need to merge RFID UID, with product details (including prize and product name) and upload it to database.
- Retailer can add, update, and delete item on to database.

### 2.1.2 Customer Side:

- Customer must register their account with their bank and credit card details on to our system (The details will be kept encrypted).
- Customer enters in shop/mall, he/she has to pick the items and put them in the basket. Then the customer has to enter the billing counter if it is not occupied.
- The person needs to scan each item of the cart, then proceed forward by clicking generate bill.

## 2.2 TOOLS & TECHNOLOGY

### 2.2.1 Software:-

#### 2.2.1.1 Arduino IDE:

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (*shields*) and other

circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

#### 2.2.1.2 WampServer(MySql database):

WampServer refers to a software stack for the Microsoft Windows operating system, created by Romain Bourdon and consisting of the Apache web server, OpenSSL for SSL support, MySQL database and PHP programming language.

#### 2.2.1.3 Netbeans IDE:

NetBeans is an integrated development environment (IDE) for Java. NetBeans allows applications to be developed from a set of modular software components called modules. NetBeans runs on Microsoft Windows, macOS, Linux and Solaris. In addition to Java development, it has extensions for other languages like PHP, C, C++, HTML5 and Javascript. Applications based on NetBeans, including the NetBeans IDE, can be extended by third party developers.

#### 2.2.1.4 JRE 1.8 (JAVA 8):

Java 8 (codename: *Spider*) was released on March 18, 2014 and included some features that were planned for Java 7 but later deferred.

Work on features was organized in terms of JDK Enhancement Proposals (JEPs).

### 2.2.2 Hardware:

#### 2.2.2.1 Arduino Uno R3 (Microcontroller):

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.


FIGURE 2.1 Arduino UNO R3

**Figure 2.1** shows Arduino UNO R3 which is microcontroller in our system.

| | |
|---|---|
| Microcontroller | ATmega328P |
| Operating Voltage | 5V |
| Input Voltage (recommended) | 7-12V |
| Input Voltage (limit) | 6-20V |
| Digital I/O Pins | 14 (of which 6 provide PWM output) |
| PWM Digital I/O Pins | 6 |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 20 mA |
| DC Current for 3.3V Pin | 50 mA |
| Flash Memory | 32 KB (ATmega328P) of which 0.5 KB used by bootloader |
| SRAM | 2 KB (ATmega328P) |
| EEPROM | 1 KB (ATmega328P) |
| Clock Speed | 16 MHz |
| LED_BUILTIN | 13 |
| Length | 68.6 mm |

| | |
|---|---|
| Width | 53.4 mm |
| Weight | 25 g |

TABLE 2.1 Specifications of Arduino Uno R3

#### 2.2.2.1.1 Advantages Of Microcontrollers

If a system is developed with a microprocessor, the designer has to go for external memory such as RAM, ROM or EPROM and peripherals and hence the size of the PCB will be large enough to hold all the required peripherals. But, the micro controller has got all these peripheral facilities on a single chip so development of a similar system with a micro controller reduces PCB size and cost of the design.

One of the major differences between a micro controller and a microprocessor is that a controller often deals with bits , not bytes as in the real world application, for example switch contacts can only be open or close, indicators should be lit or dark and motors can be either turned on or off and so forth.

#### 2.2.2.1.2 Important Features Of ATmega328

- High performance and low power requirement.
- 8-Bit Microcontroller Atmel, AVR advanced RISC architecture
- 131 instructions most of which are executed in a single clock cycle
- Up to 20 MIPS at 20 MHz
- 32 x 8 working registers
- 2 cycle multiplier

#### 2.2.2.1.3 Memory

- 32 KB of programmable Flash, IKB of EEPROM, 2KB SRAM, 10,000 Write Erase cycles for Flash and 100,000 for EEPROM
- Data retention for 20 years at 85°C and 100 years at 25°C
- Optional boot loader with lock bits. In System Programming (ISP) by via boot loader and True Read-While-Write operation. Programming lock available for software security.

