SINGAPORE INSTITUTE OF TECHNOLOGY

PLANTBUDDY
smart relay for your plants

Computing Science	
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Smart Relay-Controlled Watering Mechanism

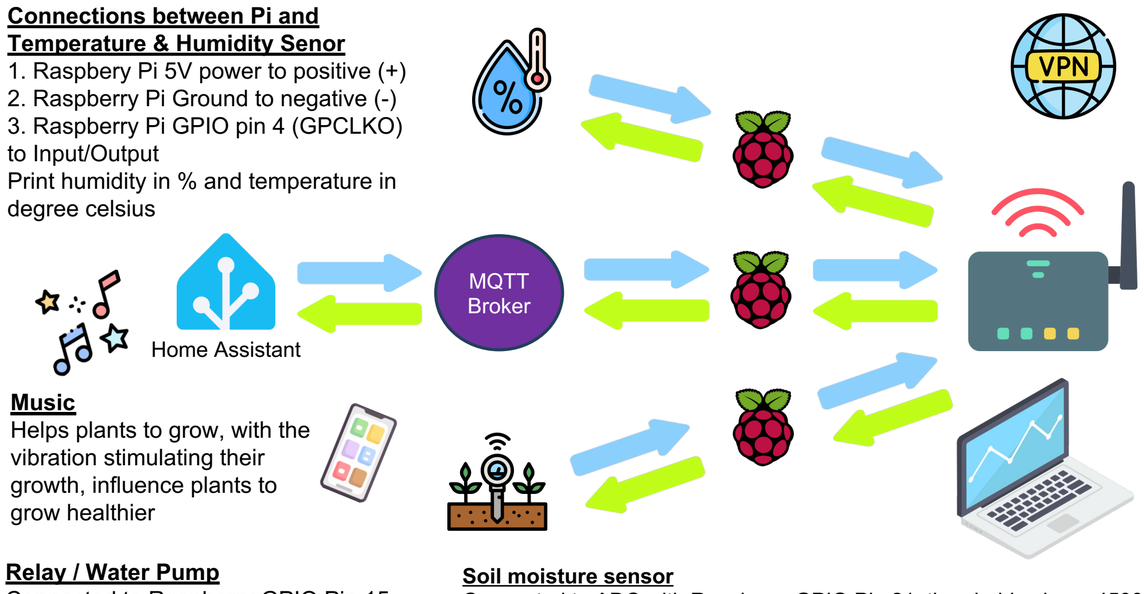
Project Goal

Our project aims to optimize agricultural practices through the development of an Agricultural IoT System. Our goals include implementing an automated irrigation system to optimize water distribution, improving soil quality management by providing real-time data on moisture, temperature, and humidity, enhancing crop yield and quality through precision agriculture techniques, and empowering farmers with actionable insights and decision-making tools via a user-friendly interface accessible through Home Assistant. By achieving these goals, we aim to revolutionize farming practices, promote sustainable agriculture, and improve the livelihoods of farmers.

System Architecture Diagram

Connections between Pi and Temperature & Humidity Senor
1. Raspbery Pi 5V power to positive (+)
2. Raspberry Pi Ground to negative (-)
3. Raspberry Pi GPIO pin 4 (GPCLKO) to Input/Output

Print humidity in % and temperature in degree celsius



Music
Helps plants to grow, with the vibration stimulating their growth, influence plants to grow healthier

