Industrial Internship Report on

”Automic Door Control System”

Prepared by

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Executive Summary
This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT). This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks’ time. My project was (Automatic Door Control System) This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

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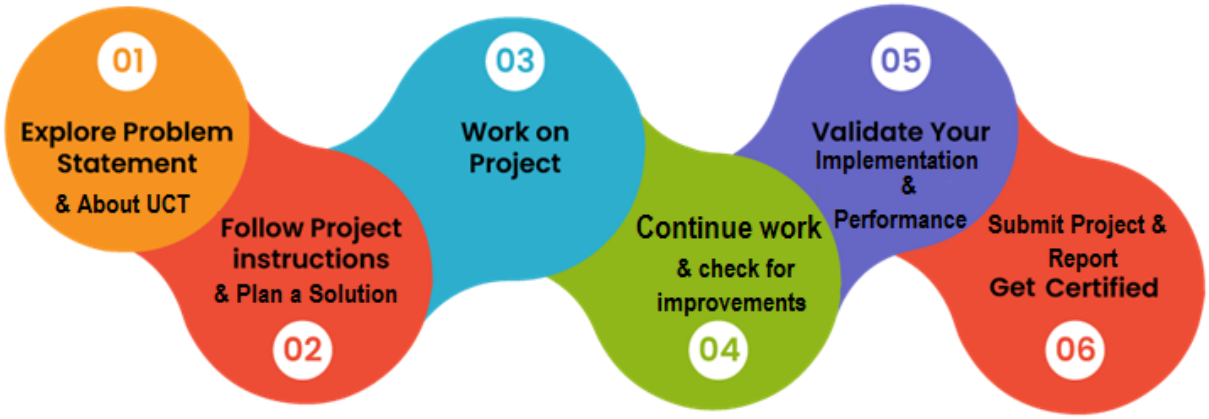
1 Preface

In whole 6 weeks I worked on iot system using arduino and rfid module with its codes.

The RFID module is mainly used for this project. Also, the lock is designed to operate automatically using a servo motor and a manual door lock

USC/UCT has given me various pdfs and video files for deep understanding.

Program was planned in simple steps given below



I learned to make a RFID door lock with Arduino as application of iot.

My message to my juniors and peers are to learn and explore as much as you can with relevant internships like conducted by uct.

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

A company established in 2013 and working in Digital Transformation domain and providing Industrial solutions with prime focus on sustainability and RoI.

For developing its products and solutions it is leveraging various **Cutting Edge Technologies e.g. Internet of Things (IoT), Cyber Security, Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end** etc.