#### 2.2.2.1.4 Additional Features

- 2 x 8-bit Timers/Counters each with independent prescaler and compare modes
- A single 16-bit Timer/Counter with an independent prescaler, compare and capture modes
- Real time counter with independent oscillator
- 10 bit, 6 channel analog to digital Converter
- 6 pulse width modulation channels
- Internal temperature sensor
- Serial USART (Programmable)
- Master/Slave SPI Serial Interface – (Philips I2C compatible)
- Programmable watchdog timer with independent internal oscillator
- Internal analog comparator
- Interrupt and wake up on pin change
- Internal calibrated oscillator
- Power on reset and programmable brown out detection
- External and internal interrupts
- 6 sleep modes including idle, ADC noise reduction, power save, power down, standby, and extended standby
- 23 programmable I/O lines
- 28 pin PDIP package
- Operating voltage – 1.8 – 5.5V
- Operating temperature range- 20.40 to 85 Degree C
- 0-4 MHz at 1.8-5.5V, 0-10 MHz at 2.7-5.5V, 0-20 MHz at 4.5-5.5V
- Low power consumption mode at 1.8V, 1 MHz and 25°C:
- Active Mode: 0.3 mA
- Power-down Mode: 0.1 μA
- Power-save Mode: 0.8 μA (Including 32 kHz RTC)
- Flash – 32 KB
- EEPROM – 1KB
- SRAM – 2KB
- Frequency Max – 20MHz
- Vcc – 1.8 to 5.5V
- 10-Bit A/D Channels – 6

- 16-Bit Timers – 1
- 8-Bit Timers – 2
- Ext Interrupts – 2
- Interrupts – 26
- PWM Channels – 6
- SPI – 1

#### 2.2.2.1.5 ATmega328 Pin Description

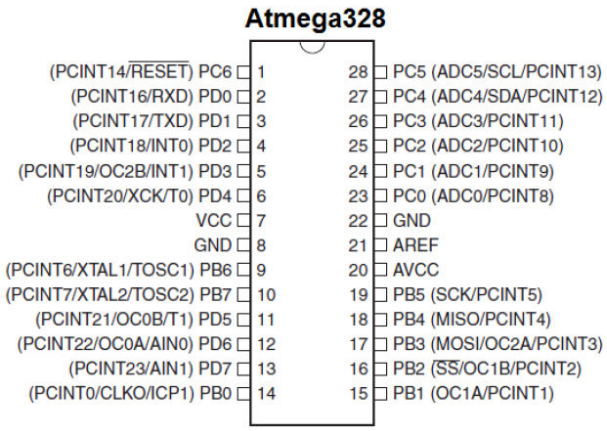


FIGURE2.2 ATmega328 Pin Description

- *VCC*

  Supply voltage.

- *GND*

  Ground.

- *Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2*

  Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tristated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7...6 is used as TOSC2...1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

- *Port C (PC5:0)*

  Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5...0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tristated when a reset condition becomes active, even if the clock is not running.

- *PC6/RESET*

  If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running.

- *Port D (PD7:0)*

  Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tristated when a reset condition becomes active, even if the clock is not running.

- *AVCC*

  AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6...4 use digital supply voltage, VCC.

- *AREF*

  AREF is the analog reference pin for the A/D Converter.

- *PSEN*

  Program Store Enable (PSEN) is the read strobe to external program memory. When the AT89S52 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

- *ADC7:6 (TQFP and QFN/MLF Package Only)*

In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

### 2.2.2.2 RFID Tags:

An RFID tag is comprised of a microchip containing identifying information and an antenna that transmits this data wirelessly to a reader. At its most basic, the chip will contain a serialized identifier, or license plate number, that uniquely identifies that item, similar to the way many bar codes are used today. A key difference, however is that RFID tags have a higher data capacity than their bar code counterparts. This increases the options for the type of information that can be encoded on the tag, including the manufacturer, batch or lot number, weight, ownership, destination and history (such as the temperature range to which an item has been exposed). In fact, an unlimited list of other types of information can be stored on RFID tags, depending on application needs. An RFID tag can be placed on individual items, cases or pallets for identification purposes, as well as on fixed assets such as trailers, containers, totes, etc.

