Embedded and IoT

"Automatic Door Control System"

Prepared by

[Sapna]

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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Preface

The 6-week training program on **Embedded Systems and the Internet of Things (IoT)** provided hands-on exposure and theoretical foundations to help participants build real-world embedded and IoT applications. The program was structured to build competencies from basic electronics to advanced IoT implementations.

In today's rapidly evolving technological landscape, **Embedded Systems** and the **Internet of Things (IoT)** are at the forefront of innovation across industries such as automation, healthcare, agriculture, smart cities, and consumer electronics. An internship in this field plays a crucial role in bridging the gap between academic knowledge and practical industry requirements.

An **Automatic Door Control System** is a smart mechanism designed to open and close a door automatically without manual effort. It typically uses sensors to detect the presence of a person or object near the door and controls a motor to operate the door accordingly.

During the 6-week internship, I acquired both theoretical knowledge and practical experience in the field of **Embedded Systems and Internet of Things (IoT)**. The structured training helped me understand real-time applications and build industry-relevant skills.

Here, I thanks to all who helped me directly and indirectly.

Introduction

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 (

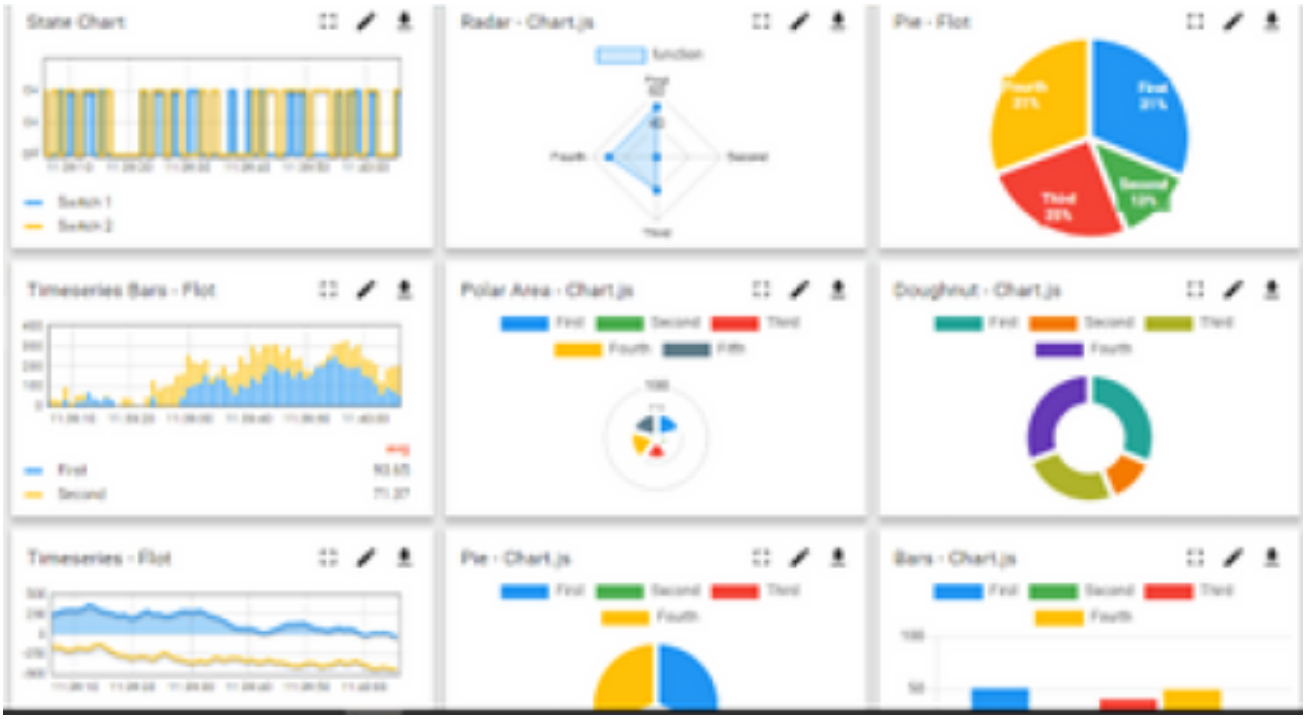
uct Insight

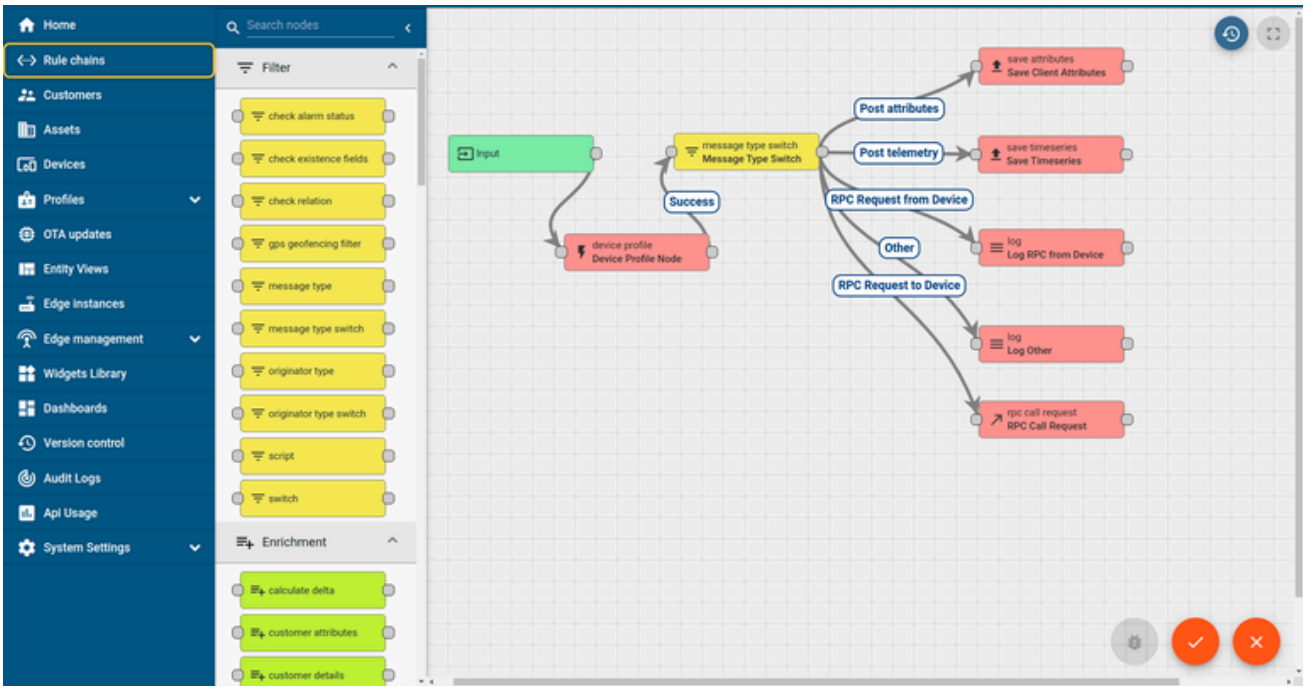
i.)

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





i. **Smart Factory Platform (**

FACTORY WATCH

i.)

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	Prod	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

i.

