Industrial Internship Report on

"Temperature and humidity monitoring 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 Temperature and Humidity Monitoring 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

Over the past six weeks , I had the opportunity to delve into the world of IoT and Embedded systems through an enriching internship program. The primary focus was to understand and implement IoT concepts using TinkerCard and some documents , culminating in the development of a Temperature and Humidity monitoring system. The program was meticulously structured to provide both theoretical knowledge and hands-on experience with various projects to solidify our understanding.

The Need for Relevant Internship in Career Development.

Internships play a crucial role in bridging the gap between academic learning and professional application. This internship, in particular provided invaluable exposure to practical challenges and solutions in the field of IoT. Engaging in real-world projects and problem-solving abilities, and understanding of industry standards. Such experiences are essential for career development as they prepare students for the demands of the professional world, fostering a seamless transition from academic to industry.

The primary project undertaken during this internship was the development of a Temperature and Humidity Monitoring System. The goal was to design a system capable of measuring accurate temperature and humidity using Tinkercad. This project involved:

- Designing and implementing the system architecture.

- Programming the Tinkercad to control and monitor different devices.

- Integrating XY You Tube for user interface and remote control functionalities.

- Testing and troubleshooting to ensure reliability and efficiency of the system.

Opportunity Provided by USC/UCT.

The university of Southern California (USC) and the university of Cape Town (UCT) provided a remarkable platform for this internship. These institutions offered access to cutting-edge resources, expert faculty, and a collaborative learning environment. The program was designed to facilitate hands-on learning, encouraging us to apply theoretical knowledge to practical scenarios. This opportunity not only expanded our technical competencies but also fostered a spirit of innovation and problem-solving.

Program Planning

The internship program was thoughtfully planned to ensure a comprehensive learning experience.

The structure included:

Week 1-2: Introduction to IoT and embedded Systems: Fundamental concepts, tools, and technologies.

Week 3: Hands-on projects: Small -scale projects to apply learned concepts.

Week 4-5: Major Project Development: Focused on the Temperature and Humidity Monitoring system , including design, implementation, and testing phases.

Week 6: Presentation and Evaluation: Demonstrating the final project, receiving feedback, and reflecting on the learning journey.

The six-week internship at UniCoverge Technologies (UCT) on IoT and embedded systems was an enlightening experience that significantly contributed to my career development. The hands-on projects, including the Temperature and Humidity Monitoring System, provided practical insights and honed my technical skills. The opportunity provided by UCT was instrumental in my professional growth, offering a perfect blend of theoretical knowledge and practical application. This internship has not only prepared me for future career challenges but has also inspired a deeper interest in IoT and embedded systems.