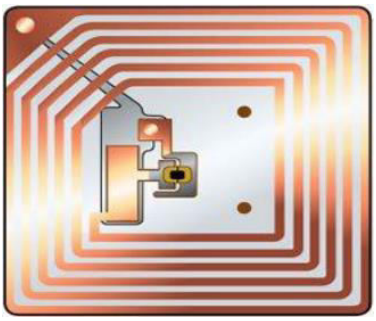

FIGURE 2.3 RFID tags

#### 2.2.2.2.1 Passive Vs. Active

“Passive” tags have no battery and "broadcast" their data only when energized by a reader. That means they must be actively polled to send information. "Active" tags are capable of broadcasting their data using their own battery power. In general, this means that the read ranges are much greater for active tags than they are for passive tags perhaps a read range of 100 feet or more, versus 15 feet or less for most passive tags. The extra capability and read ranges of active tags, however, come with a cost;

they are several times more expensive than passive tags. Today, active tags are much more likely to be used for high-value items or fixed assets such as trailers, where the cost is minimal compared to item value, and very long read ranges are required. Most traditional supply chain applications, such as the RFID-based tracking and compliance programs emerging in the consumer goods retail chain, will use the less expensive passive tags.

#### 2.2.2.3 USB Cable:

USB (abbreviation of Universal Serial Bus) is an industry standard that establishes specifications for cables, connectors and protocols for connection, communication and power supply between personal computers and their peripheral devices.

Battery Charging Specification 1.2A with increased current of 1.5 A on charging ports for unconfigured devices, allowing High Speed communication while having a current up to 1.5 A and allowing a maximum current of 5 A.

Maximum Transfer Rate: High Speed (480 Mbit/s).

FIGURE 2.4 USB cable

#### 2.2.2.4 Buzzer:

Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally available or manmade. Piezo-ceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of

piezo buzzer. When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal thereby producing sound.

FIGURE 2.5 Buzzer

### 2.2.2.5 LED:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 $mm^2$) and integrated optical components may be used to shape the radiation pattern.

FIGURE 2.6 LED bulb

### 2.2.2.6 RFID Scanner (RC522 module):

| | |
|---|---|
| Working current | 13 - 26mA / DC 3.3V |
| Standby current | 10 - 13mA / DC 3.3V |
| Sleep current | <80uA |
| Peak current | <30mA |
| Working frequency | 13.56MHz |
| Card reading distance | 0～60mm （Mifare1 card） |
| Protocol | SPI |

| | |
|---|---|
| Data communication speed | 10Mbit/s Max. |
| Card types supported | Mifare1 S50, Mifare1 S70, Mifare UltraLight, Mifare Pro, Mifare Desfire |
| Dimension | 40mm × 60mm |
| Working temperature | -20—80 degree |
| Storage temperature | -40—85 degree |
| Humidity | Relevant humidity 5%—95% |

Table 2.2 RFID reader (RC522 module) specification

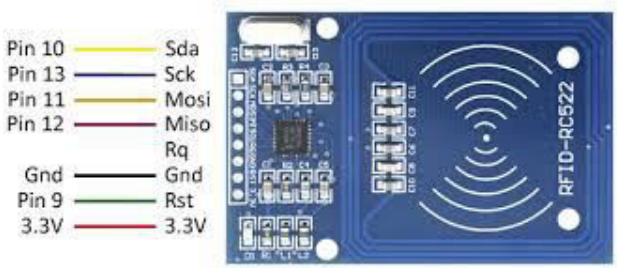


FIGURE 2.7 RFID Reader (RC522 module)

### 2.2.2.7 Regular Size Bread Board:

A modern solderless breadboard socket consists of a perforated block of plastic with numerous tin plated phosphor bronze or nickel silver alloy spring clips under the perforations. The clips are often called tie points or contact points. The number of tie points is often given in the specification of the breadboard.

The spacing between the clips (lead pitch) is typically 0.1 inches (2.54 mm).
Typically the spring clips are rated for 1 ampere at 5 volts and 0.333 amperes at 15 volts (5 watts). The edge of the board has male and female dovetail notches so boards can be clipped together to form a large breadboard.

