ECET x30 - Project Definition Template Christian Hansis

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High Level Description

A battery-powered, soil-inserted smart plant monitor that measures soil moisture, temperature, humidity, and light. It waters the plant automatically when needed, shows simple status via LEDs, supports user-configured ideal ranges, and uses a small solar panel to recharge the battery for extended outdoor operation.

Purpose

The Smart Plant Health Monitor will help users keep track of their plants' health. The idea of the Smart Plant Health Monitor is to help plant owners track environmental conditions and plant health to improve care.

The Smart Plant Monitor will:
- Continuously monitors plant conditions and keeps them in an optimal range.
- Automatically waters the plant when moisture drops below the user-defined threshold.
- Provides a plant status
  - LED off when optimal
  - red = too hot
  - blue = too cold
  - yellow = needs more light
- Minimizes user intervention via automation and solar charging.

Client

- contact information
- roles
- budget

## Communication

- repository
- logbook

Objectives

- high level: what is the product and what does it do for the user?
- descriptions
- drawings
- brochure
- models

The objective of the smart plant monitor is to help track the overall well-being of a plant. The device will measure key environmental factors such as soil moisture, soil temperature, ambient temperature, humidity, and light level. Based on user-defined ideal conditions, the monitor will provide clear feedback through an RGB LED indicator and automatically water the plant when the moisture is too low. The system will run on a rechargeable battery with solar charging support, allowing it to operate outdoors with minimal user intervention.

Below is an example sketch of what the smart plant monitor could look like when placed in a plant pot:

Below is the block diagram for the smart plant monitor. Blue blocks represent the input sensors, green are the outputs, purple is the microcontroller, and the yellow is external components such as the battery and user input.
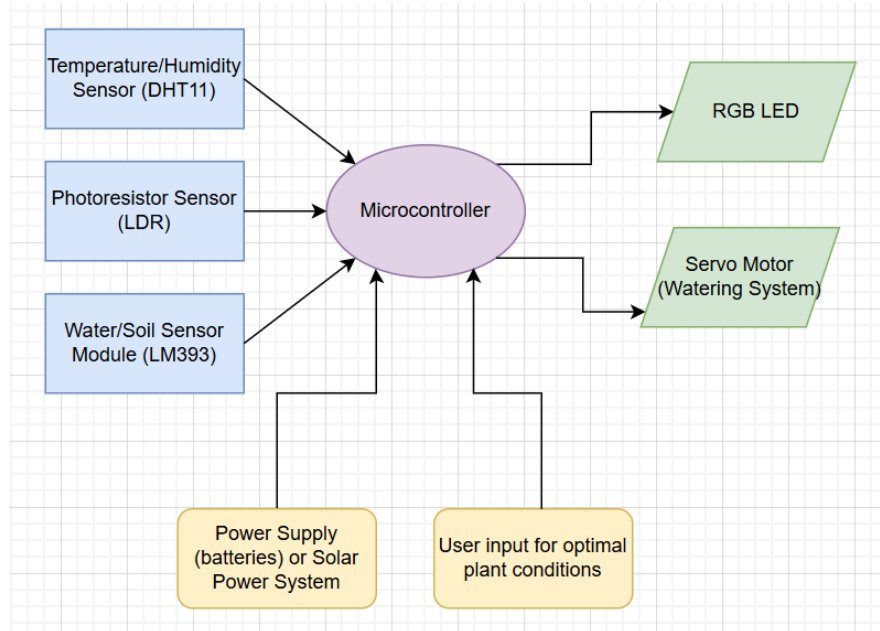
Scenario

User Interaction Stories

- unboxing
- configuring
- using
- troubleshooting
- passive/active interaction
- servicing

User Interface

The smart plant monitor gives feedback to the user through LED indicators and automatically waters the plant when needed.

LED Indicators:
- Off: Plant is healthy and in its ideal conditions
- Red: Plant is too hot
- Blue: Plant is too cold
- Yellow: Plant is not getting enough sunlight

Automatic Watering Motor:
When soil moisture drops below the set threshold, the system activates a servo motor or small pump. The servo can open a small valve

connected to a water reservoir, or the pump can deliver water through tubing. Once enough water is given, the system stops the servo/pump and returns to monitoring mode.

Water Sensor:
- Detects if the soil is too dry.
- If below the set threshold, the system activates a servo motor or small pump to water the plant.