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
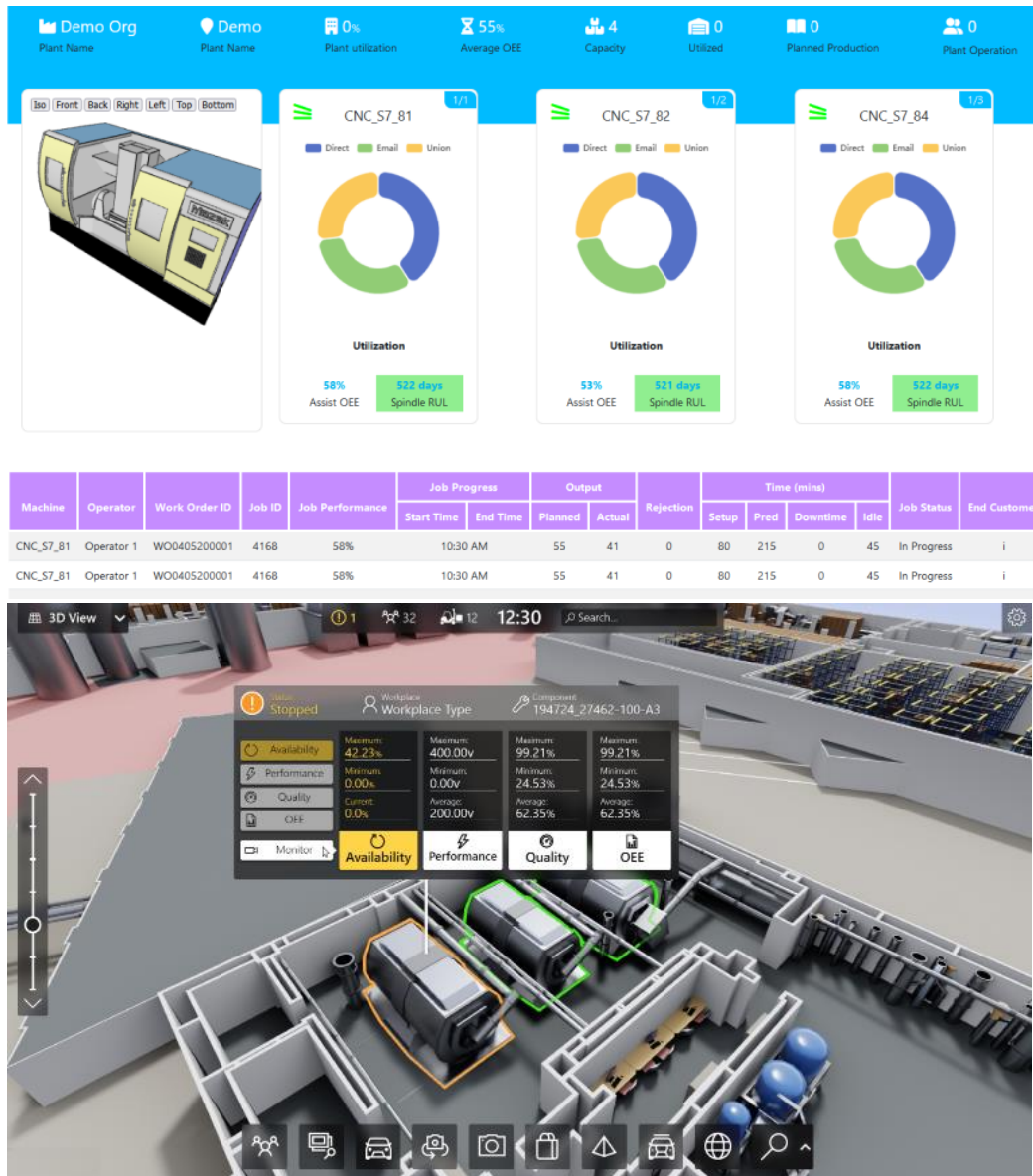- Integration with third party application(Power BI, SAP, ERP)
- Rule Engine
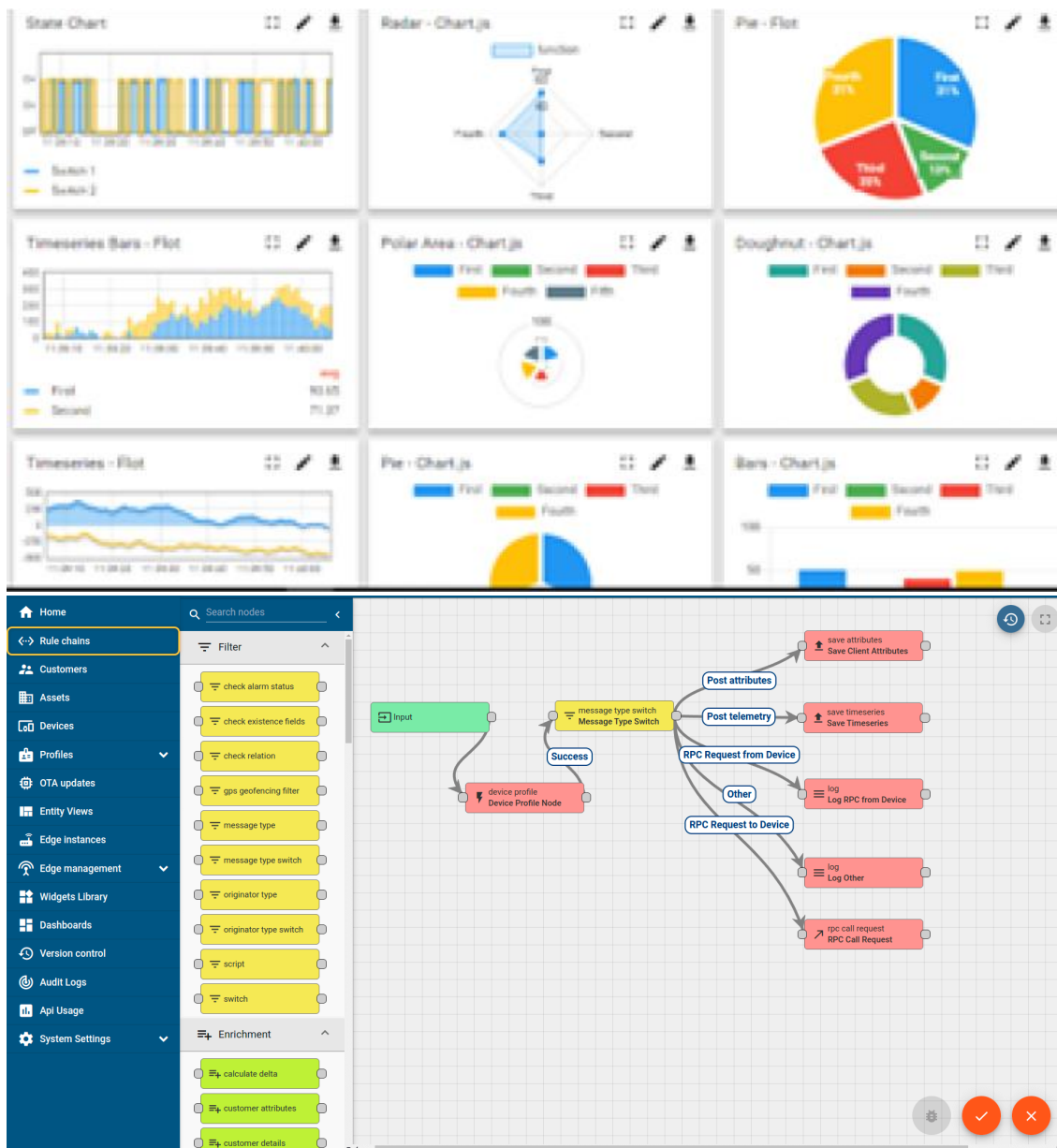
ii.   Smart Factory Platform (FACTORY WATCH)

