Industrial Internship Report on

”Automatic Door Control System”

Prepared by

Akshada Sanjay Kadam

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.

TABLE OF CONTENTS

1 Preface

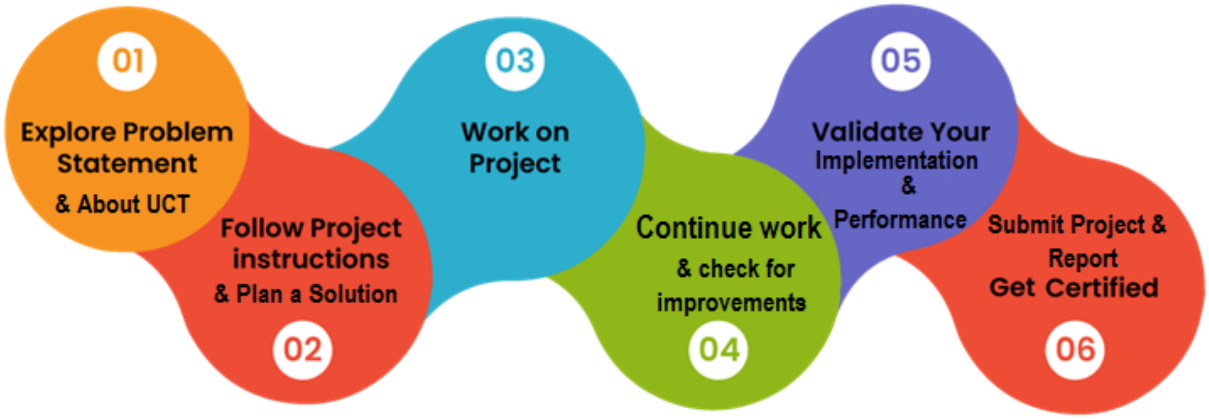
Summary of the whole 6 weeks' work.

About need of relevant Internship in career development.

Brief about Your project/problem statement.

Opportunity given by USC/UCT.

How Program was planned



Your Learnings and overall experience.

Thank to all (with names), who have helped you directly or indirectly.

Your message to your juniors and peers.

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.

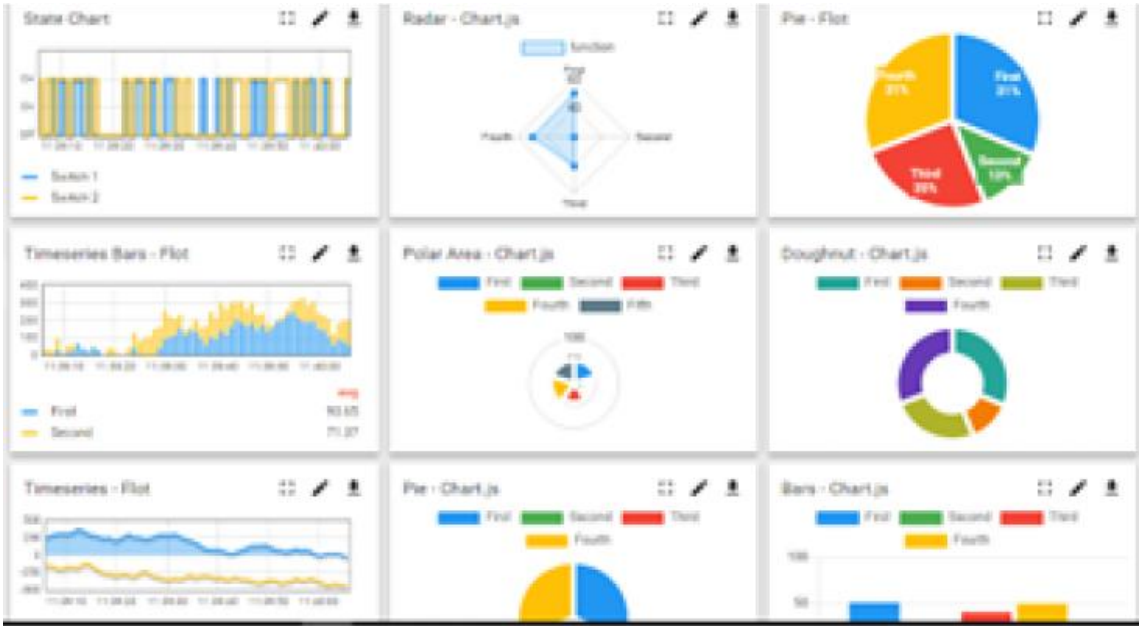
i. UCT IoT Platform (UCT Insight)

