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Automated Planter 5 Milestone Demos

Demo 1: Plant UI & Database Implementation

Objective: To test and verify that our UI interface is able to display data that is stored onto the database, Our UI interface will have 10 preset plants which the user can add their own plant and modify any plant that is stored onto the database. This will demonstrate that we have a working web based UI system that can interface and read/write data to the database that will be used for the sensors in the future. A plant preset will include how much water and how often to water it, light min-max in lux, temp min-max in celsius, humidity min-max percentage, and soil type.

Verification: This test will show the web UI interface on one of our laptops and display the database data, and will have a way for the user to add their own plant data and modify plant data

Measurable Outcome: A successful demo will include our web interface working without any bugs and features that are included for demo 1. This will allow the user to look at all of the plants that are stored onto the database and allow the user to add/modify the database without any errors or bugs on a laptop.

Demo 2: Water Pump Implementation

Objective: Ensure water pumps are functioning through Raspberry Pi GPIO. Ideally, we'll have a test mode in the UI interface or Raspberry Pi terminal, as well as the standard functioning mode that is done automatically based on a timer or soil moisture readings. Pumps should be able to interface with and be activated by the database/server. We'll likely need to use test data for this demo because we might not have real data from sensors at this point.

Verification: Test that the pumps can pump water using the test function in the UI or terminal, and test the automatic, data driven functionality. Pumps should be able to run effectively with soil in the pot. If possible, test long term function to make sure no leaks or clogs occur.

Measurable Outcome: A successful demo will have the pumps activate at the correct times, and not activate at any incorrect times. We also want to ensure that the pumps can move their nominal amount of liquid and run over several tests.

Demo 3: Sensor Implementation

Objective: The goal for Demo 3 is to verify and validate the successful use of the environmental sensors with the Raspberry Pi via its GPIO interface. These sensors will monitor moisture of the soil, ambient light, water level, humidity, and temperature. Each will be individually tested to ensure proper functionality, accuracy of data collection, and proper communication with the Raspberry Pi. The focus will be to confirm each sensor works as intended in order to later be synchronized with the UI and database for full functionality of the Automated Planter.

Verification: To verify the functionality of the sensors, each will be tested and sensor outputs will be observed. These readings will be analyzed and compared with expected environmental conditions to ensure accuracy. While collecting and observing data, readings will also be monitored to ensure sensors respond consistently, without errors or communication failures, and reliability over a period of time.

Measurable Outcome: This demo will have all sensors connected to the Raspberry Pi working and reading data accurately. Each sensor will undergo various test readings under different environmental conditions (wet vs. dry moisture for soil, bright vs. dark light levels, and varying temperature and humidity). For the demo to be considered successful, all sensors will produce readable values that align with the environmental conditions and all data is available to be stored in a structured format.

Demo 4: Sensors, Database, and UI all synchronized

Objective: Verify sensor data can be collected, stored into our database, and then be reflected on the web UI. This will demonstrate a core functionality of our system, the database, which is acting as a central hub between the hardware and the web UI.

Verification: This test will show the live sensor readings being sent from the Raspberry Pi to the database. We will be able to see the database values being updated and those changes being immediately reflected on the UI. For example, when the soil moisture sensor detects a change in moisture levels, the updated values will automatically appear in the UI graphs and tables.

Measurable Outcome: Make sure that the data pipeline (sensor → database → UI) functions reliably by introducing controlled changes in the sensor environment (adding water to soil, lowering the water level in the tank). The displayed values on the UI should match the actual physical conditions with minimal lag.

Demo 5: System Integration + Touch Screen Display

Objective: To test and verify that all previous features are working together to allow our system to work as intended and now allow the user to use the touch screen display to monitor their

selected plant.

Verification: This test will show the completed project in its entirety with the user to change data on their own device, either pc or mobile since our system is controlled by a web server. With the Touch screen the user will be able to monitor all of the sensor values and know if everything is working as intended or if it's time to refill the planter water tank.

Measurable Outcome: The user should be able to see all the sensor values and display graphs onto the touch screen of desired sections of the plant, water levels, moisture levels etc. In our test we can have the water tank empty and fill up the tank and see the water level change as we are filling up the tank. We can also demonstrate the system working by pumping water by changing the desired water time threshold to a very low value etc every 5 minutes to show that we can modify the database and have it do its intended action of watering the plant.

Demo TEMPLATE: "Plant UI & Database Implementation" i.e. Distance Sensor and Data Acquisition

Objective: "What is the point of this demo?" i.e. To test and verify the distance/ranging sensor and data acquisition necessary for our autonomous robot to locate obstacles

Verification: "What will the instructor see?" i.e. This test will show the distance measured by the sensor on a serial terminal interfaced to the TM4C. The test will output 1 line of text every 1sec that contains the distance as measured in centimeters with a precision of 1 decimal point

Measurable Outcome: "What constitutes a successful demo (best grade)? What is the acceptable accuracy, error and tolerance" i.e. A successful demo should show an accuracy of +/- 0.1cm and verified using a caliper/ruler.

- How to enter data into database
- Web UI facilitates other demos in the future
- UI capabilities
 - Add custom plant
 - Adjust custom plants