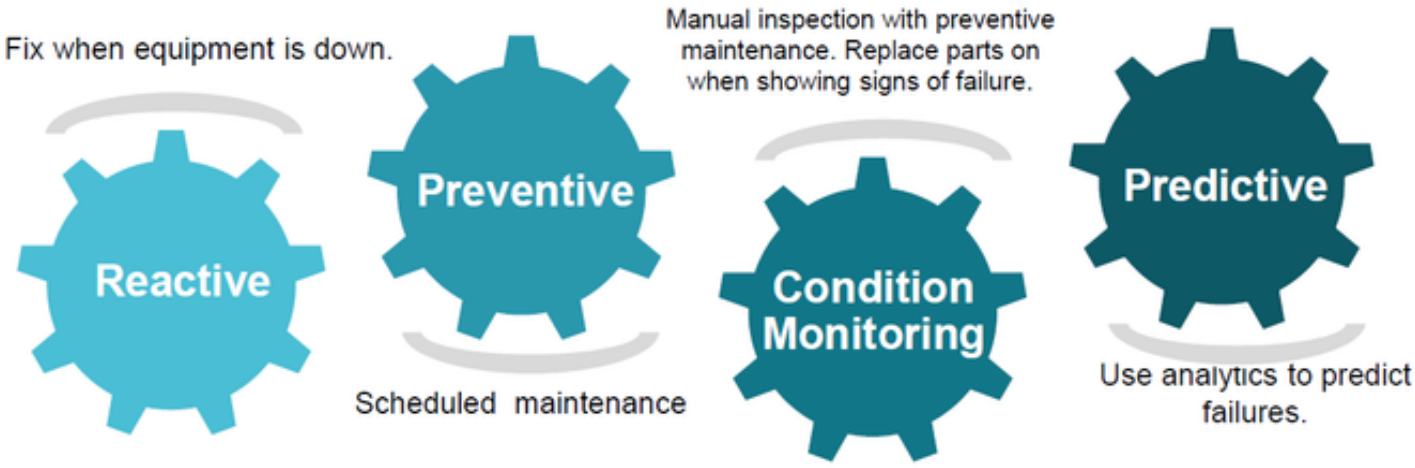
LoRaWAN™

i. 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.

i. 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.



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.

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.

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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.

Problem Statement

In the assigned problem statement

(Automatic Home Control System)

Existing and Proposed solution

An **Automatic Door Control System** is a smart mechanism designed to open and close a door automatically without manual effort. It typically uses sensors to detect the presence of a person or object near the door and controls a motor to operate the door accordingly.

Key Components:

- **Sensor (IR, Ultrasonic, or PIR):** Detects human presence or movement.
- **Microcontroller (e.g., Arduino, 8051, ESP32):** Acts as the brain of the system, processing sensor data and controlling the door mechanism.
- **Motor Driver (e.g., L298N):** Controls the direction and speed of the motor.
- **DC Motor/Servo Motor:** Physically opens and closes the door.
- **Power Supply:** Provides energy to the circuit.

Working Principle:

1. When a person approaches the door, the sensor detects motion.
2. The microcontroller receives this input and sends a signal to the motor driver.
3. The motor driver activates the motor, opening the door.
4. After a preset delay or when the person moves away, the door closes automatically.

Applications:

- Office buildings
- Hospitals
- Shopping malls
- Smart homes
- Secure or hygiene-sensitive environments

Advantages:

- Touchless entry enhances hygiene and convenience.
- Energy-efficient in temperature-controlled environments.
- Improves accessibility and security.

Code submission (Github link)

