

Industrial Internship Report on "Automatic Door Control System"

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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 (Tell about ur Project)

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 today's fast-paced world, the integration of automation and remote control in our daily lives has become increasingly significant. The "Automatic Door Control System Using SMS Gateway Based on Arduino Uno and Ultrasonic Sensor" project aims to enhance the convenience and security of door operations through the use of modern technology. This system leverages the capabilities of the Arduino Uno microcontroller and ultrasonic sensors to detect the presence of individuals and control door movements automatically. Additionally, the inclusion of an SMS gateway allows for remote monitoring and control, providing users with the ability to manage their door systems from anywhere via SMS commands.

This project represents a practical application of embedded systems and Internet of Things (IoT) principles, demonstrating how everyday tasks can be streamlined through automation. It not only addresses the inefficiencies and security concerns associated with manual door operations but also provides a cost-effective and user-friendly solution for various environments, including homes, offices, and industrial facilities.

Through the development and implementation of this project, we aim to gain a deeper understanding of sensor integration, microcontroller programming, and the use of communication modules for remote control. The knowledge and experience gained from this project will contribute significantly to our expertise in the field of embedded systems and IoT, paving the way for future innovations in automation and smart technology.

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.



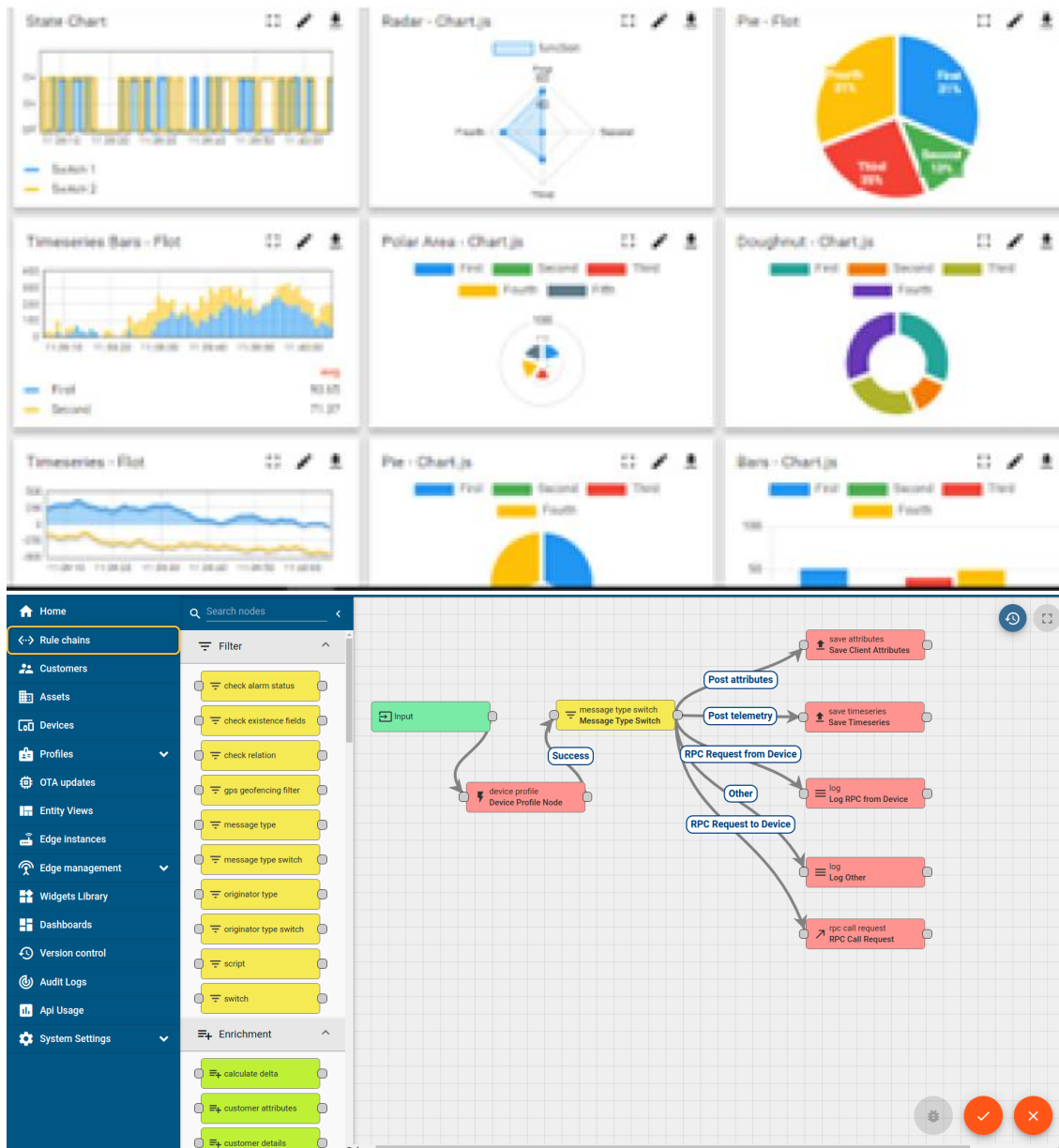
i. UCT IoT Platform ()