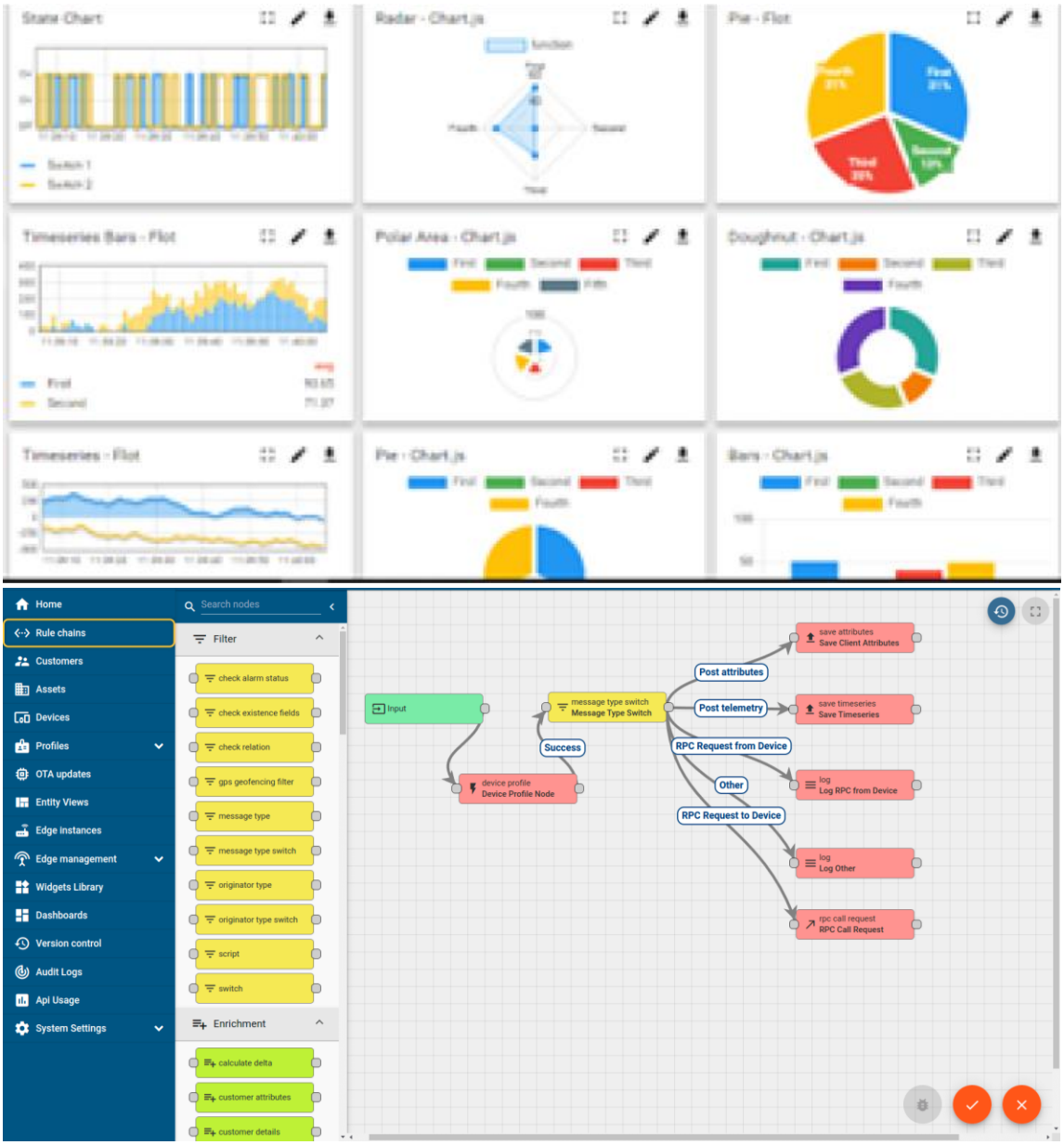
i. UCT IoT Platform (uct Insight)

UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP, HTTP, Modbus TCP, OPC UA
- It supports both cloud and on-premises deployments.

It has features to

- Build Your own dashboard
- Analytics and Reporting
- Alert and Notification
- Integration with third party application(Power BI, SAP, ERP)
- Rule Engine



ii. Smart Factory Platform (FACTORY WATCH)

Factory watch is a platform for smart factory needs.

It provides Users/ Factory

- with a scalable solution for their Production and asset monitoring
- OEE and predictive maintenance solution scaling up to digital twin for your assets.
- to unleased the true potential of the data that their machines are generating and helps to identify the KPIs and also improve them.
- A modular architecture that allows users to choose the service that they what to start and then can scale to more complex solutions as per their demands.

Its unique SaaS model helps users to save time, cost and money.

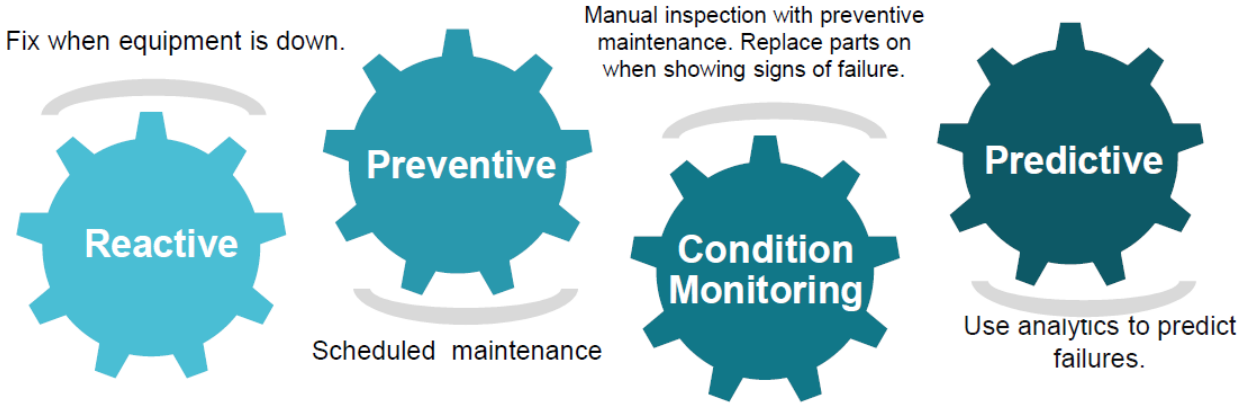
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i

