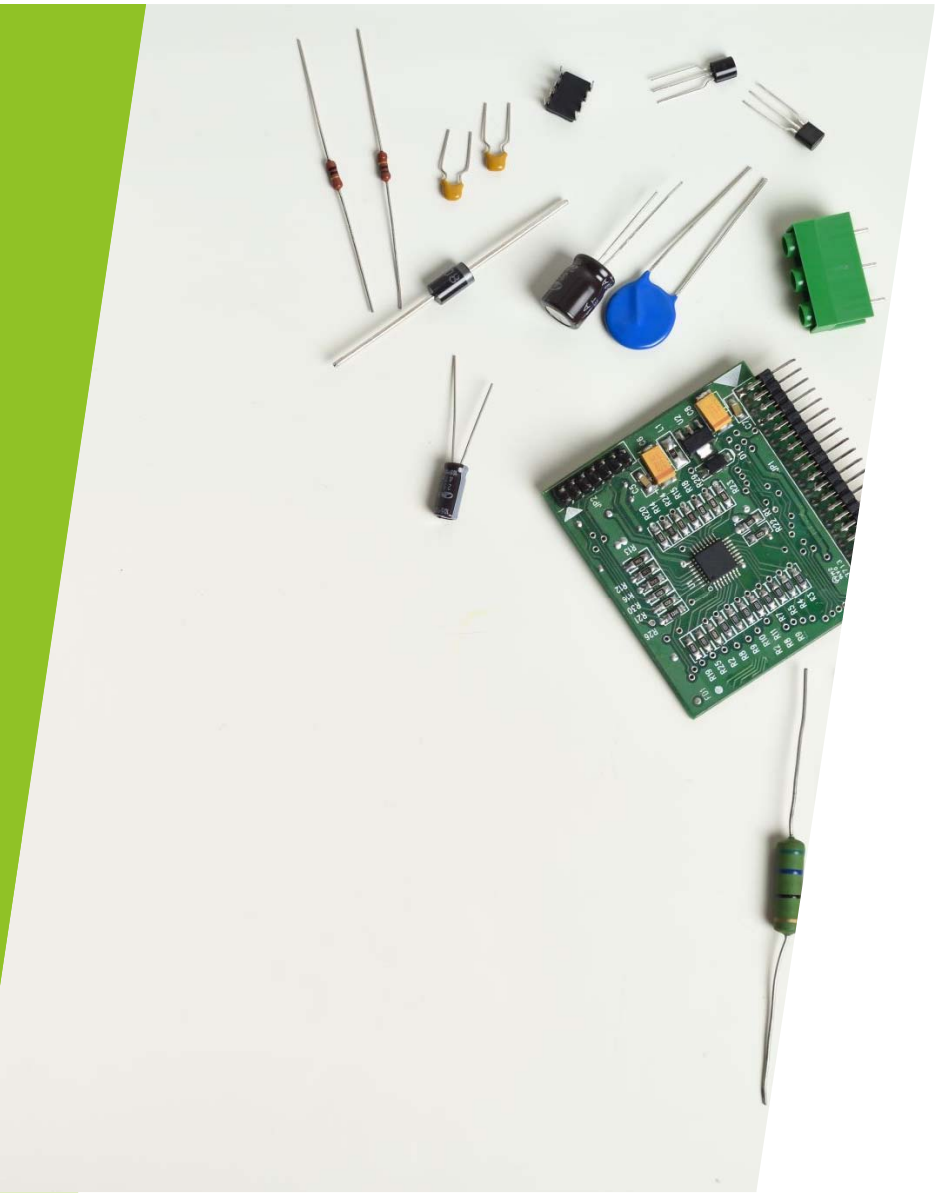


IOT Project

Team Greenhouse

Abhayram A. Nair

Aravind Narayanan

Arush Gupta

Rishin Chakraborty

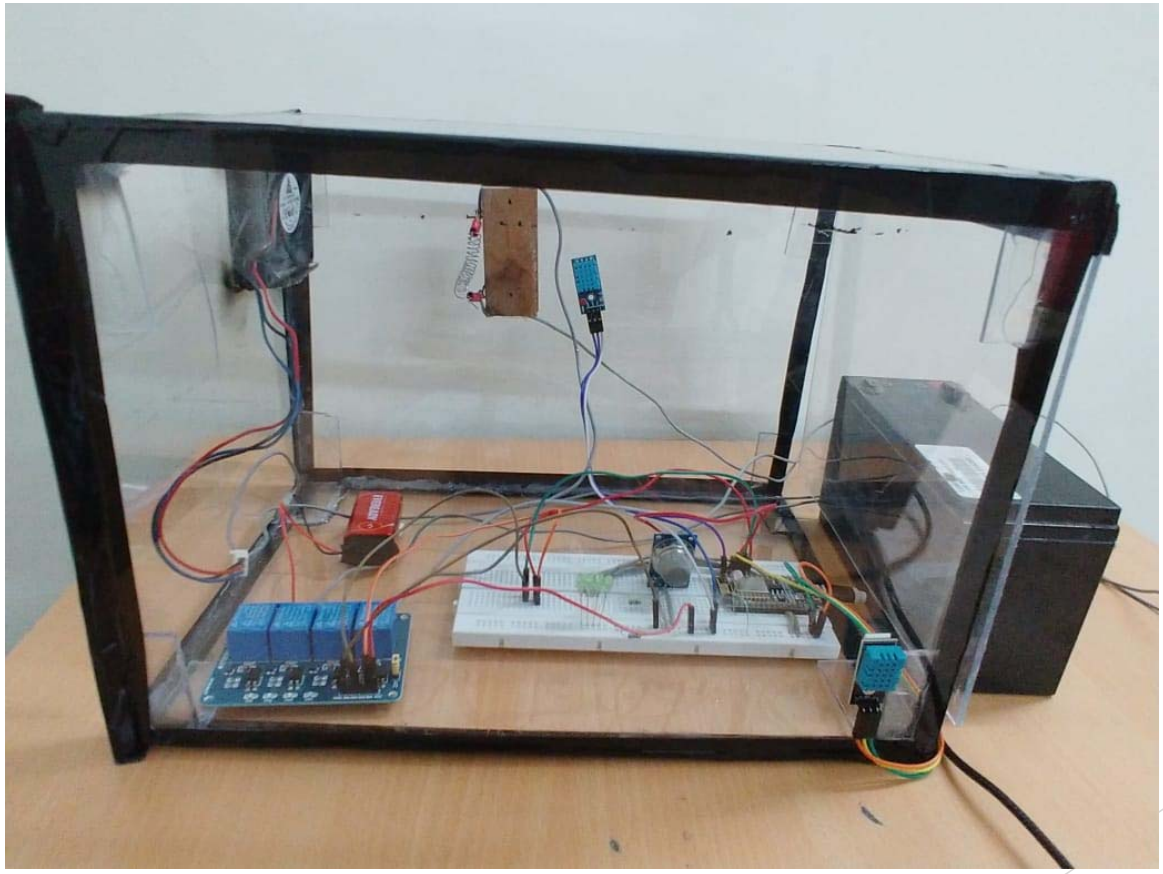
Need of this project

- There is a need in India to promote local production of goods. However, we are limited in the crops that can be grown due to various factors like climates, rainfall, etc.
- A solution to this problem is to grow crops in special enclosures where these factors can be controlled by us. However, a skilled onsite workforce is required to operate a greenhouse, which adds to the cost especially if there are multiple greenhouses at different sites.
- Our project provides a way to maintain greenhouses over large distances remotely. This does not completely eliminate the need of human work, but significantly reduces the work so that fewer workers are needed to operate a greenhouse.

