Smart IoT Irrigation System with Arduino UNO R4 WiFi

General Description

This project, developed by class 3C Informatics of I.I.S.S. "Augusto Righi" in Taranto and guided by Professors Antonio Caiafa and Amedeo De Giglio, consists of an automatic and remote irrigation system for plants. It is based on the Arduino IoT Cloud platform to control and monitor in real time the soil moisture levels of four plants, activating water pumps only when needed.

Components Used:

- Arduino UNO R4 WiFi
- 4 capacitive soil moisture sensors
- 4 5V relay modules (1 channel each)
- 4 5V DC submersible pumps
- Bypass switch
- Jumper wires
- External power supply (5V 2A)

System Operation:

1. Automatic soil moisture monitoring: Each plant has its own sensor, and the corresponding pump activates only if the value falls below a set threshold.
2. Manual control (Bypass): A physical or digital switch (via dashboard) activates all pumps simultaneously.
3. Visualization and control via Arduino Cloud: Real-time data, historical graphs, and remote control.

Circuit Connections:

- Sensors: A0, A1, A2, A3; powered by 5V and GND
- Relays: Pins 4, 5, 6, 7; powered by external 5V
- Bypass switch: Pin 8, with pull-down resistor

Arduino IoT Cloud:

- Variables: plant1, plant2, plant3, plant4 (int), bypass (bool)
- Code: reads sensors, updates variables, controls relays, and shows LED animations

Replication Instructions:

1. Connect components according to the circuit diagram
2. Upload the sketch to the Arduino UNO R4 WiFi
3. Configure the Arduino Cloud dashboard
4. Connect the board to Wi-Fi
5. Test the system
6. Monitor and adjust the thresholds

Conclusion:

This project is a concrete and educational example of an IoT application for sustainable irrigation. It can be extended to other contexts such as greenhouses, gardens, or balconies.