UCT Insight 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 unleash 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 want 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. based Solution

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

iv. Predictive Maintenance

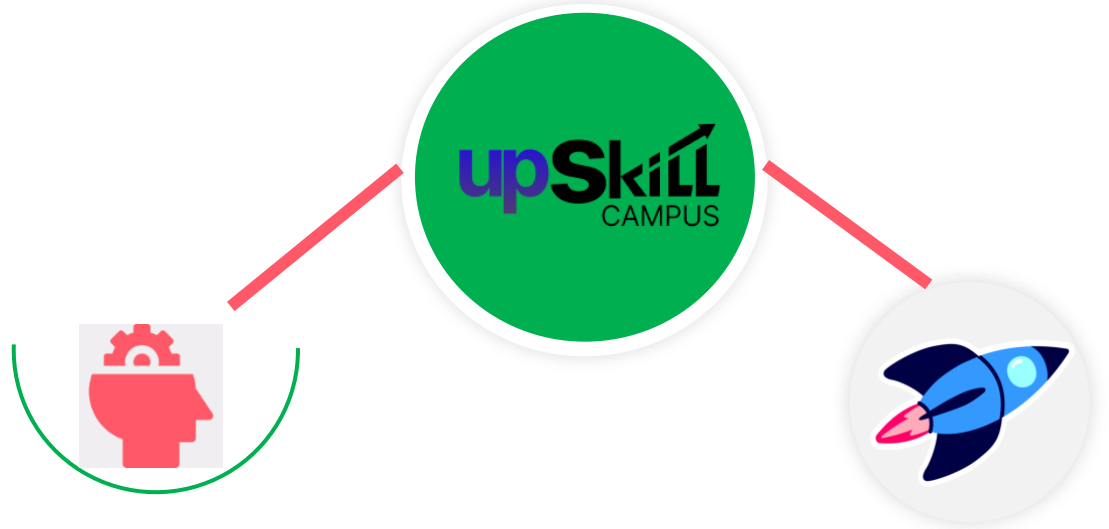
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.

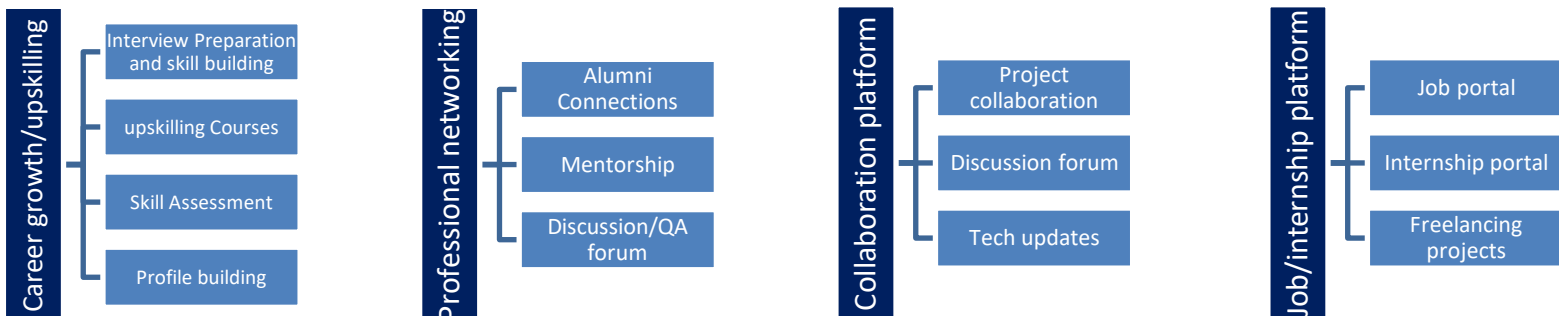
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