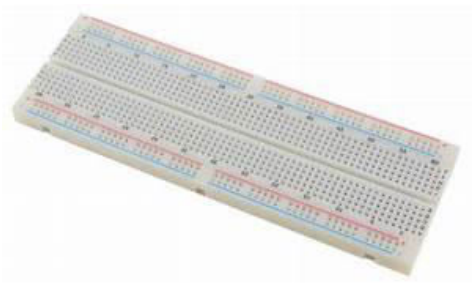

FIGURE 2.8 Breadboard

### 2.2.2.8 Jumper cables:

Jump wire material for ready-made or homemade wires should usually be 22 AWG (0.33 $mm^2$) solid copper, tin-plated wire - assuming no tiny plugs are to be attached to the wire ends. The wire ends should be stripped $^3/_{16}$ to $^5/_{16}$ in (4.8 to 7.9 mm). Shorter stripped wires might result in bad contact with the board's spring clips (insulation being caught in the springs). Longer stripped wires increase the likelihood of short-circuits on the board.

Differently colored wires and color-coding discipline are often adhered to for consistency.

A few wire colors are reserved for the supply voltages and ground (e.g., red, blue, black), some are reserved for main signals, and the rest are simply used where convenient.

FIGURE 2.9 Jumper cables

# CHAPTER 3

# SYSTEM DESIGN

## 3.1 FLOW OF SYSTEM

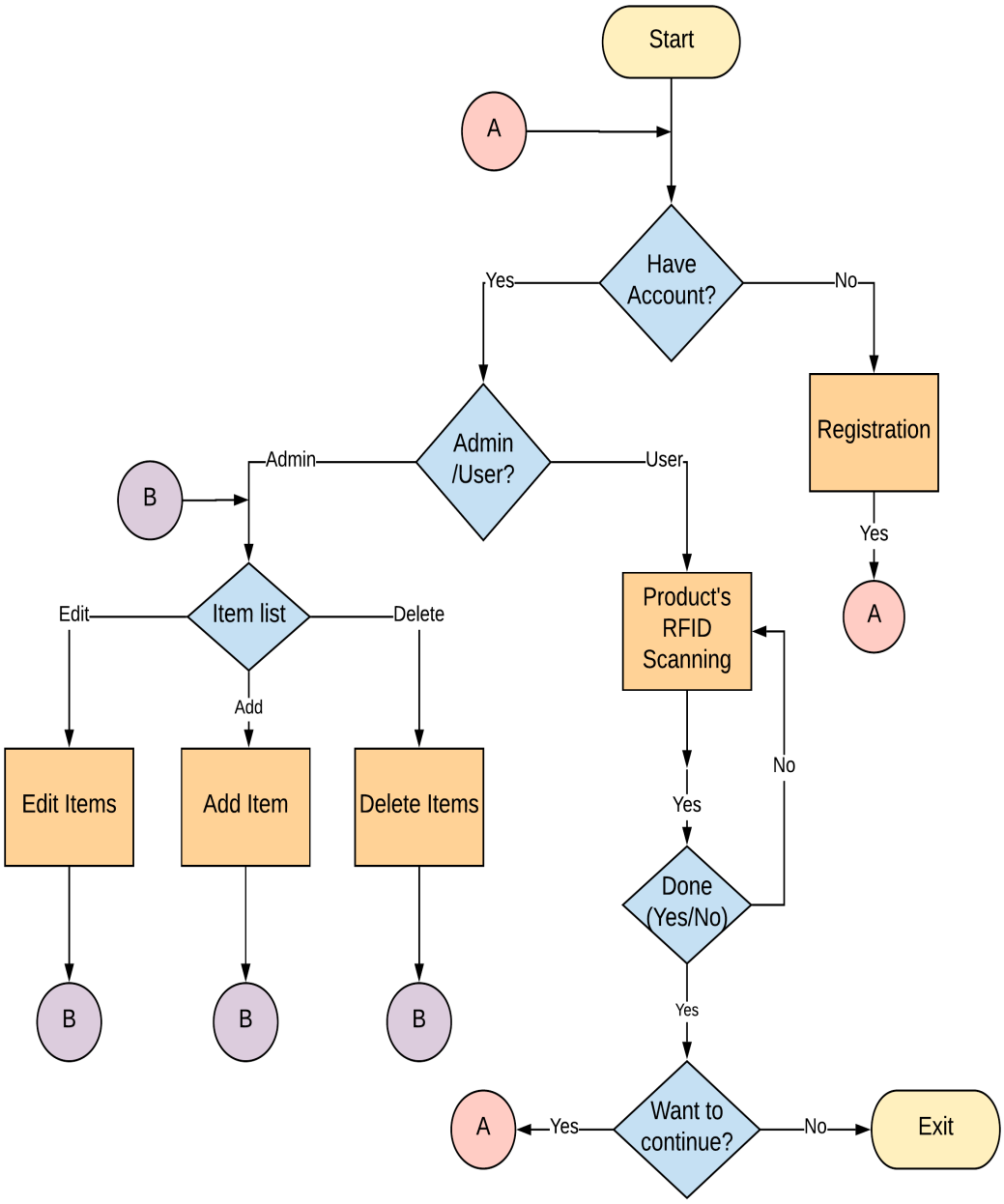


FIGURE 3.1 Flowchart of The System

## 3.2 MAJOR FUNCTIONALITY

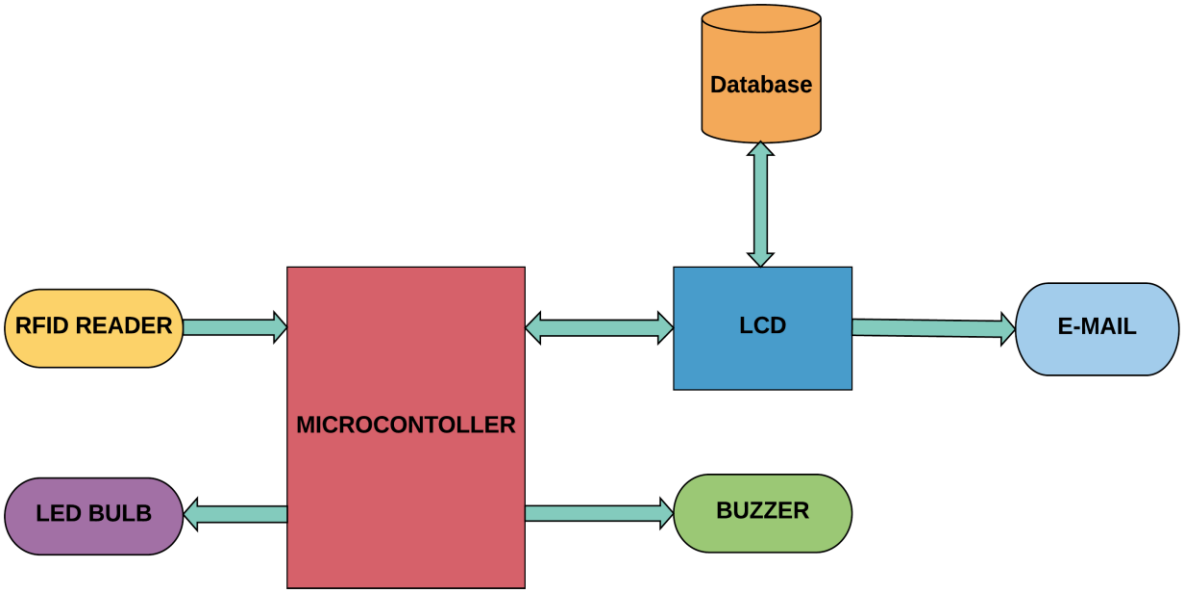


FIGURE 3.2 Block Diagram of System

## 3.3 GUI


FIGURE 3.3 Admin Side Item List

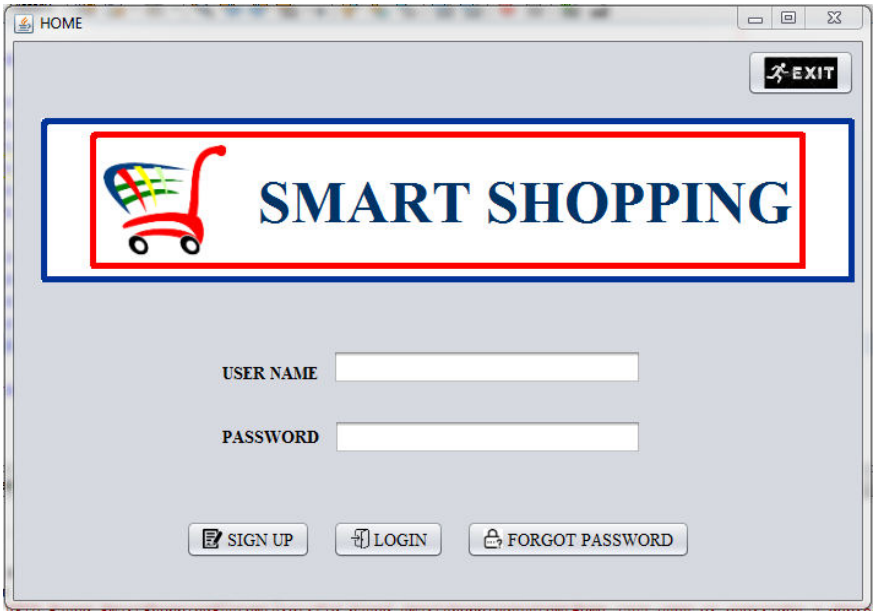


FIGURE 3.4 Customer Side Homepage


FIGURE 3.5 Customer Side Register Page

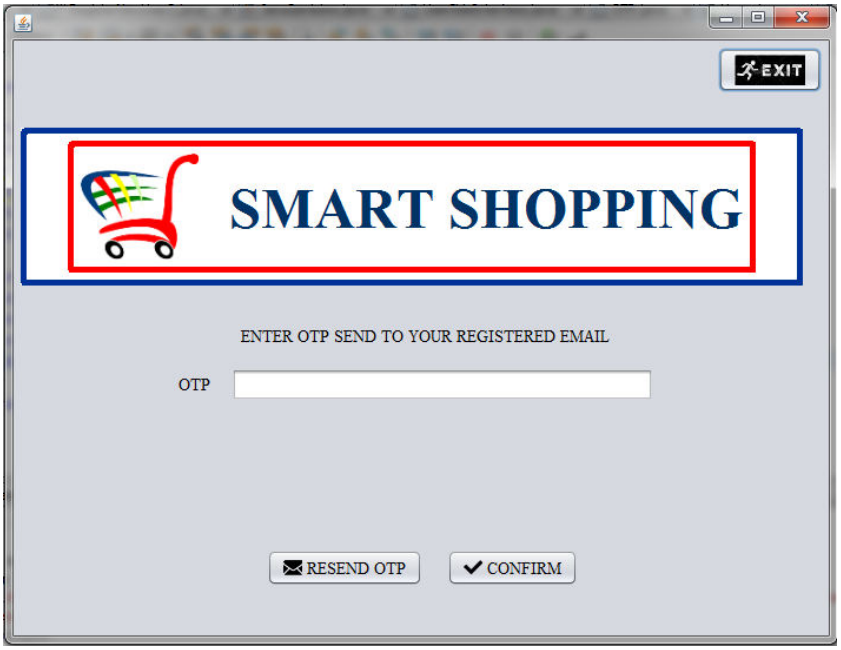


FIGURE 3.6 Customer Side OTP Verification Page


FIGURE 3.7 Customer Side Registration Page

# CHAPTER 4

# IMPLEMENTATION

## 4.1 CODING STANDARDS

*//rfid.ino*

```
#include <SPI.h>
#include <MFRC522.h>
#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN);   // Create MFRC522 instance.
int buzzPin = 3;
void setup()
{
  pinMode(buzzPin,OUTPUT);
  Serial.begin(9600);   // Initiate a serial communication
  SPI.begin();      // Initiate  SPI bus
  mfrc522.PCD_Init();   // Initiate MFRC522
}
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
  return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  String content= "";
```

```
 byte letter;
 for (byte i = 0; i < mfrc522.uid.size; i++)
 {
   //Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
   //Serial.print(mfrc522.uid.uidByte[i], HEX);
   content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
   content.concat(String(mfrc522.uid.uidByte[i], HEX));
 }
 content.toUpperCase();
 //buzzer
 analogWrite(buzzPin,200);
 delay(500);
 analogWrite(buzzPin,0);
 Serial.println(content.substring(1));
 delay(500);
}
```