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.
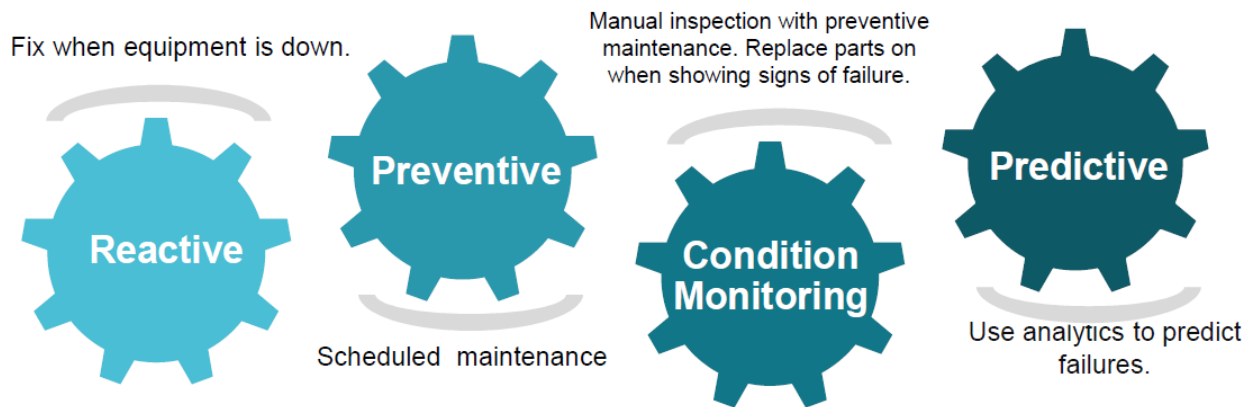
2.2 About upskill Campus (USC)

upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.
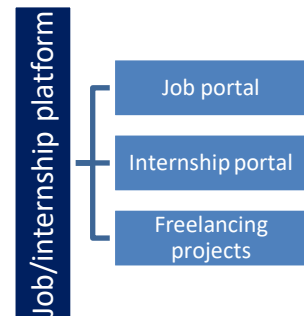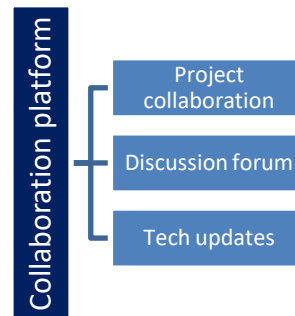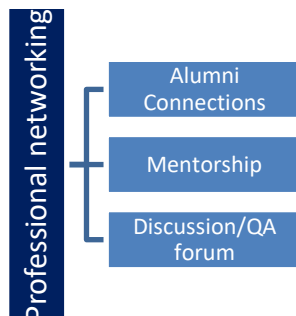
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.
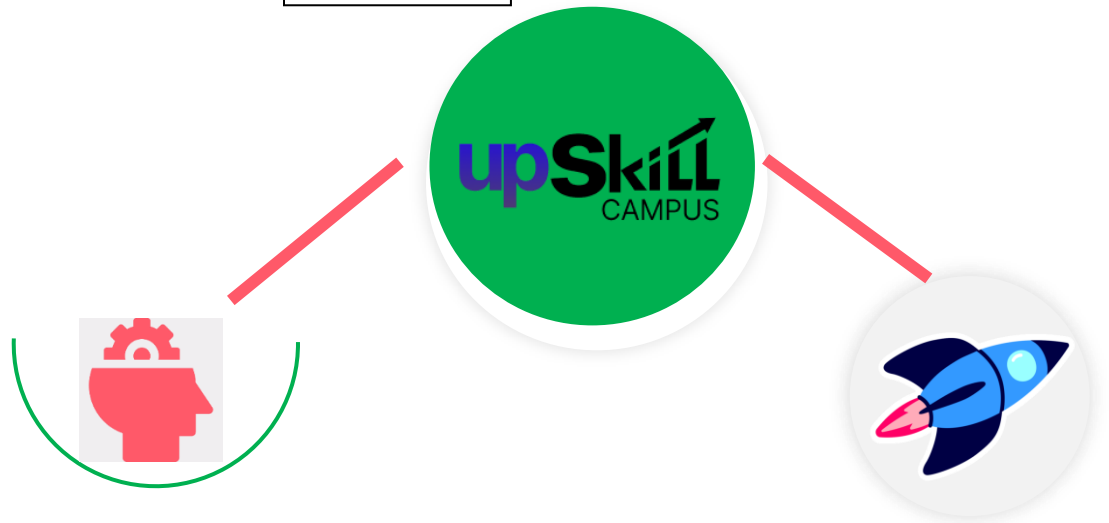
Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

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

https://www.upskillcampus.com/

Career growth/upskilling
- Interview Preparation and skill building
- upskilling Courses
- Skill Assessment
- Profile building