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] www.google.com
- [2] from college
- [3] edunet foundation

2.6 Glossary

Terms	Acronym

3 Problem Statement

In the assigned problem statement

Manual door operation systems are often inconvenient, inefficient, and pose significant security risks in various environments such as homes, offices, and industrial facilities. Traditional systems require physical interaction to open or close doors, which can be cumbersome for users carrying items or for individuals with disabilities. Moreover, these systems do not provide any form of remote control or monitoring, limiting their functionality and adaptability to modern needs. There is a clear need for an automated door control solution that not only detects the presence of individuals to operate doors autonomously but also allows for remote control and monitoring to enhance security and convenience. The proposed solution aims to address these issues by integrating an Arduino Uno microcontroller with ultrasonic sensors for presence detection and an SMS gateway for remote operation, providing a reliable, efficient, and user-friendly door control system.

4 Existing and Proposed solution

The proposed solution is an Automatic Door Control System that leverages the Arduino Uno microcontroller, ultrasonic sensors, and an SMS gateway to provide a convenient, secure, and efficient method of door operation. The system works by using ultrasonic sensors to detect the presence of individuals near the door. When someone approaches, the sensors trigger the Arduino Uno to open the door automatically. This eliminates the need for physical interaction, making it particularly beneficial for individuals carrying items or those with disabilities.

In addition to automated door operation, the system includes an SMS gateway that enables remote control and monitoring of the door. Users can send SMS commands to the system to open or close the door, check its status, and receive alerts about unauthorized access attempts. This feature enhances security by allowing users to manage their doors from any location, ensuring that the door can be operated even when they are not physically present.

This solution addresses the inefficiencies and security concerns of manual door systems by providing a cost-effective, user-friendly, and technologically advanced alternative. The integration of sensor technology with remote communication capabilities ensures that the system meets modern needs for automation and remote access, offering a significant improvement over existing solutions.

4.1 Code submission (Github link)

<https://github.com/Nileshkm911/Upskillcampus.git>

4.2 Report submission (Github link) : first make placeholder, copy the link.

5 Proposed Design/ Model

The design of door control system appliance uses several components, namely: Arduino Uno, SMS gateway, selenoid, ultrasonic sensor, and alarm (Fig. 2.). Fig. 2 shows the Arduino has a vital role in this system as the control center of the whole system. This system worked when there are input commands via SMS gateway and forwarded to be processed by Arduino Uno. Arduino Uno will give control to the selenoid to lock the door. Input command on SMS gateway is set such that Arduino Uno will process only specified words as an input command.

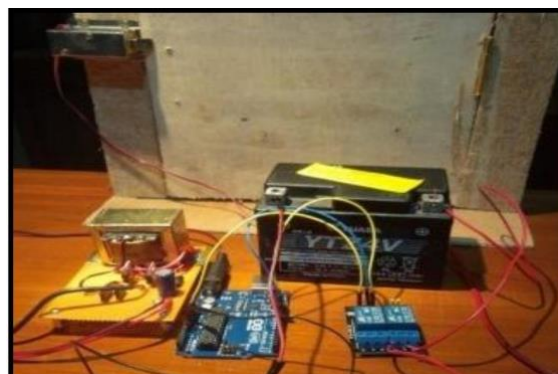
When the selenoid is in a locked state, automatically the ultrasonic Sensor will be turned on. If force opens the door, then the ultra-Sonic sensor will read the door motion, and Arduino Uno will send A warning via SMS gateway media that there is a door indicator Opened by force.

