Project Proposal (IOT)

Title: Smart Greenhouse Irrigation and Control System

Submitted by:

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Submitted to:

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Department: Computing and Information System, DIU

Submission date 9th July, 2025

1. EXECUTIVE SUMMARY

Project Overview:
This project aims to design and implement a Smart Greenhouse Irrigation and Environmental Control System using the Arduino Uno R3. The system leverages IoT sensors and actuators to automate key agricultural parameters such as soil moisture, temperature, humidity, light, air quality, and water levels.

Key Benefits:
- Ensures optimal plant growth conditions.
- Conserves water and energy via automated control.
- Reduces the need for manual intervention.
- Offers low-cost smart agriculture for small and medium-scale farmers.

Project Scope:
- Focused on small-scale greenhouse automation.
- Limited to controlling irrigation, misting, lighting, ventilation, and water refilling.
- Real-time decision-making based on sensor readings (no cloud or mobile interface in this version).

2. PROJECT BACKGROUND AND PROBLEM STATEMENT

Context:
Bangladesh is an agricultural country, but traditional farming techniques often lead to excessive water usage, poor crop health, and low yields. Climate change also causes irregular temperature and humidity levels, making crop management difficult.

Problem Identification:
Farmers face challenges such as:
- Over or under-irrigation.
- Lack of real-time monitoring of environmental factors.
- Manual labor dependency.
- Poor air quality affecting plant health.

Target Audience:
- Small-scale farmers
- Agricultural researchers
- Agri-tech startups
- Students and educational institutions in agricultural technology

3. PROJECT GOALS AND OBJECTIVES

Goals:

To develop an affordable and intelligent system that automates greenhouse irrigation and environmental control, improving crop yield and reducing water usage.

Objectives (SMART):

- Sense soil moisture, air temperature, humidity, light, air quality, and water levels every 2 seconds.
- Maintain soil moisture between 40–80%.
- Automatically activate/deactivate pump, mist, fan, and grow light based on sensor input.
- Reduce water usage by at least 30% compared to traditional irrigation.
- Complete prototype within 6 weeks.

4. PROPOSED SOLUTION

Solution Overview:
An Arduino Uno-based system that reads data from five key sensors and activates five relays to control:
1. Soil Pump
2. Misting System
3. Grow Light
4. Air Fan
5. Reservoir Refill Pump

Technical Approach:
- Arduino Uno R3 as the controller.
- Sensors: DHT22, BH1750, MQ135, Soil Moisture Sensor, Water Level Sensor.
- Actuators: Relay modules connected to water pump, mist maker, fan, grow light.
- Logic coded in C++ using Arduino IDE.
- Local serial monitoring via USB.

Innovation:
- Combines five environmental factors in a single low-cost microcontroller.
- Uses real-time sensor-triggered relay control without cloud dependency.
- Highly modular – scalable for future IoT expansion (e.g., NodeMCU, mobile app, etc.)

5. PROJECT METHODOLOGY

Development Process:
1. Requirements Gathering
2. Circuit Design & Wiring
3. Arduino Code Development
4. Testing with real-time simulation
5. Calibration and Validation
6. Final Prototype Deployment

Timeline:
Week 1 – Research and component gathering
Week 2 – Circuit wiring and breadboard setup
Week 3 – Sensor interfacing and coding
Week 4 – Relay and actuator integration
Week 5 – Testing and optimization
Week 6 – Report, documentation, and demo

Risk Assessment:

Risk	Mitigation
Sensor failure	Keep spare sensors
Incorrect readings due to noise	Use averaging/filtering in code
Power surge damaging components	Use diode and proper voltage regulators
Water leakage damaging circuits	Isolate electronics with waterproofing

6. RESOURCES AND BUDGET

Required Resources:
- Arduino Uno R3: 1
- Soil Moisture Sensor: 1
- DHT22 Sensor: 1
- BH1750 Light Sensor: 1
- MQ-135 Gas Sensor: 1
- Water Level Sensor: 1
- Relay Module (1-ch x5): 5
- 6V Water Pump: 2
- Mist Maker / Fogger: 1
- LED Grow Lamp: 1
- DC Fan: 1
- Breadboard + wires
- Power Adapter (12V): 1

Budget Breakdown (in BDT):
- Sensors and Modules: 1800
- Arduino and Breadboard: 700
- Relays & Actuators: 2000
- Power Supply and Wires: 500
- Misc (Resistors, etc.): 200
- Total: 5200 BDT

Funding Sources:
- **Personal investment**

7. EVALUATION AND MONITORING

Evaluation Metrics (KPIs):

- Accuracy of automated responses (ON/OFF logic)
- Percentage of water saved
- Time of operation per actuator
- System uptime without failure

Monitoring Plan:

- Use Arduino Serial Monitor during development

8. TEAM AND ORGANIZATION

Team Members:

- **Md. Sami Alam – Lead Developer & System Designer**

  Responsible for overall system architecture, Arduino programming, and sensor integration.

- **Saidur Rahman Polash – Hardware Engineer**

  Handles circuit wiring, relay and actuator interfacing, and power management.

- **Md. Mashrur Kabir– Data Analyst & Tester**

  Monitors sensor data, evaluates system responses, and assists in calibration and debugging.

- **Tanzid Ahmed Preiom – Cloud Engineer**

  Designs and implements cloud connectivity using NodeMCU or ESP32, enabling remote monitoring, data logging, and dashboard integration via platforms like ThingSpeak or Blynk.

- **Ahmed Chowdhury – Documentation & Report Writer**

  Prepares project proposal, documentation, and final report submission.

- **Md. Fuad Hasan – Research and Component Manager**

  Manages component sourcing, datasheet collection, and supports research and risk assessment.

Organizational Structure:

- Self-managed technical execution

9. APPENDICES

Supporting Documents:
- Full Arduino code (included in source folder)

Here is the GitHub Link:

https://github.com/sami5671/IOT_Smart_GreenHouse_System