iii. LoRaWAN based Solution

UCT is one of the early adopters of LoRAWAN teschnology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

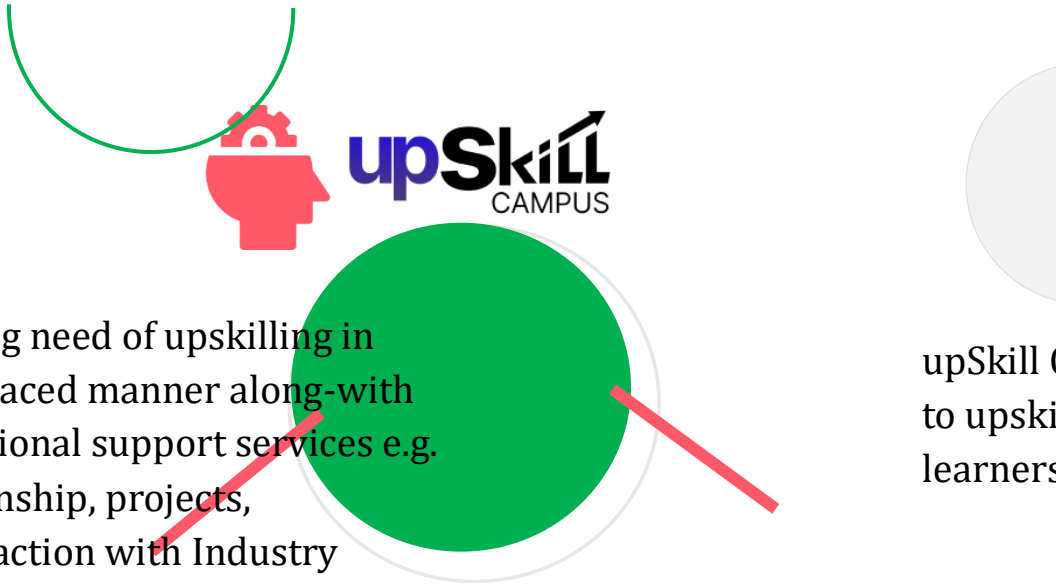
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.

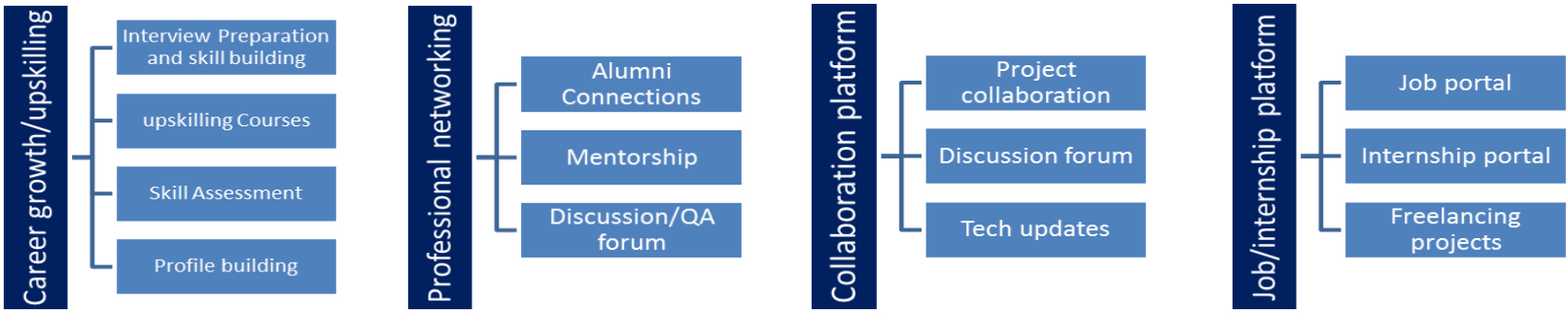
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year