5.1 High Level Diagram (if applicable)

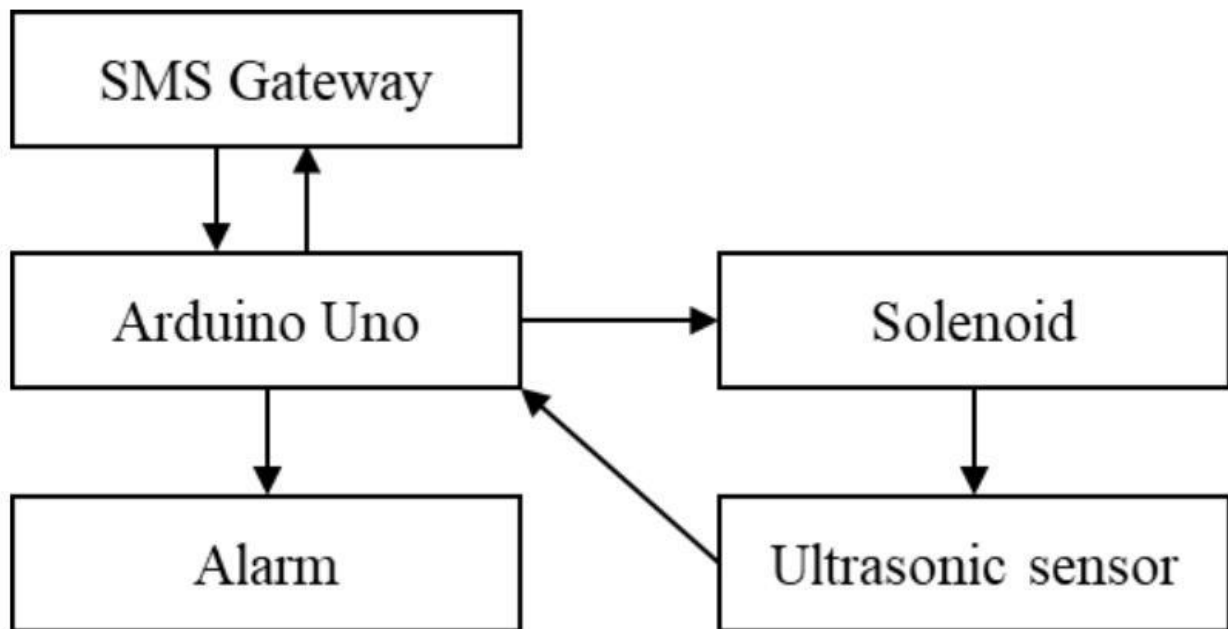


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram (if applicable)



5.3 Interfaces (if applicable)



6 Performance Test

Table 1: Ultrasonic Sensor Response

No	Distance (cm)	Response	
		Legible	Un-legible
1	1	✓	
2	2	✓	
3	3	✓	
4	4	✓	
5	5	✓	
6	6		✓
7	7		✓
8	8		✓
9	9		✓
10	10		✓

Table 2:Solenoid Response

No	Time	Solenoid Response (second)
1	07:00	5
2	08:00	5
3	09:00	4
4	10:00	6
5	11:00	5
6	12:00	5
7	13:00	5
8	14:00	4
9	15:00	4
10	16:00	6
11	17:00	5
12	18:00	5
13	19:00	4
14	20:00	4
15	21:00	4
16	22:00	5
17	23:00	4
18	24:00	4
19	01:00	6
20	02:00	4
21	03:00	5
22	04:00	4
23	05:00	4
24	06:00	5

Table 2: Selenoid Response when opening the door

No	Time	Selenoid respond (second)	SMS Alert (second)
1	07:00	4	5
2	08:00	5	4
3	09:00	5	4
4	10:00	4	4
5	11:00	4	5
6	12:00	5	6
7	13:00	6	7
8	14:00	6	6
9	15:00	7	6
10	16:00	4	4
11	17:00	6	5
12	18:00	5	7
13	19:00	4	4
14	20:00	5	5
15	21:00	4	6
16	22:00	5	4
17	23:00	4	4
18	24:00	5	5
19	01:00	5	3
20	02:00	4	4
21	03:00	5	4
22	04:00	4	5
23	05:00	6	5
24	06:00	5	4