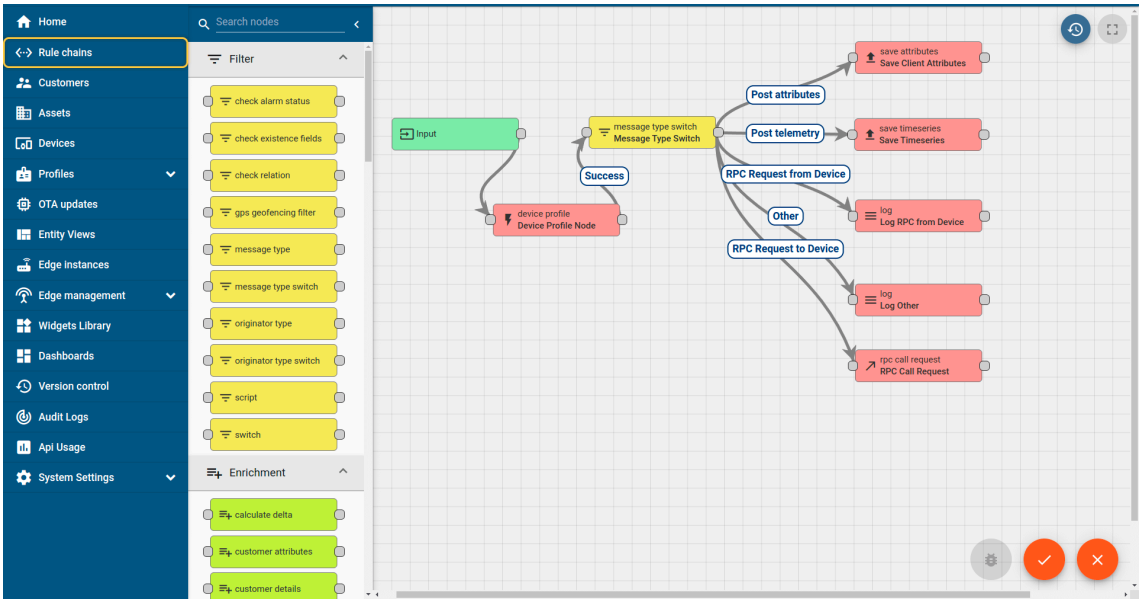
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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.

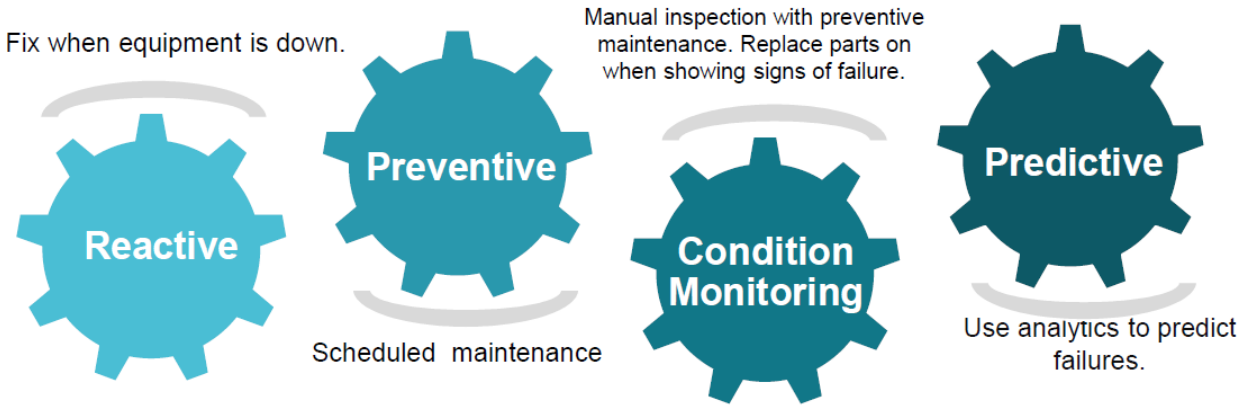
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

