ECET 430 - Smart Plant Care

Jonathan Jou

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Purpose

The Smart Plant Care device makes the care for plants easier by monitoring soil moisture, light, temperature, and humidity while sending real-time alerts to maintain the best conditions. It helps users take care of their plants by showing when to water them, change the light exposure, or fix the temperature in the room. Perfect for beginners, or plant enthusiasts, and busy people, it eliminates guesswork and fosters healthier plant growth. From intuitive feedback to actionable insights, this device makes plant care a lot easier. Whether it's for learning the best way to garden or just keeping the greenery inside thriving.

Client

- ECET 430 Class mates
- The budget of this build is estimated around $80.

Communication

- Github Repository: https://github.com/jonjonjou/Smart-Plant-Care

- Logbook: https://docs.google.com/document/d/1wdd8jddG7IZ0_z5ufNprCd1GiP8v9Tni6cgInCIsSMY/edit?tab=t.0

Objectives

- Smart Plant Care is an easy-to-use gadget that will help plant owners take care of their plants. Equipped with sensors for measuring the level of soil moisture, light level, temperature, and humidity, the device will instantly give feedback using a small OLED display or notify users on app. Whenever any one of these conditions goes out of range from the optimum level, it will alert the user by color-changing LEDs or a buzzer.

- The users simply set it inside the plant pot and let the gadget do its job. The device will send notifications, whereby the user can take instant action: water the flower or reposition it in relation to the sun. It's perfect for any person who wants their plant thriving but puts in minimum effort, whether it be an expert in gardening or not.

- **Features:**

- **Monitorin**g: Temperature, humidity, light, and soil moisture are all measured in real time.

- **Instant Alerts:** Notifies you when your plant need maintenance by using lights, sounds, and other signals.

- **Simple to Use:** Simply put it in your plant container and let it do its job. Perfect for those who desire healthier plants, are busy, or are new to gardening.

- **Basic Model**
  - **Includes**: Soil moisture sensor, light sensor, temperature/humidity sensor, OLED display, RGB LED, and buzzer, require check up every now and then.
  - **Purpose**: Provides essential monitoring and alerts for basic plant care.

- **Advanced Model**
  - **Includes**: All features of the Basic Model, plus Wi-Fi or Bluetooth connectivity for smartphone notifications.
  - **Purpose**: Offers remote monitoring and data tracking through an app for on-the-go plant care.

Scenario

User Interaction Stories

The Smart Plant Care device is designed for easy use. It is easy to unpack because all the parts are well-marked. To set it up, user only need to put the device into the pot and switch it on. The Advanced Model can be connected with a phone using Bluetooth or Wi-Fi. During its work, it constantly monitors the plant, presenting real-time data on the OLED display. It will even light up or send a notification to the user where it needs attention.

User Interface

- **Displays**
  - o **OLED Display:** An OLED display allows the device to present real-time data on soil moisture, light intensity, temperature, and humidity for clear visual feedback.

- **Buttons**
  - o **Power Button:** It has a straightforward power button that could turn on or off.
  - o **Reset Button:** This is used to reset the device when required; for instance, this may be used after an operating system update or troubleshooting of the device.

- **Indicators**
  - o **RGB LED:** The device features a multi-color LED for visual indication of alerts. Green means good condition, and red for a critical issue like dry soil or too hot/cold.
  - o **Buzzer:** This includes an onboard buzzer that allows for signals in case the plant needs immediate care, for instance, if it gets too dry or too hot/cold.
  - o **Charging Indicator:** This is a small LED indicator showing the status of charging of the rechargeable battery-for instance, blinking red for charging and green when it is full.

User Acceptance

1. **Given** the device is on and in a plant pot,
   When the soil is dry,
   Then the LED turns red, and a buzzer alerts the user to check on the display for plant status.

2. **Given** the device is connected to a phone,
   When the light is too bright for the plant,
   Then the user gets a notification on their phone.

3. **Given** the device is in the plant pot,
   When the temperature and humidity are ideal,
   Then the display shows "Optimal" and the light turns green.

4. **Given** the battery is low,
   When the device is charging,
   Then the charging light will blink red and green when full.

Parameters

Technical
- **Dimensions**:
    - Width 4 inches
    - Height 1.5 inches
- **Weight**:
    - **200 grams**
- **Electromagnetic compatibility (EMC) and electromagnetic interference (EMI):**
    - The Smart Plant Care will be designed to meet the necessary requirements of Electromagnetic Compatibility to avoid interfering with other gadgets. It shall be shielded appropriately to limit unwanted emissions, hence not interfering with the operation of other gadgets around it. The device shall also be designed to minimize EMI, which creates minimum possible interference that might affect other devices, including a Wi-Fi router, smartphone, or any other household electronic device. It ensures that the Smart Plant Care device works perfectly at home or in the office, without interfering with other technologies that may be nearby.