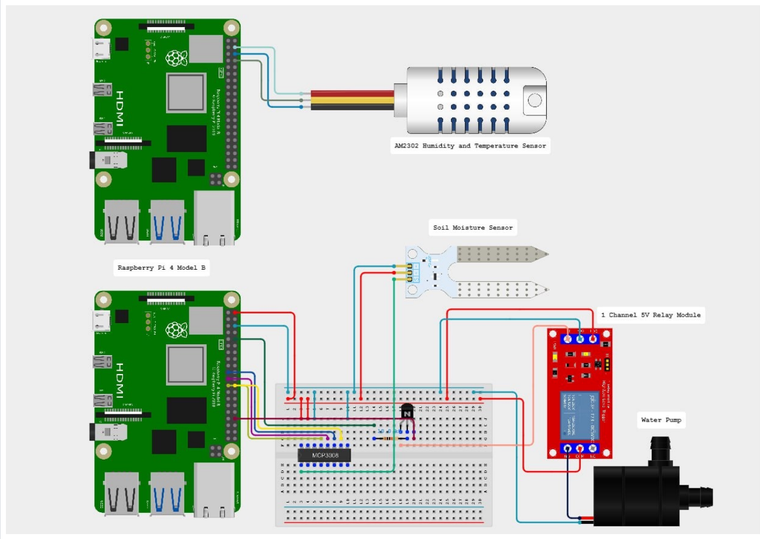
Relay / Water Pump
Connected to Raspberry GPIO Pin 15
1. If soil dry – moisture level % LOW: Activate water pump
Print 'water pump turned on message'
2. If soil wet – moisture level % HIGH: Stop water pump
Print 'water pump turned off message'
3. Control on/ off pump on Home Assistant

Soil moisture sensor
Connected to ADC with Raspberry GPIO Pin 21, threshold value = 45000
1. Sense soil moisture level
2. Print:
Soil dry – moisture level % LOW (adc voltage & value HIGH) OR
Soil wet – moisture level % HIGH (adc voltage & value LOW)
3. If moisture is LOW (below threshold), activate relay and water pump
4. Send sensor data value through MQTT
5. View & analyse data through Home Assistant

Solution

- **Real-time Monitoring:** Our system utilizes sensors to continuously monitor soil moisture, temperature, and humidity in agricultural fields.
- **Automated Irrigation:** Based on precise environmental data collected in real-time, the system autonomously regulates irrigation, ensuring optimal water distribution across the fields.
- **Data-driven Decision Making:** Farmers are empowered with access to real-time insights through a user-friendly interface. This enables informed decision-making for crop management and irrigation practices.
- **Enhanced Crop Yield:** By maintaining ideal soil conditions and minimizing water wastage, our solution aims to significantly improve crop yield and quality.
- **Sustainable Agriculture:** Efficient irrigation practices not only optimize resource utilization but also contribute to sustainable agricultural practices by reducing water consumption and environmental impact.