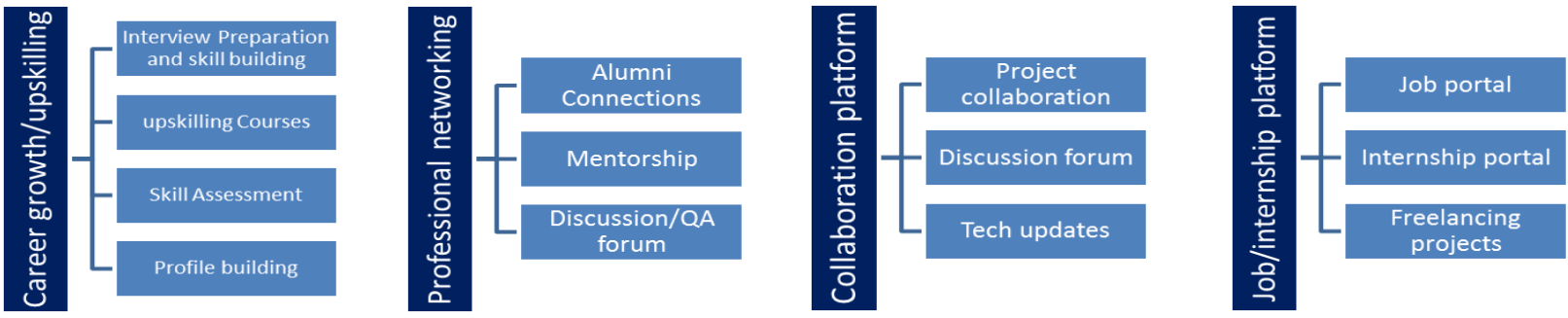
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.



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] https://learn.upskillcampus.com/s/courses/65c4b1d9e4b052b56c7d8e9d/take

[2] https://youtu.be/FgeVi5syXs4?si=4GJrONY0cSKFVl1T

[3] https://youtu.be/NbOkCnk73ZM?si=Dwk98DY1JIjkT77b

2.6 Glossary

Terms	Acronym
Internet of Things	IOT
Tinkercad	N/A
Light-Emitting Diode	LED
Test Plan	N/A
Test Cases	N/A

3 Problem Statement

I undertook a project titled "Automatic Door Control System" using Tinkercad. This project aimed to create a system that automates door operations based on motion detection using a PIR sensor, controlled by an Arduino. Additional components included a micro servo motor for door movement, an LCD for status display, LEDs to indicate door status, and basic electronic components such as resistors.

In many modern buildings, automatic door control systems are used to enhance convenience and accessibility, especially in places with high foot traffic like shopping malls, office buildings, and hospitals. These systems allow doors to open and close automatically without requiring physical contact, which is not only convenient but also hygienic. However, existing solutions can be expensive, complex to install, and difficult to customize for specific needs.

The project titled "Automatic Door Control System" aims to create an affordable, easy-to-assemble, and customizable solution using Tinkercad for design and simulation, and Arduino for implementation. The goal is to develop a system that can detect motion and automatically control the door's opening and closing mechanisms.

4 Existing and Proposed solution

❖ Existing Solution

Existing automatic door control systems often use various sensors and control mechanisms. The common solutions include:

- Infrared Sensors: Used for detecting motion to trigger door operations.
- Pressure Sensors: Placed on mats to detect weight and open doors.
- Ultrasonic Sensors: Used to detect proximity for door automation.

Limitations of Existing Solutions:

- High Cost: Many systems are expensive due to advanced sensor technology and proprietary software.
- Complex Installation: Some systems require professional installation, making them less accessible for small-scale use.
- Limited Customization: Pre-built systems often lack flexibility in customization for specific user needs.

❖ Proposed Solution

The proposed solution aims to develop a cost-effective, easy-to-build automatic door control system using Tinkercad for simulation and Arduino for control. The system will utilize a PIR sensor for motion detection, a micro servo motor for door movement, and an LCD and LEDs for status display.

Value Addition

- Affordability: Utilizing readily available and inexpensive components.
- Ease of Assembly: Simplified design for easy DIY assembly.
- Customizability: Open-source code and design allow for easy modifications and improvements.

It leverages widely available components to create a functional and efficient system that can be used in various applications. The design not only enhances convenience and security but also provides significant educational value, making it an ideal project for learning and experimentation. With potential for remote monitoring and scalability, this system is versatile and adaptable to future advancements and integrations.

