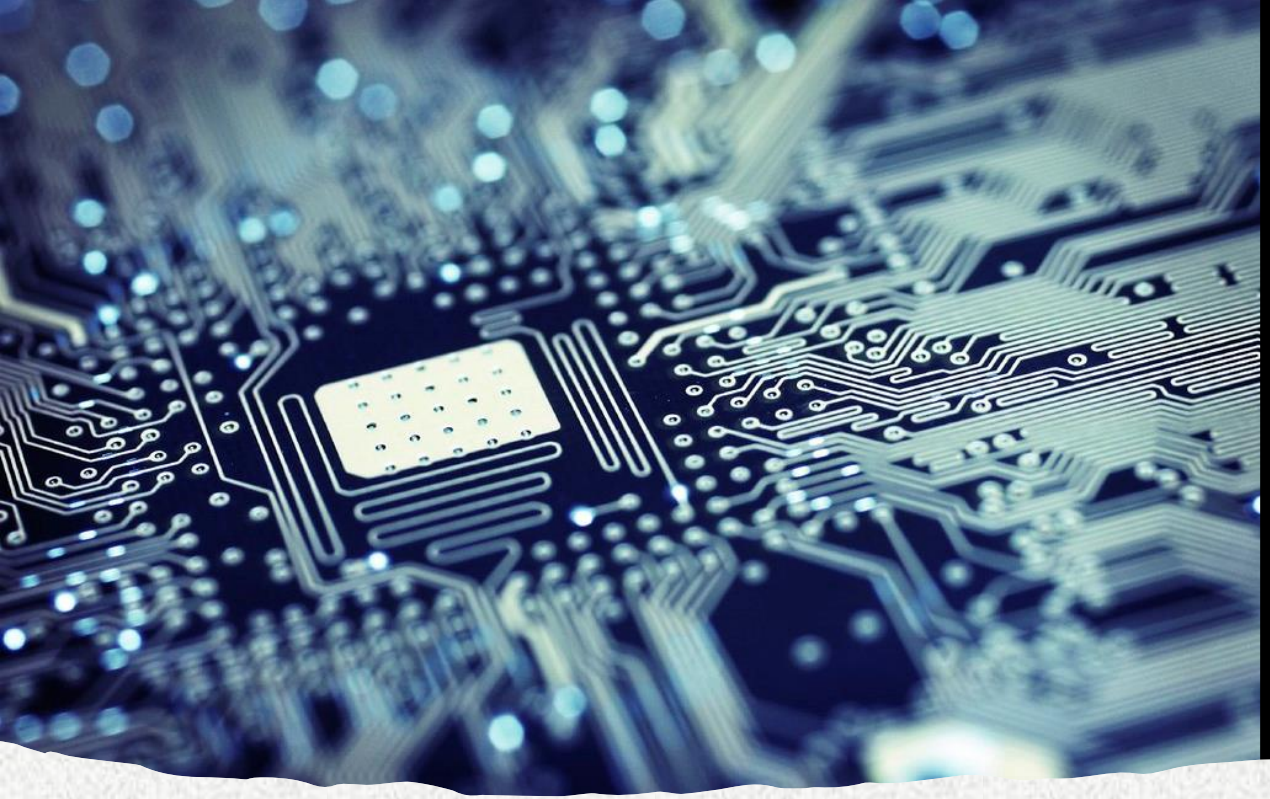

Wireless Microclimate System for Agrivoltaics

By: Da Boyz
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Team – Da Boyz (Yueithony Roillex)








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Project Abstract

In this project, we will develop a wireless microclimate sensor system that is capable of sensing local climate components such as air temperature, humidity, light intensity and frost at an agricultural site as well as the soil conditions such as soil temperature and moisture level. These sensing data will be collected remotely into an application, made accessible to the user, and will be used to make automatic decisions on the adjustment of the PV panel angle and other operations. Some extreme weather events such as hails may not be easily detected or predicted from the microclimate sensing; these will instead be reported from public alert sources.