Connection Diagram

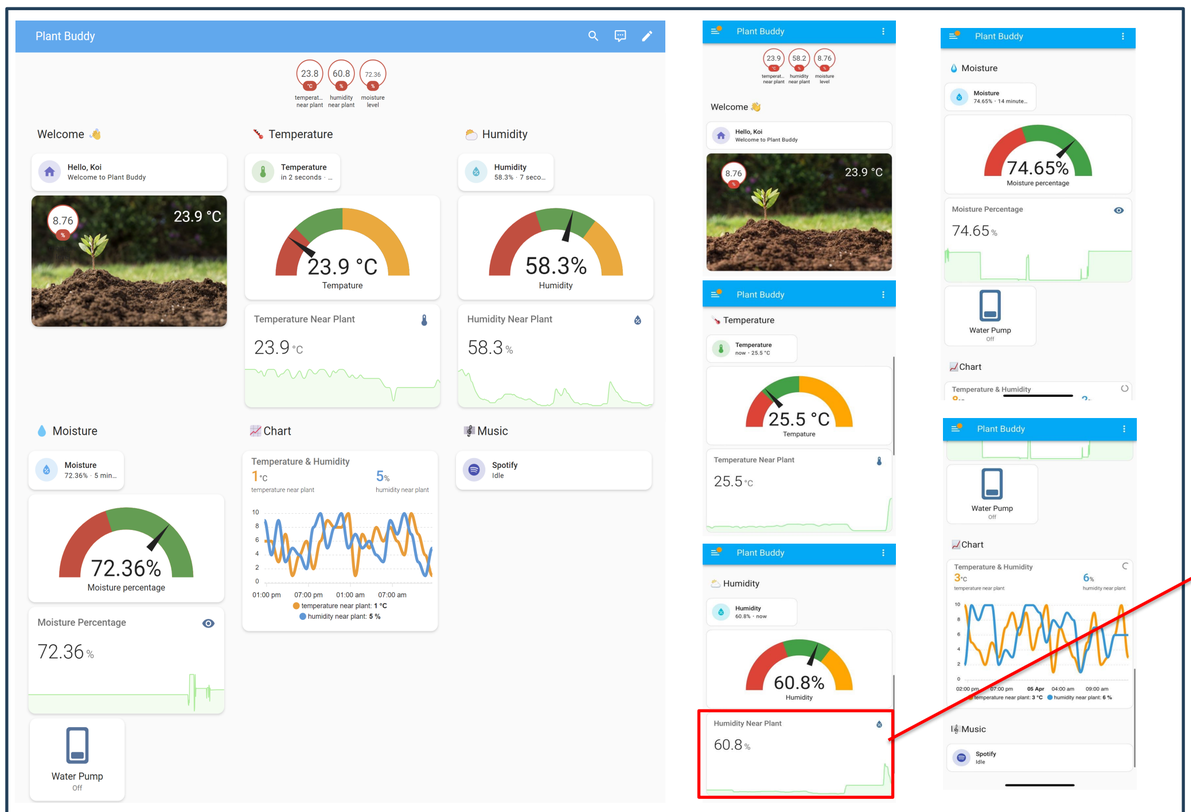


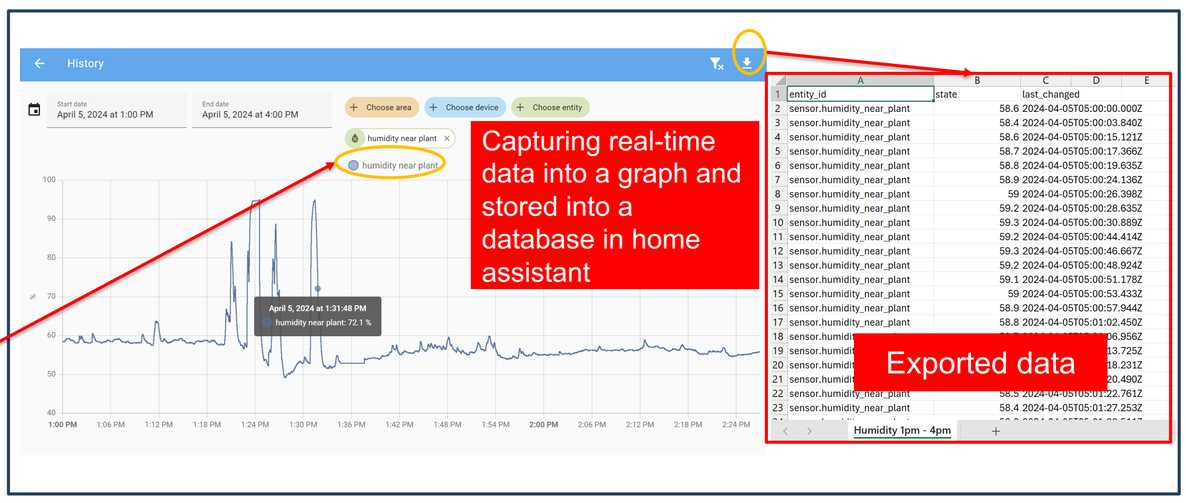
1.Connect the red wire of the DHT22 sensor to the 5V pin of the Raspberry Pi.

2.Connect the black wire of the DHT22 sensor to the ground pin of the Raspberry Pi.

3.Connect the green wire of the DHT22 sensor to GPIO pin 4 (or pin 7) of the Raspberry Pi.

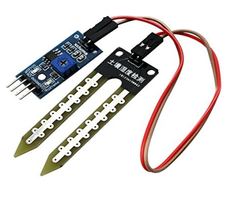
Home Assistant Dashboard



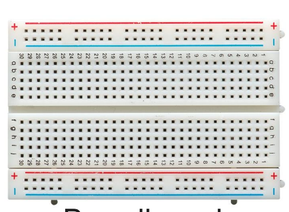


Technologies & Devices Used

DHT22 Sensor



Soil Moisture Sensor



Breadboard

5V pump

MCP3008 ADC

Relay

Home Assistant

MQTT

RaspberryPi

python™