https://www.upskillcampus.com/



2.3 The IoT Academy

The IoT academy is EdTech Division of UCT that is running long executive certification programs in collaboration with EICT Academy, IITK, IITR and IITG in multiple domains.

2.4 Objectives of this Internship program

The objective for this internship program was to

- ☛ get practical experience of working in the industry.
- ☛ to solve real world problems.
- ☛ to have improved job prospects.
- ☛ to have Improved understanding of our field and its applications.
- ☛ to have Personal growth like better communication and problem solving.

2.5 Reference

[1] uct campus study modules

[2] "The Fourth Industrial Revolution" by Klaus Schwab (book)

[3] Getting Started with the Internet of Things by Cuno Pfister (book)

2.6 Glossary

Terms	Acronym
Radio Frequency Identification	RFID
Liquid Crystal Display	LCD
Internet Of Things	IOT

3 Problem Statement

Any Internet-enabled device is vulnerable to being hacked and misused. In the age of the Internet of Things, there are billions of connected devices someone could use to access private data, spread malware, or even cause tangible harm.

Internet-enabled devices pose a number of security challenges. But while the Internet of Things has brought connectivity to new devices, the general cybersecurity issues aren't really new. We've been dealing with hackers for as long as we've enjoyed the benefits of the Internet.

One of the greatest threats to IoT security is the lack of encryption on regular transmissions. Many IoT devices don't encrypt the data they send, which means if someone penetrates the network, they can intercept credentials and other important information transmitted to and from the device.

4 Existing and Proposed solution

1. Physical security

Since IoT applications are often remote, physical security is crucial for preventing unauthorized access to a device. This is where it's valuable to use resilient components and specialized hardware that makes your data more difficult to access. For example, in cellular IoT devices, lots of critical information is stored on the SIM card. Most form factors for SIMs are removable, which makes this data more vulnerable. An eSIM, however, is soldered directly onto the circuit board. They're harder to physically access, and they're also more resistant to changes in temperature and shock damage, which are sometimes used in attempts to sabotage or hack a device.

2. Remote access security

Moreover, a robust remote-access security protocol is needed that allows SIM functionality to be locked to specific devices.The ability to remotely disable connections if there's a physical security breach

3. Private networks

Sending and receiving messages through remotely deployed devices is in itself a security risk. Connecting devices and enabling this communication using public-access networks, such as WiFi, opens up those messages for interception. Encrypting messages is a step in the right direction but using public networks to send sensitive data demands more precautions. We recommend building private networks on top of existing security mechanisms to ensure that data never crosses the public Internet.emnify helps IoT manufacturers create Virtual Private Networks (VPNs) using OpenVPN, a versatile open standard that gives you secure remote access to your devices from anywhere.

4. Abnormality detection

The moment someone attempts to breach your device or there's abnormal network activity, you need to know. With a emnify's cloud communication platform, we forward the relevant connectivity information to your operational dashboards, where you can evaluate whether there was an employee error or a serious threat.

6. Encrypted data transfer

To securely transport data to and from your devices, you need to encrypt data transfers within the network. There are a variety of protocols developers can use to secure a device's communication, the most common of which is Transport Layer Security (TLS). But while your application and network may be secure, there's a gap between them where your data can be intercepted. Using an X.509 certificate and/or a single VPN/IPSec connection between the mobile network and the application server, you can close this security gap.

Alternatively, emnify also enables you to use intra-cloud connect to establish a secure VPN for your entire deployment, so there's no need for public IPs.