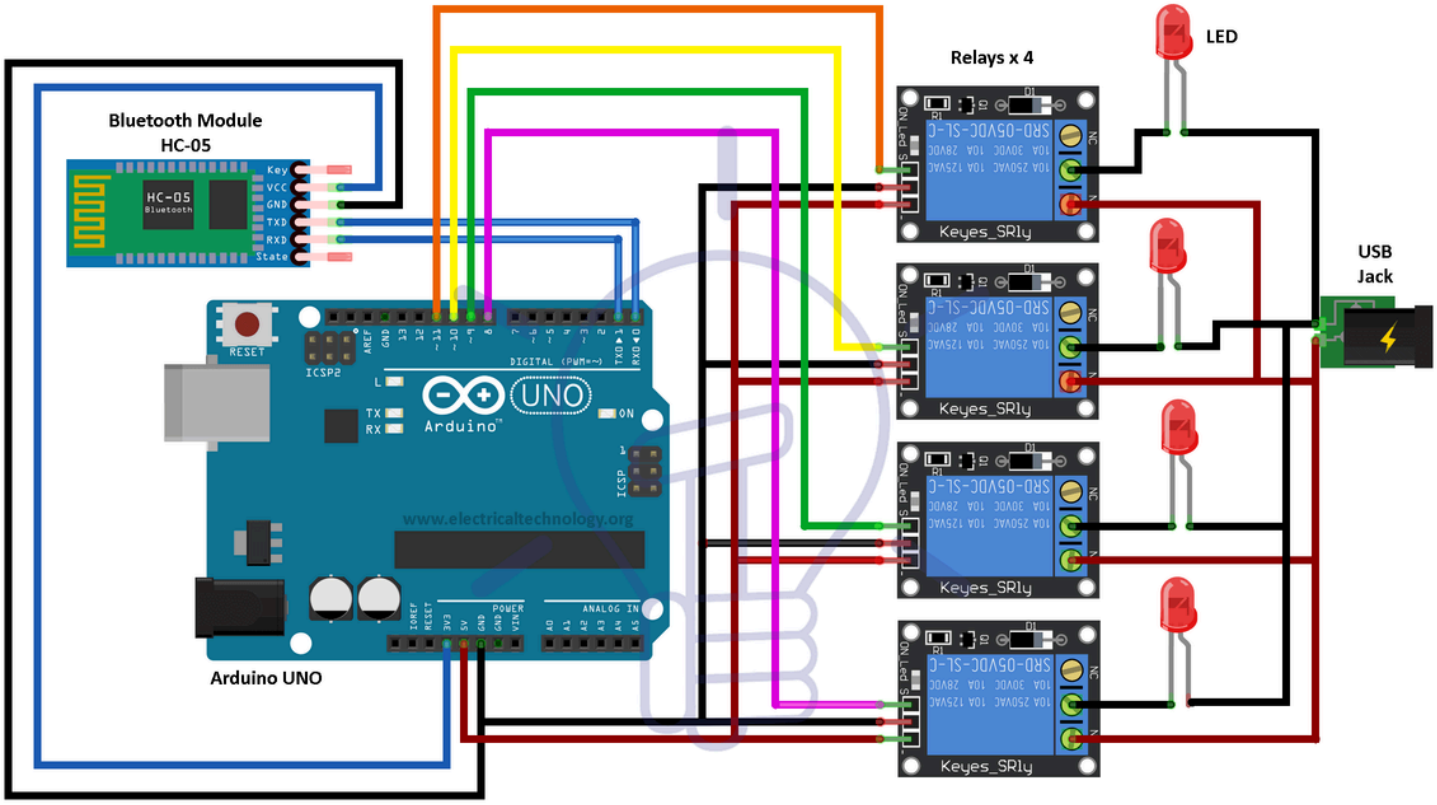
sapnadhillon/
test_code

1 Contributor | 0 Issues | 0 Stars | 0 Forks

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

[Your College Logo]