## 4.2 SNAPSHOTS OF PROJECT

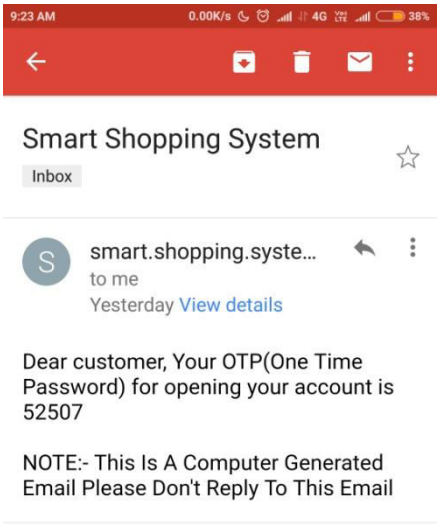


FIGURE 4.1 OTP Sent On Mail

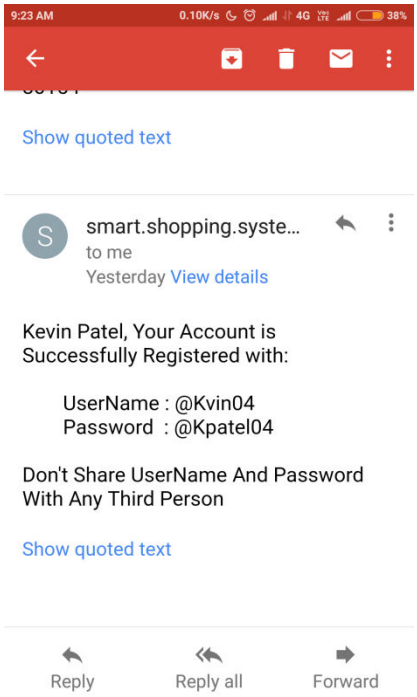


FIGURE 4.2 Account Details Sent On Mail

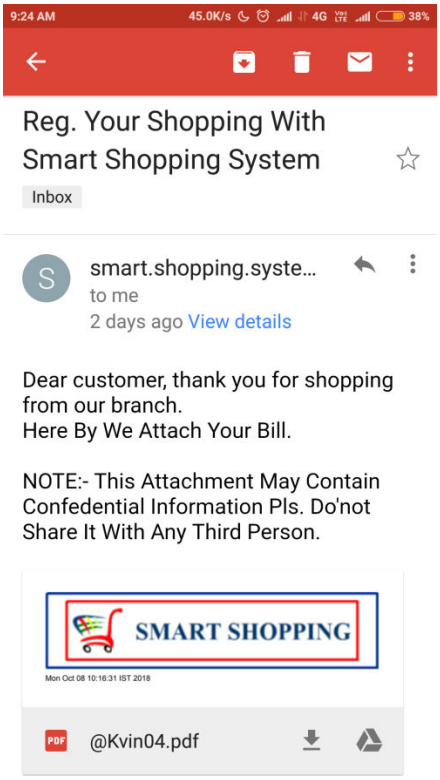


FIGURE 4.3 Bill Sent on Mail


FIGURE 4.4 Bill of Shopping

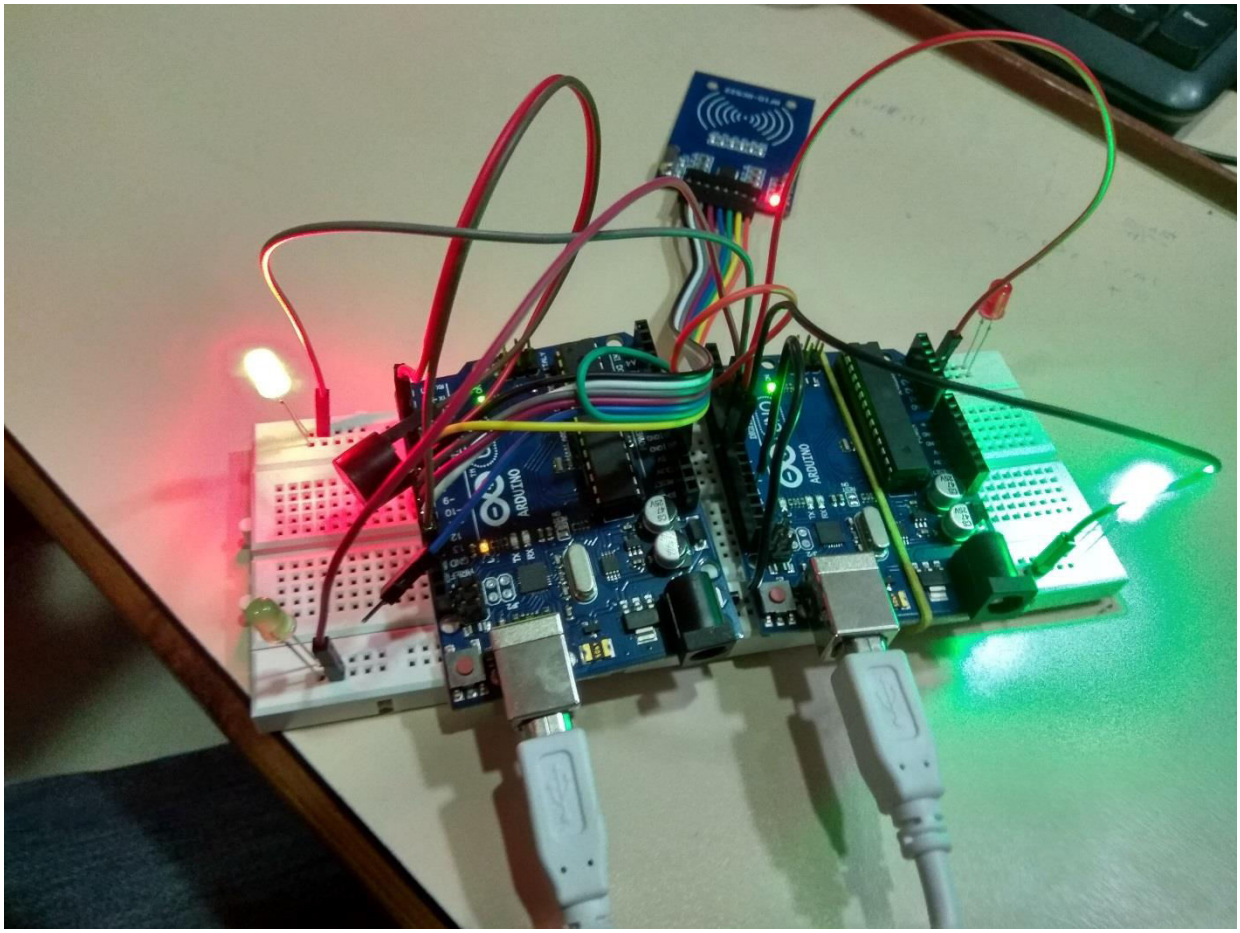


FIGURE 4.5 Project Setup

# CHAPTER 5

# CONSTRAINTS AND FUTURE ENHANCEMENTS

## 5.1 CONSTRAINTS

- We can scan RFID tag only in the range of 3 to 4 cm.
- At one time, only one person can scan the products.
- In retail market, 1 RFID tag cost around 30 Rs. Which is not affordable in small scale shops as well as the profit of shopkeeper is also somewhat affected.
- We have a budget constraint so we need to scan one product at a time, if in near future we get a better budget then we'll be able to scan multiple RFID tags and time will be saved even more.

## 5.2 FUTURE ENHANCEMENTS

The proposed system does not make use of intricate routing system architecture. Rather it uses simple algorithms in order to banish existing problems. Model can be further extended, by increasing the range of RFID reader upto 1 to 2 metres. It can be concluded that the initial cost of the model may be high but the in subsequent years the model will be beneficial as compared to the system using barcode or manual system. Further, a more advanced micro controller, larger display module and a service to pay the bill, thus providing the customers better services, improved consumer experience and improving time complexity to a great extent.

In near future, we can implement same technology for library management for issuing and returning of books.

# CHAPTER 6

# CONCLUSION

The proposed model is easy to use, low-priced and does not require any special training. This model keeps an account and uses of the existing developments and various types of radio frequency identification and detection technologies which are used for item recognition, billing and inventory update. As the whole system is becoming smart, the requirement of manpower will decrease, thus benefiting the retailers. Theft in the mall will be controlled using this smart system, which further adds to the cost efficiency. The time efficiency will increase phenomenally since this system will eliminate the waiting queues. More customers can be served in same time thus benefiting the retailers and customers as well.

# REFERENCES

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