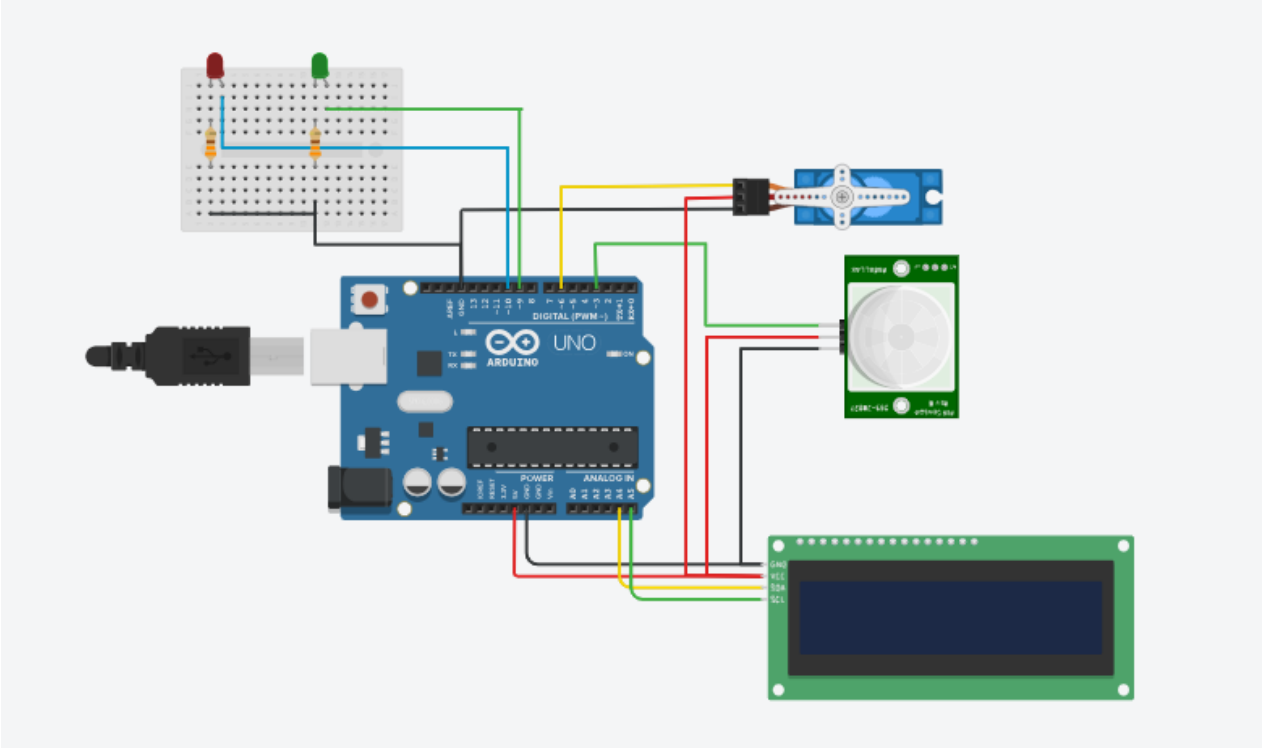
4.1 Code submission (Github link) :

https://github.com/Aksshhada/upskillcampus/blob/main/AutomaticDoorControlSystem.cpp

4.2 Report submission (Github link) :

https://github.com/Aksshhada/upskillcampus

5 Proposed Design/ Model



6 Performance Test

- ***Objective***

  Ensure Reliability and Efficiency: Validate that the system consistently performs its intended functions without failures or errors. Operating Under Various Conditions: Assess the system's functionality in different scenarios, such as varying light conditions, continuous motion, and absence of motion.

- ***Components Tested***

  PIR Sensor: Detects motion within its range and triggers subsequent actions.

  Servo Motor: Controls the door movement based on signals from the PIR sensor.

  LCD Display: Shows the current status of the door (open or closed).

  LEDs: Provide visual alerts indicating the door's status (green for open, red for closed).

- ***Aspects Evaluated***

  Response Time: How quickly the system reacts to motion detection.

  Accuracy: Correct identification of motion and appropriate door movement.

  Consistency: Reliable performance over repeated cycles.

6.1 Test Plan/ Test Cases

- **Objectives:**
  - Validate that the system correctly detects motion.
  - Ensure the servo motor opens and closes the door accurately.
  - Confirm that the LCD displays the correct status messages.
  - Verify that LEDs accurately indicate the door's status.

- **Scope:**
  - Unit Testing: Test individual components such as the PIR sensor, servo motor, LCD display, and LEDs.

- Integration Testing**:** Test the complete system to ensure all components work together seamlessly.
- Stress Testing**:** Test the system's performance under prolonged operation.

- **Approach:**
  - Hardware Setup**:** Connect components according to the schematic.
  - Software Setup**:** Upload the code to the Arduino.
  - Testing Environment: Simulate real-world conditions to validate performance.

- **Resources:**
  - Hardware**:** Arduino Uno, PIR sensor, micro servo motor, 16x2 LCD display, red and green LEDs, breadboard, resistors, connecting wires.
  - Software**:** Arduino IDE for coding and uploading firmware.
  - Environment**:** A controlled space to simulate door operations and motion detection.