Proposed Design/ Model



Smart Home Automation System Project

High Level Diagram

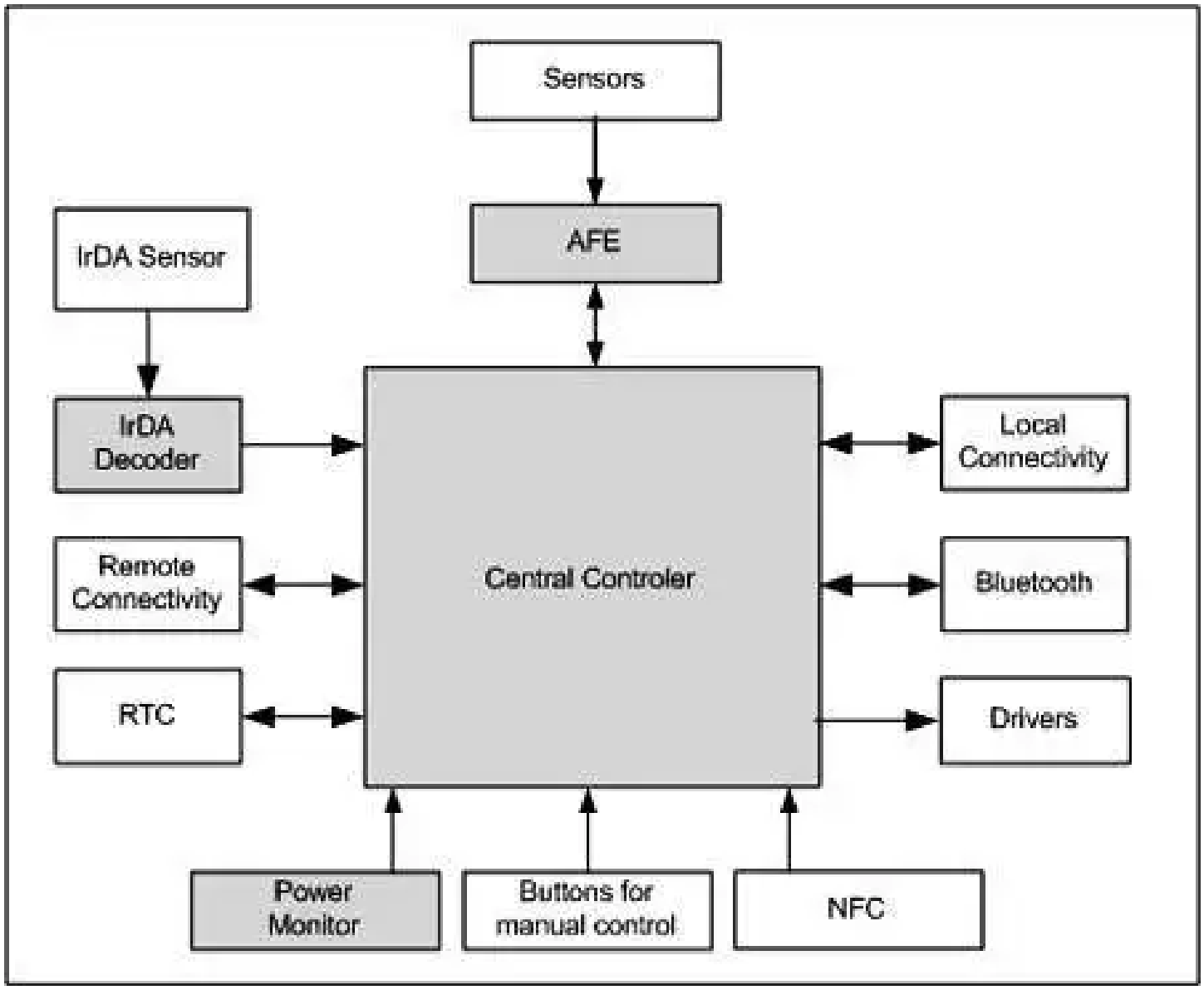
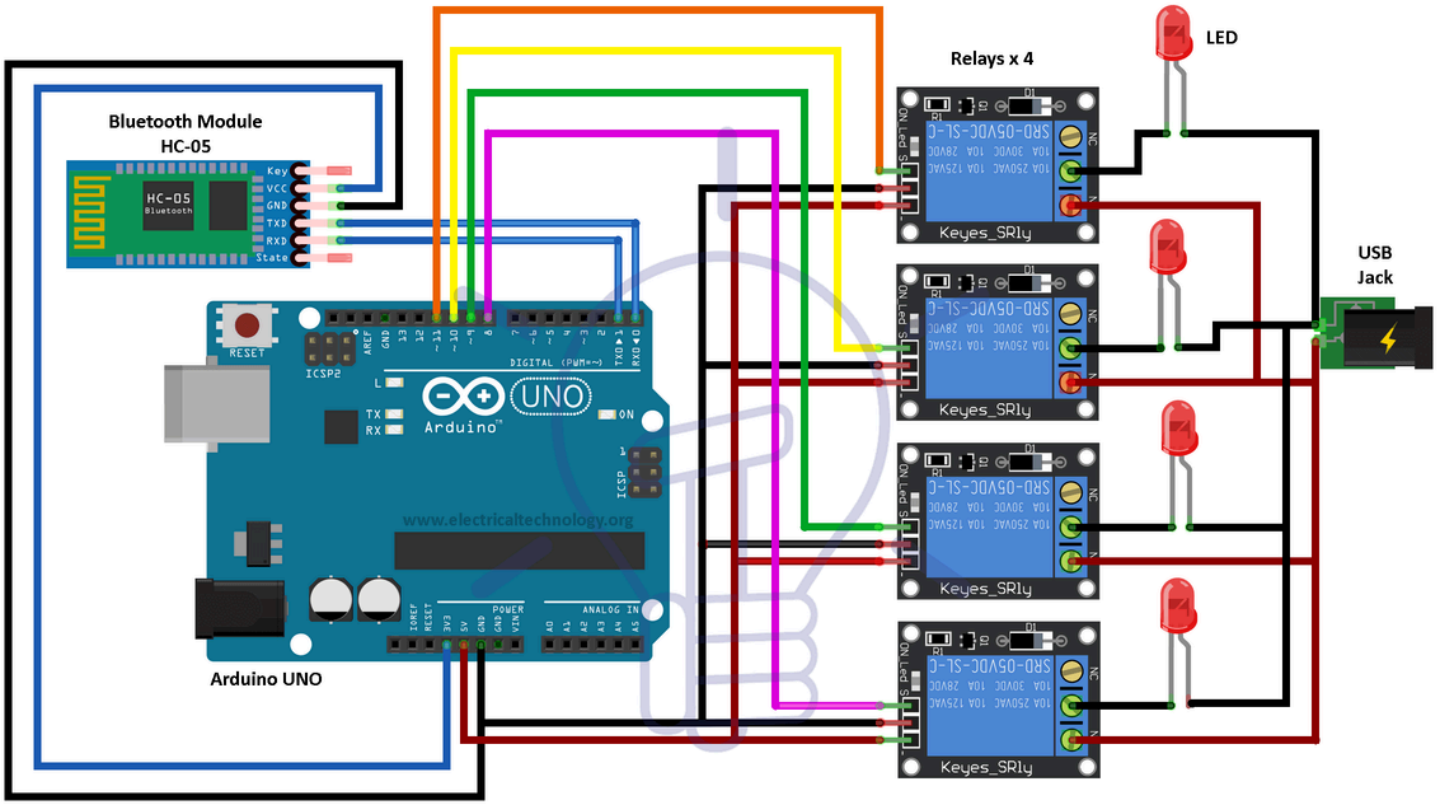