- **Protections**:
  - o **Water Resistance**: safe from splashes.
  - o **Shock Protection**: Durable, shock-resistant casing.
  - o **Overcharge Protection**: Prevents battery damage during charging.

Functions

- **Soil Moisture:** Monitors and alerts in case the plant needs water.

- **Light Level:** Monitors the light level for perfect growth.

- **Temperature and Humidity:** Measures and keeps conditions optimal.

- **Alerts:** Sends sound and phone notifications to the user for needs of care.

- **Rechargeable Battery:** Long-lasting with overcharge protection.

- **Data Display:** Real-time plant data on an OLED display for easy monitoring.

- **App Feedback:** The device sends updates and alerts right to your phone via the app.

- **Easy Setup:** Very easy to set up and use.

Integration

- **Interfaces:**

  1. **OLED Display**: displayed in real-time: Soil moisture, Light levels, Temperature and Humidity

  2. **RGB LED:** Visual feedback given- Green for optimum and Red when urgent care required.

  3. **Buzzer:** A buzzer makes a sound as an alert regarding critical plant condition.

  4. **Mobile Application Interface FOR THE Advanced model:** Real time data, notification display, and adjusting settings using smartphones can be done easily.

- **Protocols:**

  1. **Wi-Fi for Advanced Model:** Wi-Fi connectivity could send data to applications or alert the same time to sync on the cloud.

Operational

- ## Restriction

  - o **Temperature Limits**: Although this device can monitor temperature in real time, but it's best advice not to be operate in extreme heat or cold (0°C to 40°C).

  - o **Power Supply**: The rechargeable battery requires regular recharging, and cannot be replaced by the user.

  - o **Water Resistance**: it's water resistance but is best not to be submerged into water.

- **Duty Cycle**
  - The device runs continuously, always monitoring environmental conditions 24/7. However, the battery duty cycle is designed to last up to 10 days on a full charge under normal usage conditions. The device will automatically enter a low-power mode when not actively monitoring or alerting.

Regulatory

- Laws- To be research
- Regulations- To be research
- Policies- To be research

Life Cycle

- Manufacturing- To be research
- programming- To be research
- tracking- To be research
- service- To be research
- associated services- To be research

Environment

- **Temperatures**
  - **Operating Temperature:** The Smart Plant Care device functions well with in 0°C to 40°C, anything surpass 40°C or below 0°C might damage the device.

- **Hazards**
  - **Electrical Hazard:** Avoid charging the device in wet conditions to prevent electrical short circuits.

  - **Battery Hazard:** Do not try to replace the battery on its own, to prevent leakage or fire risks.

- **Power**
  - **Power Source:** The device uses a rechargeable battery.

  - **Battery Life:** The battery lasts up to 10 days on a full charge, depending on usage.

Starting Point

- existing IP- To be research
- existing prototypes- To be research

Key Concerns

- **Most Important Parameters**
  - **Battery Life:** Lasts up to 10 days after a full charge.
  - **Operating Temperature:** Works between 0°C to 40°C.
  - **Water Resistance:** Splash proof but advice not to submerged with water.
  - **User Alerts:** Sends alerts through LED, buzzer, and phone notifications (only in advanced model).
- **Set-in-Stone Parameters**
  - **Rechargeable Battery:** Charging using USB.
  - **Dimensions:** About 4 inches width and 1.5 inches in height.
  - **Connectivity:** Bluetooth and Wi-Fi for app use (only in advanced model).

Future

- **Plans:**
  - **Software Updates:** Create different needs for different plant.
  - **Better Features:** Add sensors for soil pH and nutrients.
  - **Cost:** Bring down the cost.
- **Ideas**
  - **AI Support:** Use AI to research the plant, and using the information, come up with the best way to take care of it.
  - **Community Sharing:** Build an online platform for users to share tips and advice.

Glossary

- **Common Vocabulary**

  - **Sensor:** Detecting things like soil moisture, temperature, and light.

  - **OLED Display:** display the status of the plant in real time.

  - **Buzzer:** Device that makes noise to alert the user.

  - **RGB LED:** Light that changes color to show plant health.

  - **Rechargeable Battery:** A battery that can be used multiple times after charging.

- **Project-Specific Terms**

  - **Smart Plant Care Device:** The product that monitors plant health.

  - **Mobile App Integration:** Allows user's phone to connect with the device and monitor the plants health at any time.

Open Questions

to be discussed with team/client- needs to be discussed with team or in class