Professional networking
- Alumni Connections
- Mentorship
- Discussion/QA forum

Collaboration platform
- Project collaboration
- Discussion forum
- Tech updates

Job/internship platform
- Job portal
- Internship portal
- Freelancing projects

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
Temperature and Humidity Monitoring System.	THMS
Tinkercad	N/A
Test Procedure	N/A
Light-Emitting Diode	LED

3 Problem Statement

Design and develop a temperature and humidity monitoring system that can:

1. Accurately measure and record temperature and humidity levels in real-time.

2. Provide alerts and notifications when thresholds are exceeded.

3. Display data in a user-friendly format for easy analysis and decision-making.

4. Integrate with existing infrastructure and systems.

5. Ensure data security and integrity.

Goals:

1. Improve environmental monitoring and control.

2. Enhance data-driven decision-making.

3. Optimize energy efficiency and cost savings.

4. Ensure compliance with regulatory requirements.

5. Develop a scalable and flexible solution for various applications.

Deliverables:

1.A functional temperature and humidity monitoring system.

2. A user-friendly interface for data visualization and analysis.

3. A report detailing the system's design, development, and testing.

4. A presentation summarizing the project's goals, challenges, and outcomes.

4 Existing & Proposed Solution

Existing Solution

- Verkada: provides cloud-based temperature and humidity monitoring with real-time alerts.

- Airsset: offers a temperature and humidity monitoring system with online dashboard and real-time alerts.

- ControlByWeb: provides various devices for monitoring temperature and humidity, such as the X-410 and FridgeAlert.

- Remote Temperature and Humidity Monitoring: offers a comprehensive monitoring system with sensors, data loggers, and software.

Proposed Solution

The proposed Temperature and Humidity Monitoring System aims to address the limitations of existing solutions by offering an affordable, flexible, and user-friendly platform using Tincard and XY YouTube. Key features of the proposed solution include:

1. Improved Product Quality: Monitoring temperature and humidity ensures optimal conditions for products that require specific storage conditions, such as food, pharmaceuticals, and artwork.

2. Reduced Spoilage: Real-time monitoring helps prevent spoilage and waste by alerting you to deviations from optimal storage conditions.

3. Energy Efficiency: Optimizing temperature and humidity levels reduces energy consumption and saves costs.

4. Enhanced Safety: Monitoring systems detect potential safety hazards, such as high temperatures that could lead to fires or explosions.

5. Compliance: Many industries require temperature and humidity monitoring to meet regulatory standards, making it easier to comply with regulations.

6. Increased Customer Satisfaction: By ensuring products are stored and delivered in optimal conditions, you can improve customer satisfaction and loyalty.

7. Reduced Downtime: Monitoring systems help prevent equipment failure by detecting temperature and humidity fluctuations that could lead to damage.

8. Improved Supply Chain Management: Real-time monitoring enables more efficient supply chain management by tracking conditions during transportation and storage.

4.1 Code submission (Github link) :

https://github.com/Bhavani488/Durga-Bhavani-UpSkillCampus_Edunet_IOT_Temperature-Humidity-monitoring_Systems/blob/main/code.c

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

https://github.com/Bhavani488/Durga-Bhavani-UpSkillCampus_Edunet_IOT_Temperature-Humidity-monitoring_Systems