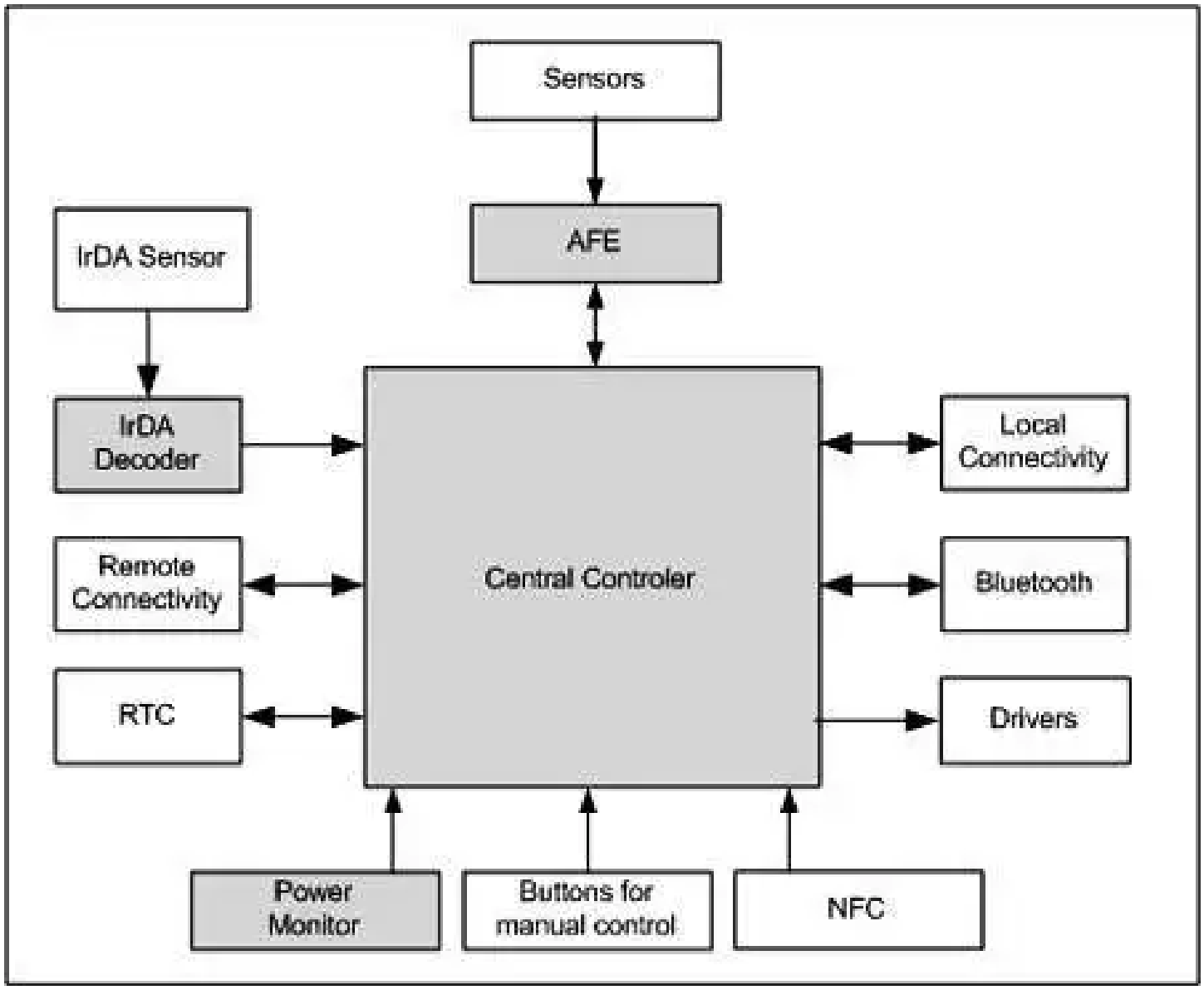
Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

