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Project:
https://github.com/Madina1219/CASA0016-Plant-Soil-Monitor-Prototyping/upload/main

CASA-0016 Final Presentation and Crit

Tomato Soil Monitoring System

1. Project Overview & Inspiration

- The **Tomato Soil Monitor** is an automated plant care system designed to monitor soil moisture levels and the water reservoir level for tomato plants. The system is designed to solve the common problem of under-watering or over-watering

sensitive plants like tomatoes. By automating this process, the device ensures consistent plant health without constant manual checking.

- It displays real-time readings on an LCD screen and activates a water pump when the soil becomes too dry.
- **Inspiration/Motivation:** I chose to build this system because tomato plants require very specific, consistent moisture levels to stay healthy. Over-watering causes root rot, and under-watering leads to blossom-end rot. I wanted a simple, low-cost prototype that helps beginner growers like my-self avoid these common mistakes while learning practical IoT skills

2. Build Construction & Enclosure

- The system is housed in a **Repurposed Tool Caddy** which makes the device:
  - Waterproof / splash-resistant
  - Easy to carry
  - Safe to hold electronics and a pump at the same time
- This was inspired by the idea of creating something practical, lightweight, and safe around water.

3. Sensors & Component Roles

The system utilises **two primary sensors** and several supporting components. Here are their roles in one line each:

- **Arduino Uno:** The "brain" that processes sensor data and controls the system logic.
- **Capacitive Soil Moisture Sensor:** Measures the moisture content in the tomato soil to detect dryness.
- **Water Level Sensor:** Monitors the water reservoir to ensure the pump doesn't run dry.
- **LCD1602 RGB Module:** Visualises the system status by displaying moisture and water level readings to the user.
- **Relay Module:** acts as a switch to turn the high-power water pump on or off safely
- **Water Pump:** Physically moves water from the reservoir to the plant when triggered.
- **Battery Pack:** Provides the separate power supply required to run the pump.

4. Integrated Parts & Wiring Strategy

The system uses a **Breadboard** to integrate the components, ensuring modularity. The wiring is split into two distinct power circuits for safety:

1. **Logic Circuit (5V):** Powered by the Arduino, handling the sensors and LCD screen.
2. **Power Circuit (Battery):** Powered by the battery pack, handling the water pump via the Relay.

Wiring Summary Table:

Component	Connects To	Purpose
Arduino 5V / GND	Breadboard rails	Power distribution
Soil Moisture Sensor	+, –, A0	Soil moisture reading
LCD1602 RGB	+, –, SDA, SCL	Displays messages
Relay Module	+, –, Pin 7	Controls pump
Pump	Battery +, Relay COM	Waters the plant
Battery –	Relay NO	Pump ground switching
Water Level Sensor	+, –, A1	Measures reservoir level

5. Functionality & Data Visualization

- **Visualization:** Data is clearly presented on the **LCD1602 Screen**, allowing the user to see real-time "Dry/Wet" status and water tank levels.
- **Functionality:** The device functions via specific code thresholds:
    - **Dry Soil (<20%):** Triggers watering.
    - **Overwatered (>70%):** Alerts the user.
    - **Low Reservoir (<20%):** Warns that the tank is empty.
- **Originality:** The use of a tool caddy as an all-in-one chassis is a creative "upcycling" touch that distinguishes it from standard box enclosures.
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6. Quality of Build & Deployability

- **Build Quality:** The build uses a breadboard for connections. While this is excellent for prototyping and education (allowing for easy adjustments), it is less durable than a soldered PCB for long-term outdoor use.
- **Deployability:** As it stands, the device is **functional and deployable** as a working prototype. The logic covers necessary safety checks (like checking if the water tank is empty before pumping). However, for a permanent commercial product, the wiring would ideally be soldered and the electronics compartment sealed more tightly against humidity.
- Worked reliably during testing