Table 4: SMS alert when there's theft

No	Time	SMS Alert (second)
1	07:00	4
2	08:00	5
3	09:00	6
4	10:00	4
5	11:00	6
6	12:00	6
7	13:00	4
8	14:00	7
9	15:00	5
10	16:00	7
11	17:00	6
12	18:00	7
13	19:00	5
14	20:00	6
15	21:00	5
16	22:00	4
17	23:00	5
18	24:00	4
19	01:00	4
20	02:00	3
21	03:00	4
22	04:00	4
23	05:00	6
24	06:00	5

6.1 Test Plan/ Test Cases

6.2 Test Procedure

6.3 Performance Outcome

The design results show the system works well for opening and Locking doors via SMS Gateway, as well as alerting via SMS When the door opened forcibly. The components used are: Arduino Uno, SMS gateway, solenoid key, ultrasonic sensor, relay, Accu, adapter, and buzzer. Based on the result of work tool response analysis, it can be concluded that:

- Accu durability, when the door is locked, the batteries can Back up to 2,389 hours, and when the solenoid key is open the Batteries can back up to 2,029 hours.
- The average speed of solenoid response when locking the door is 4 seconds.
- The average speed of solenoid response when opening the Door is 5sec.
- The average speed of an open lock SMS alert is 4 seconds.
- The average speed of SMS alert response when there is a Forced open door that is 4 seconds.

7 My learnings

From this internship, I gained a comprehensive understanding of integrating various technologies to create an automated system. Specifically, I learned about the following key areas:

1. **Microcontroller Programming:** I developed skills in programming the Arduino Uno, including configuring input and output pins, writing code to interface with sensors, and controlling actuators.
2. **Sensor Integration:** I learned how to use ultrasonic sensors to detect the presence of individuals and how to process sensor data to trigger specific actions, such as opening or closing a door.
3. **Communication Protocols:** By integrating an SMS gateway, I gained practical experience with communication modules and protocols, enabling remote control and monitoring of the system via SMS commands.
4. **System Design and Troubleshooting:** I acquired knowledge in designing a cohesive system that combines hardware and software components. This included assembling the physical components, writing and debugging code, and ensuring that all parts of the system worked together seamlessly.
5. **Security Considerations:** I learned about the importance of security in automated systems, particularly in preventing unauthorized access and ensuring reliable operation. Implementing features to monitor and control the door remotely provided insights into designing secure IoT systems.
6. **Practical Application of IoT Principles:** This project provided a hands-on experience with the Internet of Things (IoT), demonstrating how interconnected devices can enhance everyday tasks and improve convenience and security.

8 Future work scope

- **Enhanced Security Features:** Incorporate advanced security measures such as biometric authentication (fingerprint, facial recognition) and RFID card access to prevent unauthorized entry.
- **Integration with Smart Home Systems:** Extend the system's functionality by integrating it with existing smart home ecosystems like Google Home, Amazon Alexa, or Apple HomeKit, allowing for voice control and seamless interaction with other smart devices.
- **Mobile Application Development:** Develop a dedicated mobile application that offers a more user-friendly interface for remote control and monitoring. The app could provide real-time alerts, status updates, and allow for more intuitive control of the door system.
- **Energy Efficiency Improvements:** Implement power-saving features and optimize the system to reduce energy consumption, making it more sustainable and cost-effective.
- **Cloud Connectivity:** Connect the system to cloud services for better data management and analytics. This can enable advanced features such as predictive maintenance, usage statistics, and remote firmware updates.
- **Scalability for Commercial Use:** Adapt the system for larger-scale applications in commercial buildings, industrial facilities, and public spaces, addressing specific requirements such as multiple door controls, centralized management, and integration with existing security infrastructure.
- **Customization Options:** Allow for greater customization based on user preferences, such as adjustable sensor sensitivity, different modes for day and night operation, and integration with other environmental sensors (temperature, light) to enhance overall functionality.
- **Emergency Features:** Add emergency response features such as automatic door opening during fire alarms or other emergencies, ensuring compliance with safety regulations and enhancing the overall safety of the premises.