Low Level Diagram



Smart Home Automation System Project

Interfaces


Sensors
AFE
IrDA Sensor
IrDA Decoder
Remote Connectivity
RTC
Central Controler
Local Connectivity
Bluetooth
Drivers
Power Monitor
Buttons for manual control
NFC

Performance Test

🚀 Why Automation is Important for Industries

Automation plays a critical role in modern industrial operations. Here's a clear breakdown of its **importance** across different dimensions:

✅ 1. Increased Efficiency and Productivity

- **24/7 Operation**: Automated machines can work continuously without fatigue.
- **Faster Production**: Speeds up manufacturing processes compared to manual labor.
- **Consistency**: Maintains uniform output without human error or variability.

💰 2. Cost Reduction

- **Lower Labor Costs**: Fewer human operators required for repetitive tasks.
- **Reduced Waste**: Precision in automated processes reduces material wastage.
- **Optimized Resource Use**: Automation helps use energy and materials more efficiently.

🔒 3. Improved Safety

- **Hazardous Tasks**: Robots or control systems handle dangerous jobs (e.g., welding, chemical handling).
- **Reduced Workplace Accidents**: Minimizes risks to human workers in high-risk environments.

📊 4. Better Quality Control

- **Real-Time Monitoring**: Sensors and control systems detect defects instantly.
- **Tight Tolerances**: Automated machines can operate with high precision and accuracy.
- **Data Logging**: Automated systems keep records for quality audits and continuous improvement.

🌍 5. Scalability and Flexibility

- **Easier Expansion**: Automated systems can scale up with demand by adding modules.
- **Programmable Systems**: Quick changes in production lines for new products or designs.

📡 6. Data-Driven Decisions (Smart Industry/Industry 4.0)

- **IoT Integration**: Sensors collect real-time data from machines.
- **Predictive Maintenance**: AI and analytics can predict failures before they occur.
- **Remote Monitoring**: Managers can monitor and control operations from anywhere.