Goals

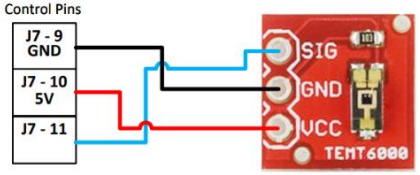
- To collect meaningful data at the vineyard that includes temperature, humidity, light, rainfall, soil moisture and frost
- Send the data to cloud to graph and visualize the data
- Send graphs to an app that the farmer can use to analyze
- Send alerts via the app to the user when hazardous conditions are met so the farmer can make preparations

Broader Impacts

- Farmers can now get alerts can be prepared to save their crops which help feed a community
- These alerts also help farmers save money on equipment, especially with frost detection and the supplies to combat frost
- The data collected can be analyzed and help for predictability
- This design will be open to the public, so other engineers can build upon and improve the current model

Design Specifications

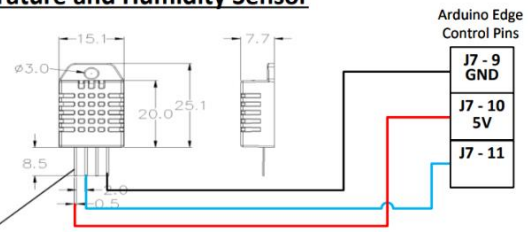
Light Sensor



0-5 V

Symbol	Description
SIG	Output Voltage from the divider circuit
GND	GND (0V)
VCC	Collector Voltage (**should not exceed 6V**)

Temperature and Humidity Sensor

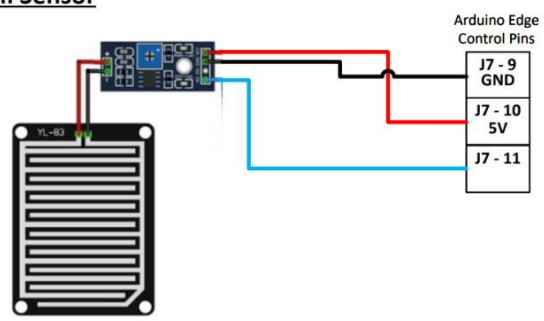


0-5 V

Pin sequence number: 1 2 3 4 (from left to right direction).

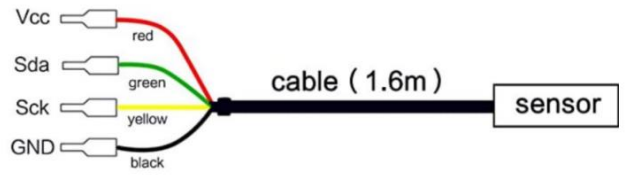
Pin	Function
1	VDD—power supply
2	DATA--signal
3	NULL
4	GND

Rain Fall Sensor



0-5 V

Soil Moisture Sensor



Technologies

- ESP32 Microcontrollers
- DHT22 Temperature and Humidity Sensor
- TEMP600 Ambient Light Sensor
- YL-83 Rainfall Sensor
- FS20-SHT10 Soil Moisture and Temperature Sensor
- SF-110 Frost Sensor
- Phone and Web Application to Display Collected Data Coded in Python

Milestones

- Fall 2022 Semester: Researched microcontroller and sensors and application options, completed class assignments
- January 2023: Begin app development and purchase microcontrollers and sensors
- February 2023: Begin testing sensors with microcontrollers and send data to the app via InfluxDB
- March 2023: Add filtering and alert functionality to app, continue implementing sensor system
- April 2023: Build small scale sensor system for expo, implement sensor system at vineyard after expo

Results

- Meaningful data was collected using our microcontrollers and sensors
- Data was pushed with wireless communication
- App was developed that displays data along with filters to be implemented at multiple zones and sites in the future
- Complete sensor system was designed to automate data collection and push to the app for the user to analyze

Challenges

- Implementing the clock cycle for the soil moisture sensor
- Researching ways to protect the hardware once installed at the vineyard
- Pushing data to InfluxDB and then to the app
- Developing app to be multiplatform