4.1 (Github link)

https://github.com/csy2004/

5 Proposed Design/ Model

The model is formed by the combinations of following components :

Arduino UNO board x 1

RFID module x 1

LCD x 1

I2C module x 1

Servo motor x 1

Door lock x 1

Foamboard

Iron stick

Jumper wires

The RFID module is mainly used for this project. Also, the lock is designed to operate automatically using a servo motor and a manual door lock

5.1 High Level Diagram

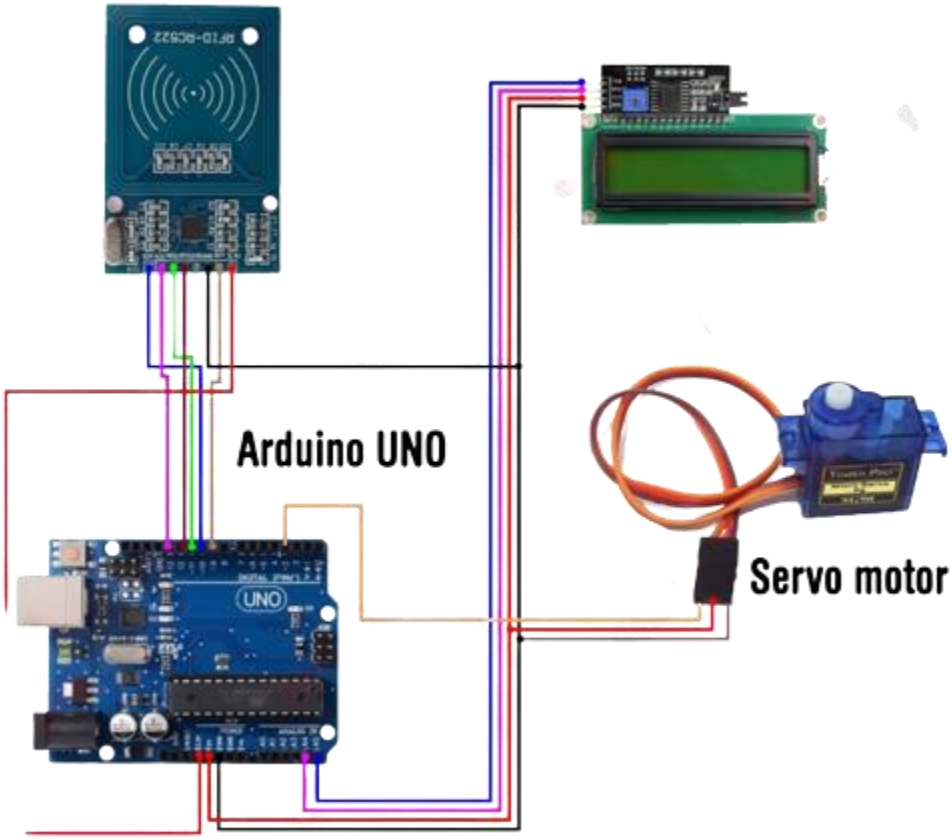
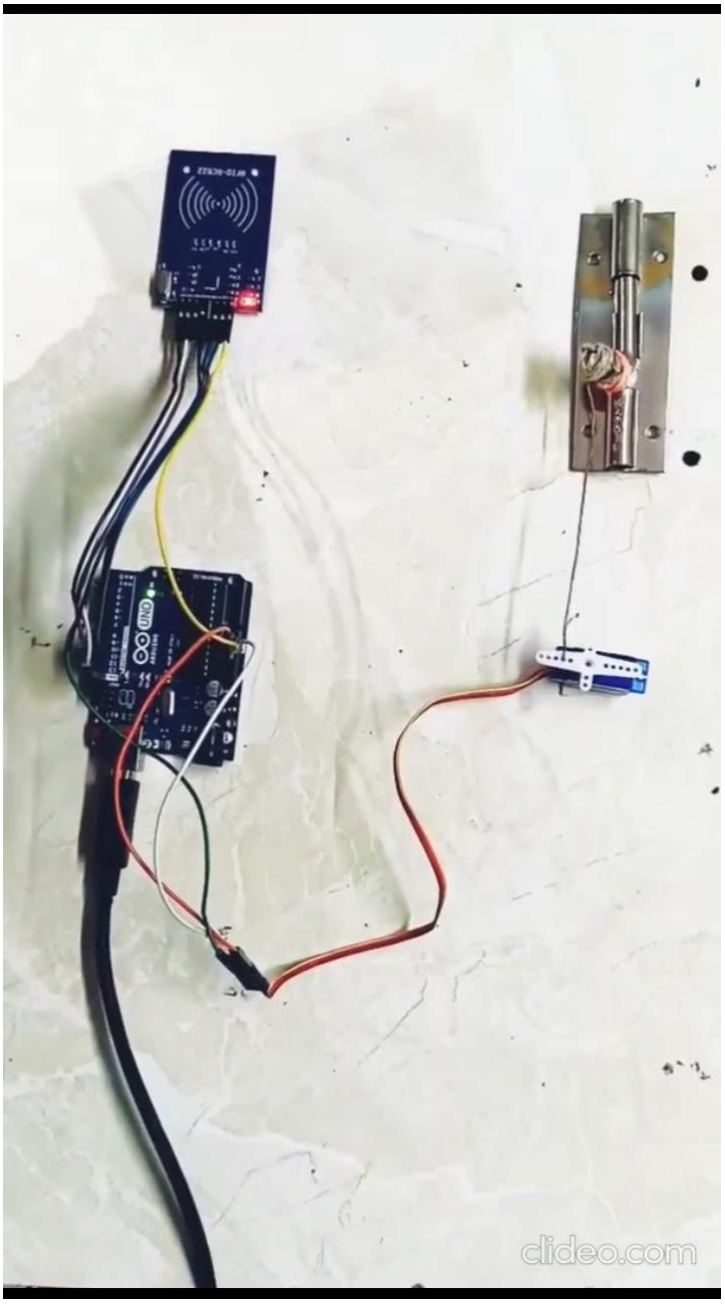


