# FINAL PROJECT REPORT

## IoT-Based Plant Care and Monitoring System for Potted Plants


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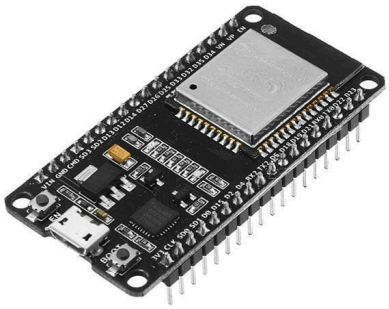
**Background**

Plants require consistent care, including the right amount of water and a suitable environment, to thrive. However, keeping up with these needs can be inconvenient, especially for those with busy schedules. This is where IoT technology steps in to make life easier. An IoT-based plant care and monitoring system is an innovative and practical solution for anyone who loves plants but struggles with daily maintenance. With this system, the user can monitor and manage their plants from anywhere, at any time as long as there's an internet connection. It will save effort and time and also ensures the plants get the best possible care, helping them grow strong and healthy. This blend of technology and gardening not only enhances plant care but also makes it more accessible and efficient for everyone.

**Schematic, PCB Layout and Explanation**

- ESP32 (Microcontroller)

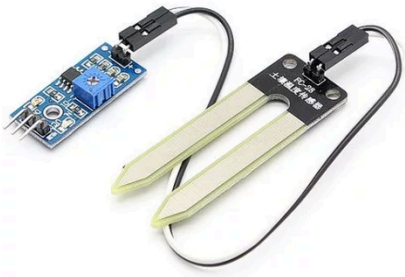


The ESP32 is the heart of the IoT plant care and monitoring system. It allows users to check the plant's status and manage the watering system from anywhere, thanks to its Wi-Fi capabilities. In this project, the ESP32 reads data from the soil moisture sensor and controls the relay using a digital pin. This ensures that your plant care is both efficient and automated, taking the guesswork out of watering.

- Moisture and Temperature Sensor (DHT22)

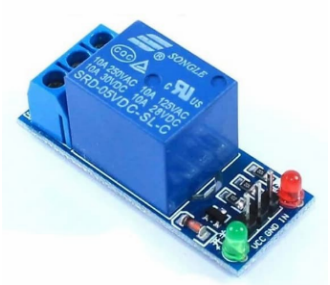
The DHT22 is an affordable and commonly used temperature and humidity sensor in IoT projects. Its function is to provide temperature readings in degrees Celsius and humidity readings in percentage.

- Soil Moisture Sensor (YL-69)



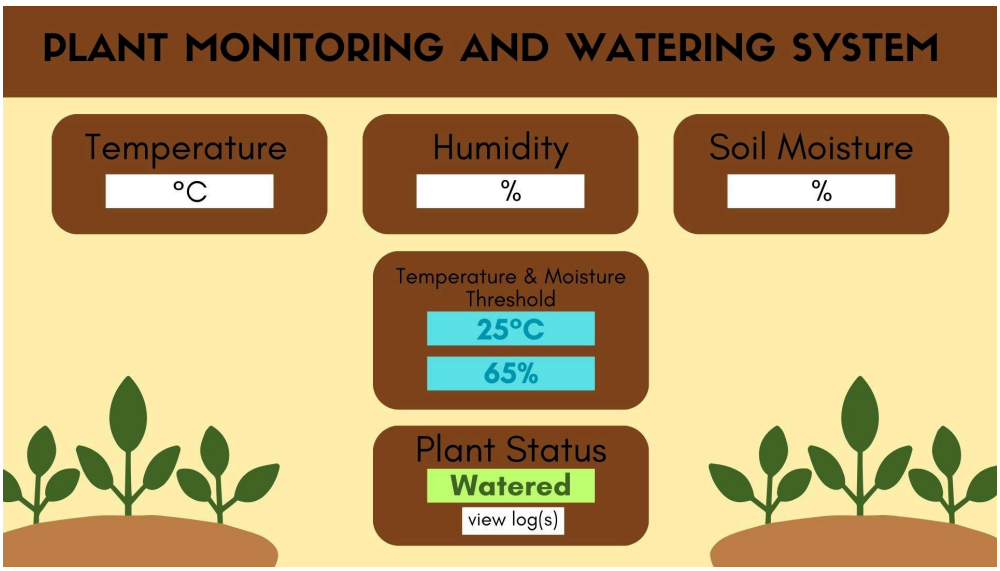
A soil moisture sensor is a device designed to measure the moisture level in soil. It works by detecting soil moisture through electrodes embedded in the soil. As the soil becomes wetter, its electrical conductivity increases, and the sensor provides a reading that reflects the moisture level.