6.2 Test Procedure

- **Setup:**
  - Assemble all hardware components according to the provided schematic.
  - Upload the Arduino code to the Arduino Uno.
  - Connect the power supply to the system.
- **Execution:**
  - Perform each test case step-by-step, starting with the initial power-on test.
  - Observe and record the outcomes for each test case.
  - Note any deviations from the expected outcomes and investigate potential causes.

6.3 Performance Outcome

- **Initial Power-On:**

  Outcome**:** The system initializes correctly, the LCD displays "Gate Closed," and the red LED lights up as expected.

- **Motion Detection:**

  Outcome**:** The PIR sensor accurately detects motion, the servo motor opens the door, the LCD displays "Gate Open," and the green LED lights up as expected.

- **No Motion:**

  Outcome**:** The PIR sensor correctly detects the absence of motion, the servo motor closes the door, the LCD displays "Gate Closed," and the red LED lights up as expected.

- **Continuous Motion Detection:**

  Outcome**:** The door remains open as long as motion is detected, the LCD continuously displays "Gate Open," and the green LED remains on.

- **No Motion for Extended Period:**

  Outcome**:** The door remains closed with no motion detected, the LCD continuously displays "Gate Closed," and the red LED remains on.

- **Servo Motor Response Time:**

  Outcome**:** The servo motor responds within the expected time frame of 1 second.

- **LCD Display Accuracy:**

  Outcome**:** The LCD accurately displays "Gate Open" or "Gate Closed" based on the door's status.

- **LED Indicators:**

  Outcome**:** The LEDs accurately indicate the door status: green for open, red for closed.

7 My learnings

The six-week internship at Unicoverge Technologies (UCT) was an enriching and transformative experience that significantly expanded my knowledge and skills in the field of IoT and embedded systems. Here are the key learnings and insights gained during this period:

1. Understanding IoT Fundamentals

- Theory and Application: I gained a comprehensive understanding of the theoretical foundations of IoT, including how different sensors, actuators, and microcontrollers work together to create intelligent systems.
- System Design: I learned how to design IoT systems that can efficiently gather, process, and communicate data to achieve specific objectives.

2. Hands-on Experience with Tinkercad and XY YouTube

- Hardware Prototyping: Working with Tinkercad provided practical experience in setting up and programming microcontrollers to interact with various smart devices.
- User Interface Development: Integrating XY YouTube for remote control and monitoring taught me how to develop user-friendly interfaces that enhance the usability of IoT systems.

3. Project Management Skills

- Planning and Execution: Managing the home automation project from inception to completion helped me develop strong project management skills. I learned to plan tasks, set milestones, and ensure timely delivery.
- Problem-Solving: Encountering and resolving technical challenges during the project enhanced my problem-solving abilities and taught me to approach issues methodically and creatively.

4. Automation and Energy Efficiency

- Automation Techniques: I explored various automation techniques that can be implemented to improve convenience and efficiency in home environments. This included creating scripts for automatic control of lights, climate, and security systems.
- Energy Management: Learning how to design systems that optimize energy usage provided valuable insights into sustainable technology practices.

5. Security in IoT Systems

- Security Protocols: I understood the importance of implementing robust security measures to protect IoT systems from potential breaches. This involved learning about encryption, secure communication protocols, and event logging.

8 Future work scope

1. **Enhanced Security Features**:

   Integration with facial recognition or biometric systems for authorized access.

   Implementation of intrusion detection algorithms using sensors to alert security personnel.

2. **Energy Efficiency Improvements**:

   Optimization of power consumption through advanced sensor scheduling and power management techniques.

   Integration with renewable energy sources or energy harvesting mechanisms.

3. **User Experience Enhancements**:

   Implementation of a mobile app for remote door control and monitoring.

   Voice command integration using natural language processing (NLP) for hands-free operation.

4. **Data Analytics and Reporting**:

   Collection and analysis of usage data to optimize door opening/closing timings.

   Generation of reports on usage patterns and efficiency metrics for facilities management.

5. **Integration with IoT Ecosystems**:

   Compatibility with smart home or building automation systems (e.g., integration with Amazon Alexa, Google Home, etc.).

   Expansion to support interoperability with other IoT devices for broader automation capabilities.

6. **Accessibility and Universal Design**:

   Implementation of features to assist users with disabilities, such as voice commands, tactile feedback, or visual indicators.

7. **Remote Monitoring and Maintenance**:

   Deployment of remote monitoring tools for real-time status updates and proactive maintenance alerts.

   Predictive maintenance using machine learning algorithms to anticipate component failures.

8. **Scalability and Modularity**:

   Designing the system architecture to easily scale for different door types (e.g., sliding doors, revolving doors) and building sizes.

   Modular design approach to facilitate future upgrades and component replacements without significant system downtime.