5 Proposed Design/ Model
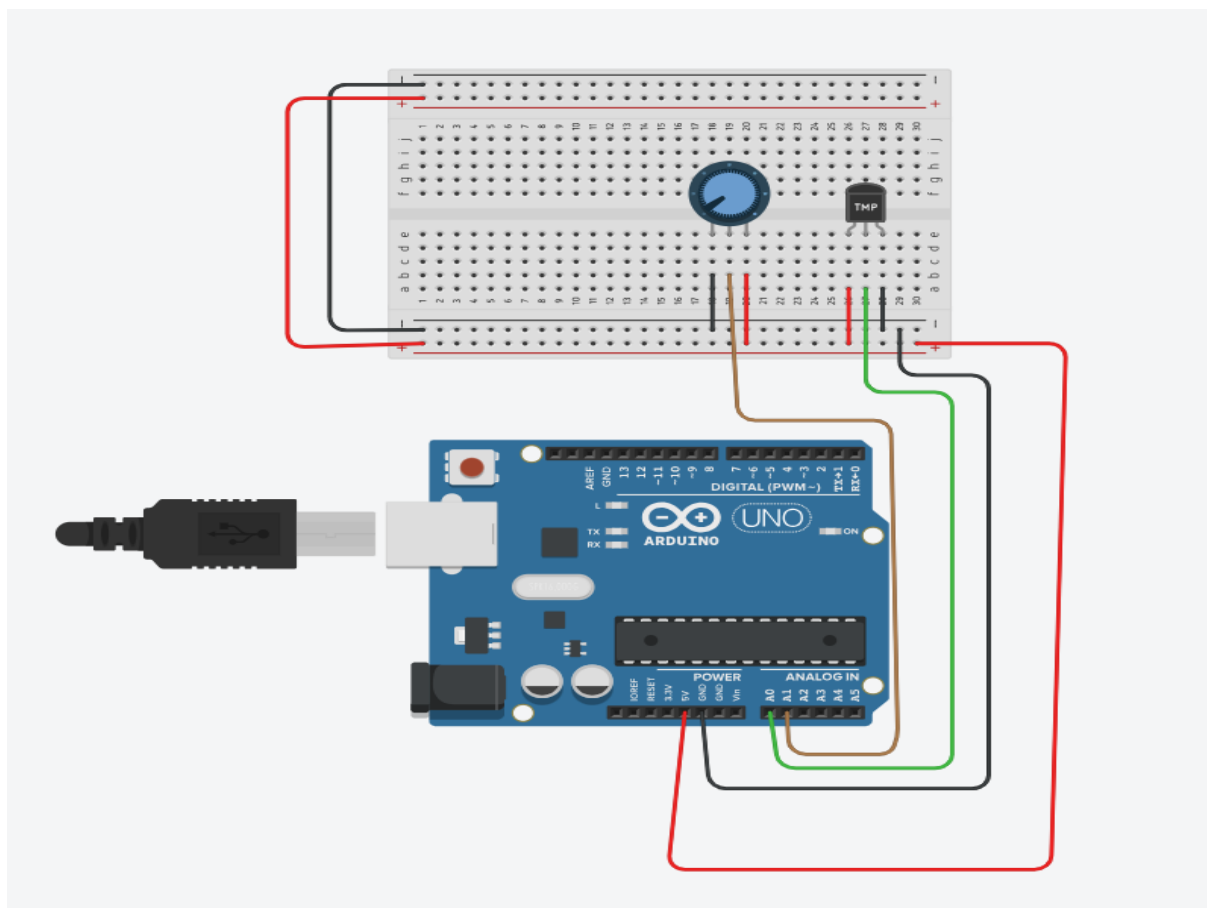
6 Performance Test

The Temperature and Humidity Monitoring System developed using Tinkercad is designed with scalability and integration in mind, making it suitable for various applications are compatible with a wide range of existing technologies and appliances. This adaptability ensures that it can meet the diverse needs of real-world consumers and industries. By leveraging cost-effective components and innovative design, the system provides a budget-friendly alternative to existing market solutions, making advanced temperature management accessible to a broader audience. The energy-efficient features of the system not only help in reducing downtime and maintenance costs but also align with the growing emphasis on environmental sustainability.

1. Accuracy Test: Compare the system's readings with calibrated reference instruments to ensure accuracy within specified tolerances.

2. Resolution Test: Verify that the system can detect small changes in temperature and humidity within its specified resolution.