- Relay 5V single channel

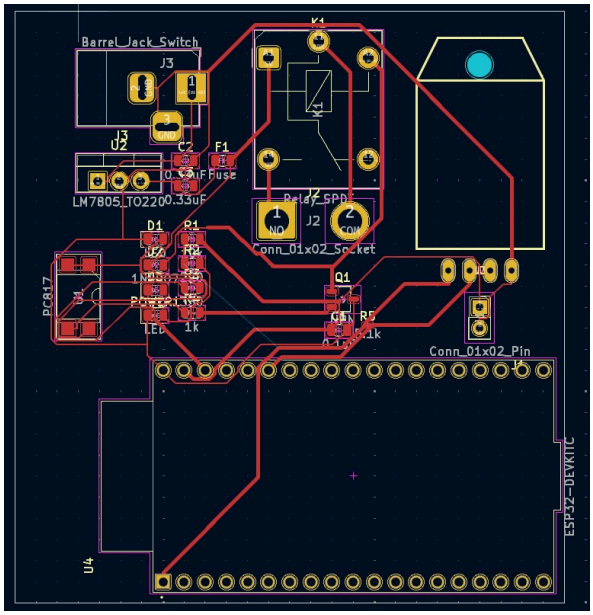


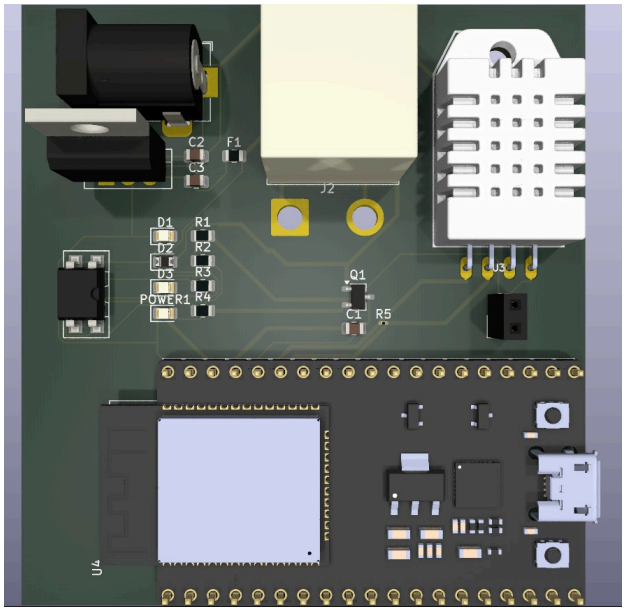
A single-channel relay is an electronic device that acts as an electromagnetic switch to control one channel. It's used to manage electrical devices needing more current than a standard microcontroller (3.3V or 5V) can provide, such as lights and motors. Upon receiving a control signal, the relay's electromagnet activates, switching the connection to either allow or stop the electrical flow.

In this system, the ESP32 is connected to three components: a 5-volt relay-controlled water pump system, a DHT22 sensor, and a YL-69 soil moisture sensor. These components enable the ESP32 to monitor the plants and their overall health using a local server housed within the ESP32. The system tracks soil moisture, temperature, and humidity around the plants. Users can set preferred humidity and temperature thresholds, view the status of whether the plant has been watered that day, and access data logs of watering times. This system also has a barrel jack which can be used as an external power source for the PCB, besides the ESP32's 3.3 input voltage. The User Interface of the website can be seen below:

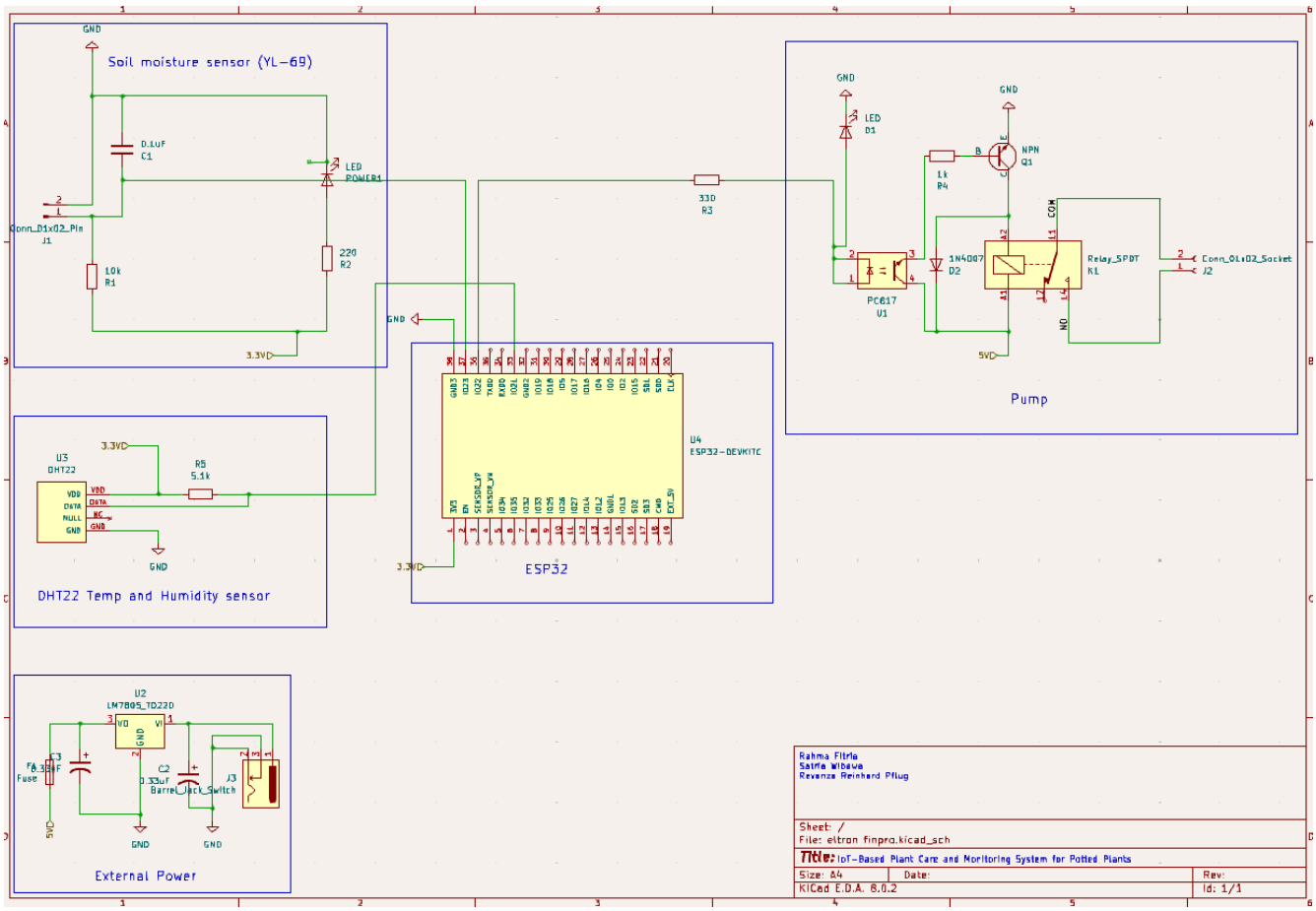


PCB Lay out & 3D design:




Schematic:



**Design Constraints**

1. Selecting appropriate components is quite challenging because each component must have corresponding footprints in KiCad's library. If they are not available, custom footprints from external sources are needed.
2. Different components in our project have varying voltage and current requirements. For example, the ESP32 operates at 3.3V, while the relay and water pump may require 5V to operate.
3. Strategic component placement and layering in our PCB was quite a challenge.

**Conclusion**

Overall this project aims to make the ESP 32 microcontroller an effective tool for monitoring conditions of a smart plant care and environmental monitoring system. It keeps an eye on soil moisture, temperature, and humidity, using this information to control a water pump. We aim to create a simple yet effective PCB in terms of use and overall efficiency, so that the plants get the right amount of water and are kept in optimal conditions, whether the user is nearby or checking in remotely.

**References**

[1] "IOT-Based Plant Watering System," *Hackster.io*. https://www.hackster.io/aliffahmi538/iot-based-plant-watering-system-205df5 (accessed Jun. 03, 2024).

[2] K. Han, D. Zhang, J. Bo, and Z. Zhang, "Hydrological Monitoring System Design and Implementation Based on IOT," *Physics Procedia*, vol. 33, pp. 449–454, 2012, doi: https://doi.org/10.1016/j.phpro.2012.05.088.

[3] "Lets make an IOT based plant watering system using Arduino Nano 33 IoT, some pumps and an Android Smart Phone. - Share Project - PCBWay," *www.pcbway.com*. https://www.pcbway.com/project/shareproject/Lets_make_an_IOT_based_plant_watering_system_using_Arduino_Nano_33_IoT_some_pum_ae63fa42.html (accessed Jun. 03, 2024).

[4] “Kalyan | Automated Plant Watering System - Part 2 - PCB Design and Prototyping,” *kalyanchakravarthy.net*. https://kalyanchakravarthy.net/blog/automated-plant-watering-system-part-2-pcb-design-and-prototyping.html (accessed Jun. 03, 2024).