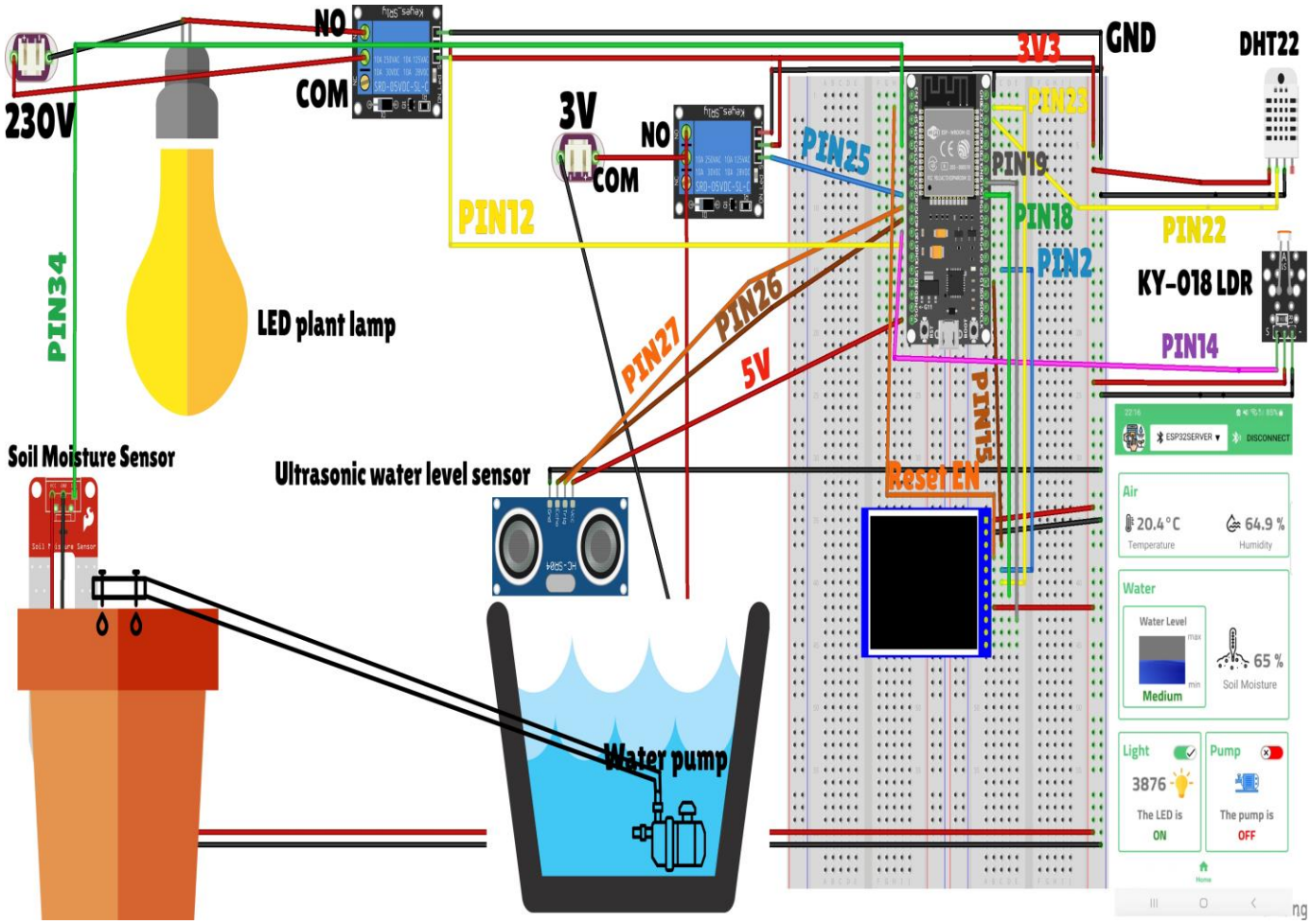
Description of the installation process on the ESP32



Hardware components

- Breadboard: is a plastic plate with many holes into which electronic components can be inserted. This means you can build and change circuits without soldering.

- ESP32 microcontroller: (Espressif Systems 32) is a high-performance microcontroller with built-in Wi-Fi and Bluetooth connectivity and features wireless communication and control.

- DHT22 temperature and humidity sensor: measures the temperature and humidity of the environment. It can be operated with a voltage of 3.3 V to 5 V and has three pins: Pin 1 for the supply voltage (3.3 V to 5 V), Pin 2 for the data line and Pin 3 for ground.

- Soil moisture sensor: measures the moisture of the soil and sends a digital signal to a microcontroller that interprets the moisture and switches irrigation on or off accordingly. The sensor can be operated with a voltage of 3.3 V to 5 V and has 3 pins: Pin 1 for the data line, Pin 2 for the supply voltage (3.3 V to 5 V), and Pin 3 for ground.

- **Water pump:** is a mechanical device used to move water from one place to another by creating pressure and moving the fluid through pipe. The water pump can be operated with a voltage of DC 3V or 4.5V. Controlling the water pump requires the use of a relay to establish the connection between the Arduino and the pump.

- Ultrasonic Water Level Sensor: measures the water level in a water tank using ultrasonic waves. The sensor has a transmitter and a receiver for ultrasonic waves. The transmitter sends out an ultrasonic wave, which is received by the receiver, and how long it takes the ultrasonic wave to return from the water is measured. With this time the sensor can calculate how high the water is. The sensor module has four pins: two supply voltage pins that connect to the Arduino's 5V and ground pins, and two data pins.

- Relay: is a programmable electronic switch that can be controlled by a microcontroller. It is used to turn devices with high voltage or current on and off, such as a water pump or an LED grow light. The relay has three connections: VCC, GND and IN. VCC should be connected to 3-5V, GND to GND and IN to a digital pin of the microcontroller. When the pin is set to HIGH, the relay passes current and turns the device on. When the pin is set to LOW, the relay cuts off the power and turns the device off.

- Direct Current (DC) Power Supply: is an electronic device designed to provide a constant direct voltage to electrical devices or circuits.

- LED plant lamp: is a light that was specially developed to provide plants with the light spectrum they need for their growth. The LED is designed for a voltage of 230V and can be connected to an Arduino with a relay.

- KY-018 Photoresistor Light Sensor Module (LDR): reacts to changes in the light intensity in its surroundings and is therefore used to measure changes in brightness. It is used to detect the presence or absence of light. It adjusts the LED plant light depending on the ambient brightness. When there is enough sunlight it stays off, when it gets dark it turns on.

The module is intended to measure the brightness of the ambient light, not the brightness of the LED. That's why it shouldn't work near the LED. The

LED light can affect the LDR module and cause the lamp to always stay on even when light comes from outside. This is because the LDR module interprets the LED light as ambient light.

-ILI9341 TFT LCD display: shows real-time data such as air temperature, humidity, soil moisture and ambient brightness. This data is constantly updated and shown on the display. The display shows the water level with five status colors: Empty (0%, Red), Low (25%, Yellow), Medium (50%, Orange), High (75%, Green) and Full (100% %, Blue). It also shows the status of the pump and the LED plant light, whether they are on or off.