Temperature/Humidity Sensor (DTH11):
- The temperature/humidity sensor will measure the outside temperature.

Light Sensor
- Measures how much sunlight the plant is receiving.

User Acceptance

• Given-When-Then criteria
• quantifiable goals

Parameters

Technical

- This project must be small enough that it can be placed in the pot/soil of a plant. The dimensions can not be larger than 8 inches. The project must be somewhat waterproof or water-resistant since it will be located in the plant pot/soil. This project should be able to read the current temperature, humidity, moisture, and light level.
- Dimensions
  - Height: No larger than 8 inches tall, no smaller than 2 inches tall
  - Width: No larger than 2 inches wide, no smaller than 1 inch wide
  - Weight: 50-300 grams
- Electromagnetic Compatibility (EMC) & Electromagnetic Interference (EMI) Protection
  - Add small capacitors near the sensors and microcontroller to keep signals clean
  - Add a diode or filter to protect against noise from the servo or pump
  - Make sure the solar panel and battery connections are protected against surges or wrong wiring
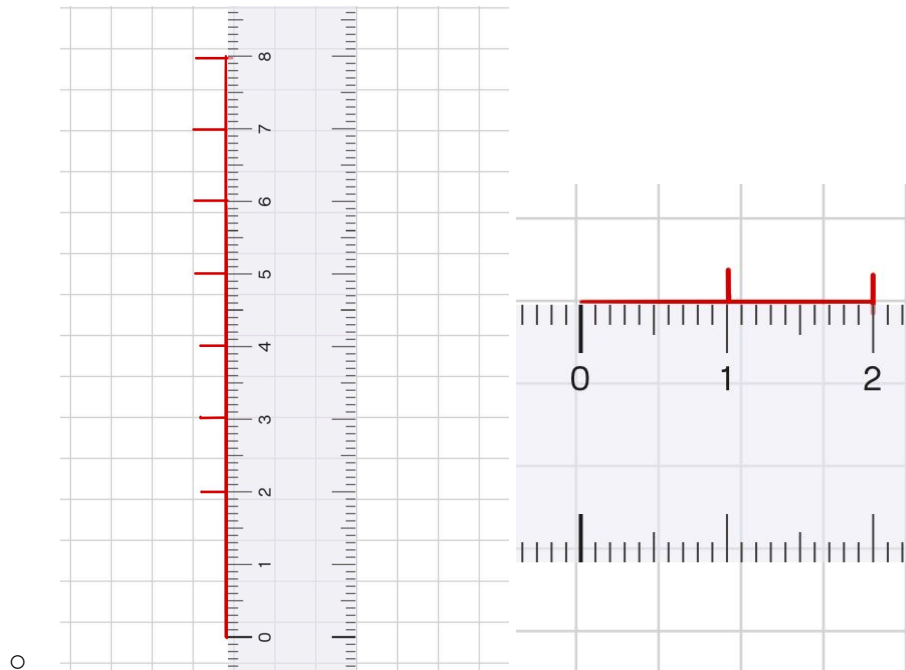
Functions

The core functions of the smart plant monitor are:

- Water Sensor: The device measures the moisture level in the soil. If the soil is too dry, it triggers the watering system to add water until the desired level is reached.
- Temperature/Humidity Sensor: A sensor checks the air temperature and humidity around the plant. If it gets too hot or too cold, the LED changes color to warn the user.
- Light Sensor: A light sensor measures how much sunlight the plant is receiving. If the plant is not getting enough light, the yellow LED turns on.
- LED Status Indicator: An RGB LED provides simple feedback. When conditions are ideal, the LED stays off. Red indicates too hot, blue indicates too cold, and yellow means the plant needs more light.
- Automatic Watering System: When soil moisture is too low, the system uses a servo or small pump to deliver water from a reservoir. Once the soil is back in range, watering stops automatically.
- Power: The system runs on a rechargeable battery, supported by a solar panel to extend operating life outdoors without frequent charging.

Integration

- interfaces
- protocols

Operational

- restrictions
- duty cycle

Regulatory

- laws
- regulations
- policies

Life Cycle

- manufacturing
- programming
- tracking
- service
- associated services

Environment

- temperatures
- hazards
- ingress
- power

Starting Point

- existing IP
- existing prototypes

Key Concerns

- most important
- set-in-stone parameters

Future

- plans
- ideas

Glossary

- common vocabulary
- project specific terms

Open Questions

to be discussed with team/client