3. Stability Test: Monitor the system's readings over time to ensure stability and minimal drift.

4. Linearity Test: Check the system's response to changes in temperature and humidity to ensure a linear relationship.

5. Response Time Test: Measure the system's response time to changes in temperature and humidity.

6.1 Test Plan/ Test Cases:

- Test Objectives:

  - Verify that the software application performs correctly under various user inputs and conditions.

  - Ensure that the system meets all specified requirements and functionalities.

- Scope:

  - The test scope includes all features and functionalities of the software application.

  - The test scope excludes external dependencies and third-party integrations.

- Test Data:

  - Test data will include a set of pre-defined inputs and expected outputs.

  - Test data will be provided by the product owner.

6.2 Test Procedure:

A test procedure is a detailed, step-by-step document outlining the testing process for a specific test case or scenario. It ensures consistency and accuracy in testing.

1. Test Case ID: Unique identifier for the test case.

2. Test Case Description: Brief summary of the test case.

3. Preconditions: Conditions that must be met before executing the test case.

4. Test Steps: Detailed, numbered steps to execute the test case.

5.Test Data: Specific data required for the test case.

6.3 Performance Outcome:

"Performance outcome" refers to the results or achievements resulting from a specific action, effort, or process.

- Business: Refers to the measurable results of business activities, such as revenue growth, profitability, market share, or customer satisfaction.

- Education: Represents students' achievements, such as grades, test scores, or other assessments.

- Project Management: Relates to the outcomes of a project, such as meeting deadlines, staying within budget, and achieving the project's objectives.

7 My learnings

My learning journey has been focused on developing a deep understanding of embedded systems and the Internet of Things (IoT). Through coursework, hands-on projects, and self-study, I have gained a comprehensive skill set that spans both theoretical knowledge and practical application. This journey has significantly contributed to my career growth by equipping me with the expertise needed to excel in the rapidly evolving field of technology.

Alignment with Career Goals:

My learning journey aligns with my career goal of becoming a leading expert in embedded systems and IoT. The skills and experiences I have acquired provide a solid foundation for pursuing advanced roles and responsibilities in this field.

Opportunities for Growth:

- Continuous learning through advanced coursework and certification in embedded systems and IoT.

- Participation in industry conferences, workshops, and hackathons to stay updated with the latest trends and technologies.

- Pursuing leadership roles in projects to further develop management and strategic planning skills.

Overall, my learning experience has been immensely beneficial, providing me with the technical expertise, practical experience, and professional skills needed to thrive in the field of embedded systems and IoT. This journey has not only advanced my career but also positioned me for future opportunities and growth in the technology industry.

8 Future work scope

You can put some ideas that you could not work due to time limitation but can be taken in future.

Detailed Case Studies:

Healthcare: Explore how embedded systems and IoT are used in remote patient monitoring, wearable health devices, and smart medical equipment. Discuss case studies like IoT-enabled insulin pumps and remote ECG monitoring.

Agriculture: Examine precision farming techniques that utilize IoT sensors for soil moisture, weather conditions, and crop health. Highlight examples like smart irrigation systems and automated tractors.

Smart Cities: Look into the implementation of smart traffic management, waste management, and energy-efficient buildings. Discuss case studies like smart street lighting and IoT-based air quality monitoring

Development Tools and Platforms:

Development Boards: Review popular development boards like Raspberry Pi, Arduino, and BeagleBone for IoT projects.

Software Platforms: Compare software platforms and ecosystems such as Arduino IDE, PlatformIO, and Node-RED for developing and managing IoT projects.

Integrated Development Environments (IDEs): Discuss the features and benefits of various IDEs used in embedded systems development.

Future Trends and Innovations:

5G and IoT: Discuss how 5G technology will revolutionize IoT applications with higher speeds and lower latency.

AI and IoT: Explore the integration of artificial intelligence in IoT devices for smarter decision-making.