🔄 7. Competitive Advantage

- **Faster Time-to-Market**: Automation enables quicker response to market demand.
- **Innovation Friendly**: Supports high-tech processes like 3D printing, robotic assembly, etc.
- **Global Competitiveness**: Necessary for staying competitive in international markets.

🏁 Conclusion:

Industrial automation is not just about reducing labor—it's about **enhancing performance, quality, and competitiveness**. In an era of smart manufacturing and Industry 4.0, automation is essential for

industrial growth, innovation, and sustainability.

My learnings

1. Core Technical Learning:

- **Embedded Systems Basics**: Understanding microcontrollers (e.g., Arduino, ESP32), digital electronics, and embedded C programming.
- **Sensor & Actuator Integration**: Hands-on experience interfacing sensors (temperature, motion, etc.) and actuators (motors, LEDs).
- **IoT Fundamentals**: Learning how devices connect and communicate over the Internet using protocols like MQTT, HTTP, and Wi-Fi.
- **Real-time Data Handling**: Acquiring skills in collecting, processing, and transmitting sensor data to cloud platforms (e.g., ThingSpeak, Blynk).
- **Project Development**: Implementing small-scale IoT projects like smart home automation, environmental monitoring, or security systems.

2. Software & Tools:

- Development environments like Arduino IDE, PlatformIO.
- Embedded C/C++ and Python for IoT scripting.
- Exposure to cloud services and mobile app integration for real-time control and monitoring.

3. Soft Skills & Industry Exposure:

- Working in collaborative teams.
- Documentation and debugging practices.
- Exposure to industry standards, timelines, and problem-solving approaches.

How It Helps in Career Growth

- **Stronger Resume**: Practical experience makes you stand out to recruiters in core electronics, IoT startups, and embedded software companies.
- **Career Paths**: Opens doors to roles such as Embedded Developer, IoT Engineer, Firmware Developer, or R&D Intern.
- **Competitive Advantage**: Early hands-on exposure gives a strong edge in interviews, project presentations, and future internships or placements.
- **Innovation & Entrepreneurship**: Equips you with the skills to design real-world solutions, ideal for hackathons, research projects, or startups.

Future work scope

🌐 1. Smart Agriculture System (with AI integration)

Why not feasible now: Needs multiple sensor nodes, weatherproofing, and AI model training for crop prediction.

Future potential:

- Soil moisture, temperature, and humidity sensors.
- Automated irrigation using ML-based decision-making.
- Data logging and analytics on the cloud.

🏥 2. Remote Health Monitoring System

Why not feasible now: Involves biomedical sensors, data privacy concerns, and rigorous testing.

Future potential:

- Heart rate, SpO2, ECG, temperature sensors.
- Real-time alerts via cloud or mobile app.
- Integration with telemedicine platforms.

🚗 3. IoT-based Smart Traffic Management System

Why not feasible now: Requires wide-scale deployment or simulation, and real-time vehicle detection systems.

Future potential:

- Vehicle counting using IR/camera.
- Adaptive traffic signals based on density.
- Centralized dashboard with analytics.

🔐 4. AI-powered Smart Door Lock System

Why not feasible now: Requires biometric authentication, servo control, and mobile-app integration.

Future potential:

- Face recognition or fingerprint sensor.
- Remote unlocking via app or RFID/NFC.
- Live monitoring using camera module.

⚡ 5. Smart Energy Meter with Load Control

Why not feasible now: Needs precision sensors, secure data transmission, and utility-level integration.

Future potential:

- Real-time energy consumption tracking.
- Remote load control and billing updates.
- Integration with solar/wind inputs.

🌍 6. Environmental Monitoring Drone (IoT + Robotics)

Why not feasible now: Requires drone design, flight control, and wireless data transmission.

Future potential:

- Air quality, CO_2, PM2.5 monitoring from altitude.
- Data upload to cloud dashboards.
- Real-time location tracking via GPS.