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram



6 Performance Test

When power ON this door lock, the servo motor activates and pushes the door lock forward. Also displayed as “Welcome, put your card” on the LCD. Then when the RFID tag is moved closer to the RFID reader, it is scanned. In that case, it is displayed as “scanning” on the LCD. Then, if the RFID tag is correct, the servo motor is activated and the door lock is pulled back. The LCD shows “Door is Open”. When the RFID tag is moved closer to the RFID reader again, if it gets the correct tag, the servo motor will push the lock forward. Displays “Door is locked” on LCD. If a wrong RFID tag is used according to the program, it will be displayed as “Wrong card” on the LCD.

6.1 Test Plan/ Test Cases

The RFID module is mainly used for this project. Also, the lock is designed to operate automatically using a servo motor and a manual door lock. Using the knowledge in this tutorial, you can easily design a door lock system for your home doors.

6.2 Test Procedure

Step 1: Firstly, identify these components.

Arduino UNO board x 1

RFID module x 1

LCD x 1

I2C module x 1

Servo motor x 1

Door lock x 1

Foamboard

Iron stick

Jumper wires

Step 2 : Secondly, connect the servo motor and the lock as shown below. Use the iron stick for that.

Step 3 : Thirdly, glue this lock and servo motor to the foam board.

Step 4 : Now, connect all the components to the Arduino board.

Step 5

Then, let's creates the program for scan RFID tags. It is as follows.

```
/*RFID tag scan code
 */

#include <LiquidCrystal_I2C.h>
#include <SPI.h>
#include <MFRC522.h>

#define RST_PIN 9
#define SS_PIN  10
byte readCard[4];
byte a = 0;

LiquidCrystal_I2C lcd(0x27, 16, 2);
MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup() {
 Serial.begin(9600);
 lcd.init();
 lcd.backlight();
 while (!Serial);
 SPI.begin();
 mfrc522.PCD_Init();
 delay(4);
```

```
  mfrc522.PCD_DumpVersionToSerial();
  lcd.setCursor(2, 0);
  lcd.print("Put your card");
}

void loop() {
  if ( ! mfrc522.PICC_IsNewCardPresent()) {
    return 0;
  }
  if ( ! mfrc522.PICC_ReadCardSerial()) {
    return 0;
  }

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Scanned UID");
  a = 0;
  Serial.println(F("Scanned PICC's UID:"));
  for ( uint8_t i = 0; i < 4; i++) {  //
    readCard[i] = mfrc522.uid.uidByte[i];
    Serial.print(readCard[i], HEX);
    Serial.print(" ");
    lcd.setCursor(a, 1);
    lcd.print(readCard[i], HEX);
```

```
  lcd.print(" ");
  delay(500);
  a += 3;
 }
 Serial.println("");
 mfrc522.PICC_HaltA();
 return 1;
}
```