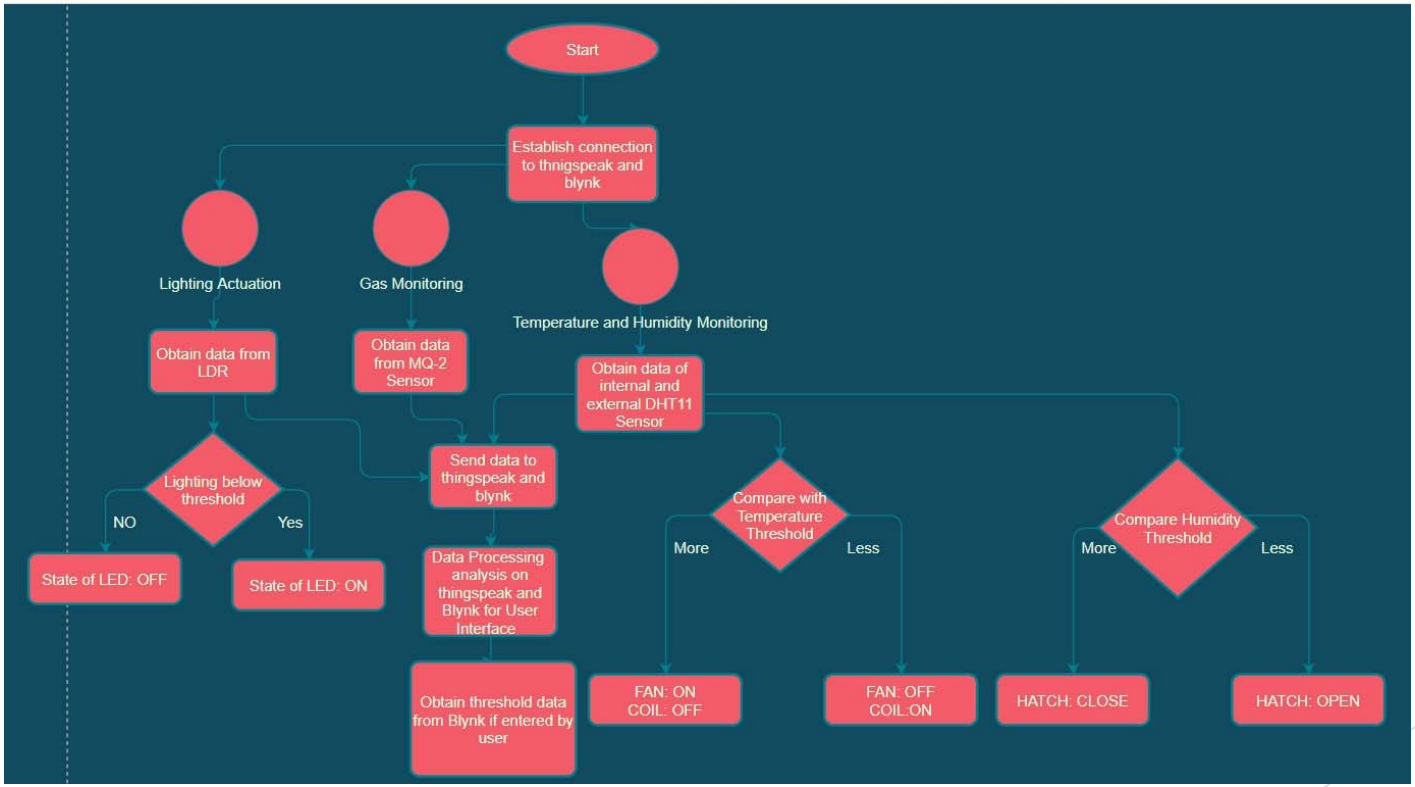
Overview

- The goal of the project is to create a remote monitoring and control system. The system will mainly find use in greenhouses, but can be adapted for other applications too.
- The system will support monitoring and control of values both on an internet browser and on a mobile application.
- The system will facilitate monitoring of temperature, humidity, light level and gases.
- The system will also facilitate limited temperature and light level control.