Step 6 : Now, select board and port. Afterward, upload this code to the Arduino board.

Step 7 : Then, turn on the serial monitor and bring the RFID tag closer to the RFID reader.

Step 8 : Next, let's creates the main program for this project. It is as follows.

```
/*Door lock system code
 */

#include <Servo.h>
#include <LiquidCrystal_I2C.h>
#include <SPI.h>
#include <MFRC522.h>

#define SS_PIN 10
#define RST_PIN 9
String UID = "";
byte lock = 0;
```

```
Servo servo;
LiquidCrystal_I2C lcd(0x27, 16, 2);
MFRC522 rfid(SS_PIN, RST_PIN);



void setup() {
 Serial.begin(9600);
 servo.write(70);
 lcd.init();
 lcd.backlight();
 servo.attach(3);
 SPI.begin();
 rfid.PCD_Init();
}

void loop() {
 lcd.setCursor(4, 0);
 lcd.print("Welcome!");
 lcd.setCursor(1, 1);
 lcd.print("Put your card");

 if ( ! rfid.PICC_IsNewCardPresent())
   return;
 if ( ! rfid.PICC_ReadCardSerial())
```

```
  return;


lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Scanning");
Serial.print("NUID tag is :");
String ID = "";
for (byte i = 0; i < rfid.uid.size; i++) {
  lcd.print(".");
  ID.concat(String(rfid.uid.uidByte[i] < 0x10 ? " 0" : " "));
  ID.concat(String(rfid.uid.uidByte[i], HEX));
  delay(300);
}
ID.toUpperCase();


if (ID.substring(1) == UID && lock == 0 ) {
  servo.write(70);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Door is locked");
  delay(1500);
  lcd.clear();
  lock = 1;
} else if (ID.substring(1) == UID && lock == 1 ) {
```

```
    servo.write(160);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Door is open");
    delay(1500);
    lcd.clear();
    lock = 0;
  } else {
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Wrong card!");
    delay(1500);
    lcd.clear();
  }
}
```

Step 9 : Lastly, select board and port, Afterward, upload this code to the Arduino board.

Step 10 : the project is ready

6.3 Performance Outcome

We have made the automatic door control system where,When power ON this door lock, the servo motor activates and pushes the door lock forward. Also displayed as “Welcome, put your card” on the LCD. Then when the RFID tag is moved closer to the RFID reader, it is scanned. In that case, it is displayed as “scanning” on the LCD. Then, if the RFID tag is correct, the servo motor is activated and the door lock is pulled back. The LCD shows “Door is Open”. When the RFID tag is moved closer to the RFID reader again, if it gets the correct tag, the servo motor will push the lock forward. Displays “Door is locked” on LCD. If a wrong RFID tag is used according to the program, it will be displayed as “Wrong card” on the LCD.

7 My learnings

1. The automatic door locks security technology allows users to open or closed locks automatically, remotely and keyless. It gives easy access to users for locks or unlocks at pre-set specific times.

2. The automatic door locks enable no human intervention. They can also integrate with panic, intrusion door position sensors and fire alarm systems. This prevents the entry or release of individuals in specific areas.

3. RFID cards are used for applications where tracking or identifying personnel is important or where access control is required.

4. Arduino hardware is a programmable circuit board called a microcontroller. Arduino software is an IDE (integrated development environment) through which developers write and upload the code to the microcontroller.

8 Future work scope

In future I will like to be working in embedded systems and iot combinations type project and wanted to excel my carrier in electronics domain.

I like to excel in embedded systems and joint combinations of internet of things and helps the society to get advance in automated systems.