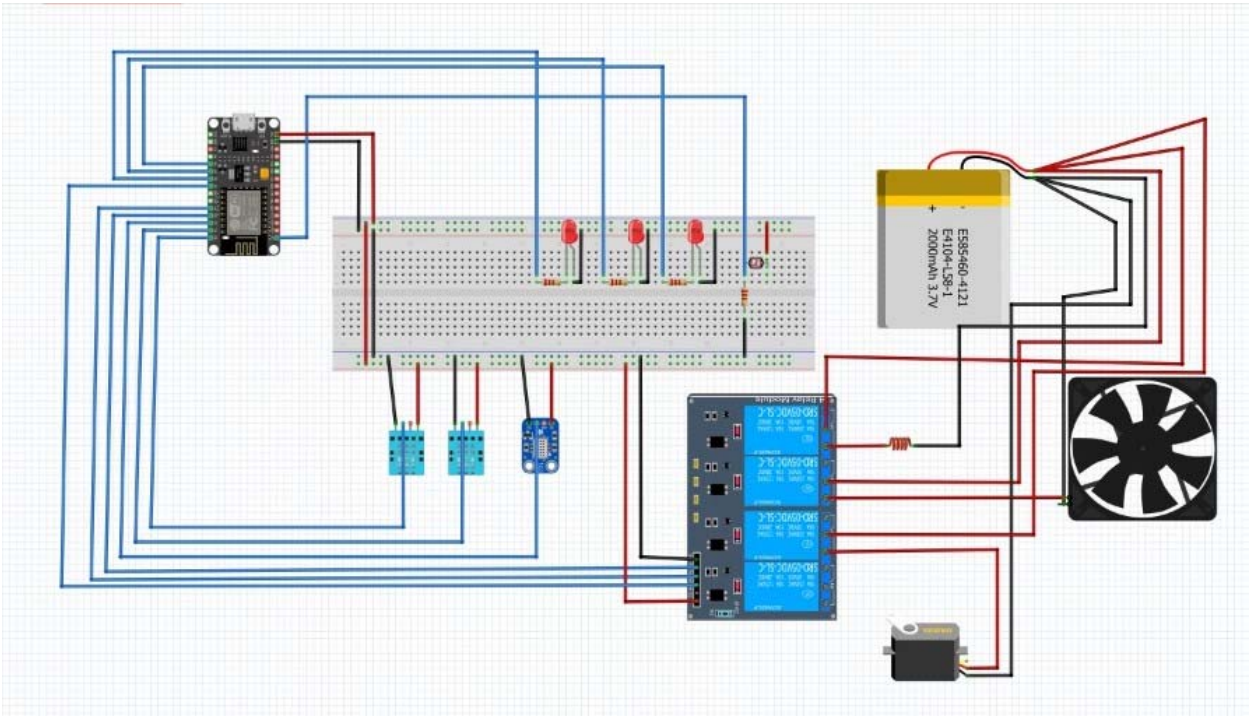
Model



Flowchart


Start
Establish connection to thnigspeak and blynk
Lighting Actuation
Gas Monitoring
Temperature and Humidity Monitoring
Obtain data from LDR
Obtain data from MQ-2 Sensor
Obtain data of internal and external DHT11 Sensor
Lighting below threshold
NO
Yes
State of LED: OFF
State of LED: ON
Send data to thingspeak and blynk
Data Processing analysis on thingspeak and Blynk for User Interface
Obtain threshold data from Blynk if entered by user
Compare with Temperature Threshold
More
Less
FAN: ON COIL: OFF
FAN: OFF COIL:ON
Compare Humidity Threshold
More
Less
HATCH: CLOSE
HATCH: OPEN

Circuit Diagram



Microcontroller used- Nodemcu

- We will use a single Nodemcu microcontroller to operate the greenhouse system. We mainly chose it because it connects to WiFi. It also supports all the features we wish to implement and we are familiar with it so we chose this microcontroller.
- The following components are connected to the microcontroller

1. D0 – DHT11 - Internal temperature and humidity sensor
2. D1 – DHT11 - External temperature and humidity sensor
3. D2 – MQ2 – Carbon monoxide gas sensor
4. D3 – Cooling fan – Temperature actuator
5. D4 – Heating coil – Temperature actuator
6. D5, D6, D7, D8 – LEDs – Light level actuator
7. A0 – LDR – Light level sensor

Sensors and Actuators

1. Temperature and Humidity
   - DHT11 sensor is used to measure internal and external temperature as well as humidity.
   - This temperature data is sent to the Thingspeak server and displayed on thingspeak as well as on the Blynk app.
   - A slider is provided to set ideal temperature value. The setup attempts to maintain that temperature through the use of actuators.
   - Actuators used are a nichrome wire for a heating coil and a fan for cooling.
   - We chose this sensor because we are familiar with its working and because it serves the dual role of measuring both temperature and humidity.
2. Gas
   - MQ-2 gas sensor is used to monitor amount of Carbon monoxide gas. CO inhibits photosynthesis so it is advantageous to measure this.
   - This is also a proof-of-concept, we can monitor any gas like CO_2 or oxygen in a similar fashion using their respective sensors.
   - We chose this sensor as it was the only available to us for a reasonable price. It is mostly meant to be a proof of concept

Sensors and Actuators(contd.)

3. Light Level
   - An LDR is used to monitor light level in the setup.
   - The data is sent to the Thingspeak server and to the Blynk app and can be viewed through Thingspeak website or Blynk app.
   - A slider is provided to set ideal light level. If it is too dark, photosynthesis is inhibited, so an LED array is used to maintain light level.
   - LDR and LEDs are simple to implement and use, and available easily, so we chose them for our project.

Networking

1. Thingspeak
   - Sensor data is conveyed to Thingspeak through the microcontroller.
   - It uses HTTP POST/GET requests.
   - It supports authentication
   - Data can be viewed directly on the website as graphs plotted with respect to time.
   - Thingspeak is chosen mainly because it is user-friendly and because it can be integrated with MATLAB for processing and analysis of collected data.
2. Blynk
   - Sensor data is also displayed on Blynk app.
   - It uses TCP/IP protocols
   - It supports authentication
   - It provides sliders to adjust ambient temperature and light level, which the actuators attempt to maintain.
   - It was chosen mainly for its user friendly features like sliders.

Protocols used

- Thinkspeak uses HTTP GET/POST requests.
- Blynk app uses TCP/IP protocols
- Nodemcu uses 802.11b and 802.11n protocols to connect to WiFi
- Nodemcu pins D0-D8 are classified as GPIO pins and support UART, SPI, I2C, I2S and PWM. We are using I2C for DHT11 sensor.
- Nodemcu pin A0 is an ADC and used for light level detection.

Thank You!