HW #2 Requirements Description

Com S/SE 409 & Com S 509, Fall, 2020

Due by 8 p.m. Thursday, Sept. 17; turn in on Gradescope as a pdf (+ Problem 5's individual pdf)

Textbook reading assignment: Chapters 6, 10, 11, Robertson & Robertson, 3rd ed.

EARS (Problem 2) is not in the textbook and was presented in class (Lecture 6 Video). An additional set of EARS tutorial slides is posted on Canvas.

Team assignment: one assignment is turned in for this part with the names of all the team members who participated on it. **Problem 5 is individual.** If you prefer, you may instead do the entire assignment individually. Re-read the Homework Policy at the top of HW#1.

1. *Deriving Scenarios* (from the Product Use Cases). 20 pts. Read p. 122 of the e-textbook. Note that this template is for a Business Use Case (BUC) Scenario. However, pp. 172-173 has an example of a Business Use Case **and** its associated Product Use Case (PUC) Scenario, which uses Actors rather than Active Stakeholders.

Normal scenarios. (Chap. 6). Produce and turn in normal scenarios for the three Product Use Cases listed below for our EverGreen project. (Note that you are here providing only some of the scenarios for EverGreen. For Homework 2 only, we exclude Exception/Failure/Abnormal scenarios. This will give you enough practice with developing scenarios from use cases for now. A real-world project would build out all the scenarios at this point.)

The 3 product use cases for which you'll develop scenarios:

1) Set parameters

   Users can set parameters for landscape watering via the control panel.

Product use case name: Set parameters.
Trigger: User selects set parameters from the configuration menu.
Preconditions: active moisture level sensors are present and connected, water usage sensors are present and connected.
Interested Stakeholder: User.
Actor: User.

i. The system prompts the user for parameters.
ii. User provides an ideal moisture level.
iii. User sets a maximum water usage value.
iv. User sets the desired watering time.
v. User chooses what watering zones will be affected.

vi. User confirms the changes.
vii. The system displays a confirmation dialog.

Outcome: New maximum water usage; watering time; watering zones; moisture level are recorded in the system. Automated watering is now bound by them.

2) Turn valves on/off

In manual mode, users can direct valves opened/closed via the control panel.

Product use case name: Turn valves on/off.
Trigger: User selects manual valve control from the configuration menu.
Preconditions: The system is in the manual mode.
Interested Stakeholder: User
Actor: User

i. The system displays the current status of valves and lets the user choose a valve.
ii. User selects a valve to control.
iii. User toggles valve state.
iv. User confirms the action.
v. The system displays a confirmation dialog.

Outcome: New valve state is recorded and the state is changed.

3) Display status

The control panel shows the current status of the landscape watering system and related parameters of the environment.

Product use case name: Display status.
Trigger: User wakes up the control panel.
Preconditions: The system is on.
Interested Stakeholder: User
Actor: User

i. User enters the main system screen.
ii. The system displays its current status and related parameters of the environment.
ii. User reads the status of the landscape watering system and related parameters.

Outcome: User is aware of the current state of the system.

2. Gaining Knowledge of the Domain. 10 pts. Read “5. Relevant Facts & Assumptions”, pp. 332-334.

a) Answer the questions you posed in Homework 1, or move them to c) below.
    i) Who is responsible for maintaining the sensors and valves used in our system?
        1) The user is responsible for replacing and maintaining the sensors and valves used in our system, however, our system will notify users when there are faults in the system hardware so that they know when to get them replaced.

ii) Are there any chemicals that are needed in our watering system and if so, will our system need to monitor the concentration of those chemicals in the watering supply?
    1) No. There will not be chemicals mixed in with the water supply in our system.

b) Identify any non-obvious facts or assumptions that an EverGreen developer should know &/or that may not remain true over time.
    i) The project description explicitly states that users will interact with our system via a control panel, however, it might be a useful feature down the line to offer the ability to users to interact with our system via a web or mobile application instead of only using the control panel.
    ii) The project description does not mention the possibility of a potential user that does not have an existing watering system in place. Our system does not provide them with a way to acquire the necessary equipment to use our system, so down the line, it might be effective to implement a way for users to order equipment (even from a third party) through our system, providing more of an incentive for onboarding more users.

c) List any new & remaining open questions.
    i) Will our system need to contact the weather forecast and change the watering schedule based on the information received?
    ii) What if a user does not have an existing watering system installed on their property? Can our system provide a service for them to order any hardware they may need through one of our providers?
    iii) How can we expect a user's already-installed equipment to be seamlessly compatible with our system if many users can have many different kinds of watering equipment?
    iv) How accurately does the system need to accommodate for moisture level, water usage, and other settings?
    v) What specific kinds of sensors is our system expected to support?
    vi) What is the expected climate of the areas in which our system will be installed and how will that impact our system?
    vii) Are there any other uses for our system that our clients expect?
    viii) Is there any competition in the market for our system? Are there other companies that have created a system similar to ours?

3. *Specifying Functional Requirements.* 40 pts. Read Chap. 10 & the slides associated with Lecture 6. Document **in EARS** and turn in the first draft of your Functional Requirements for EverGreen. You might start with the three scenarios that you built in Problem 1, using the steps in your scenarios as a guide to the functional requirements they need. Most of the points for this problem will be for those FRs. These EARS requirements are what the developer will

design and code the software to do. Accuracy and Completeness with respect to your clients' needs --"Getting Requirements Right" as the book's subtitle puts it—is the goal.

Ubiquitous:

- The system shall operate in one of the two modes: manual and automatic.
- The system shall provide a user with a way of switching modes via the control panel.
- The system shall display its current status and related environmental parameters.
- The system shall indicate when user-input values are invalid.

Event-driven:

- When the user switches modes, then the system will operate according to the values used previously for that mode.
- When the user wakes up the control panel, then the system will display its current status and related parameters of the environment.

State-driven:

- While in manual mode, the system shall accept and record the user's input about the status of the valves.
- While in automatic mode, the system shall accept and record the set user parameter for the ideal moisture level.
- While in automatic mode, the system shall accept and record the user parameter for maximum water usage.
- While in automatic mode, the system shall accept and record user time settings for watering intervals.
- While in automatic mode, the system shall accept and record parameters for individual watering zones.

Unwanted behavior

- If one of the sensors/valves becomes inoperable, then the system shall inform the user by displaying a warning message.
- If one of the sensors/valves becomes inoperable, then the system shall adjust itself accordingly to resume the watering process after deactivation of the inoperable component(s).

4. *Specifying Non-Functional Requirements*. 30 pts. Read Chap. 11, and "10. Nonfunctional Requirements," pp. 341-353. Document (not in EARS) and turn in the first draft of your Non-Functional Requirements for EverGreen using the steps in your Product Use Case scenarios and the NFR checklist in the textbook as a guide. Note that you won't have NFRs for most of the NFR types listed in the book, i.e., don't make up NFRs your product doesn't need.

Relevant NFRs for the EverGreen may address, for example, usability, security, reliability and maintainability.

Ubiquitous:

- Once confirmed, the parameters shall be recorded within a second after confirmation.
- The system shall maintain desired parameters with an error margin no greater than 2%.
- The product shall support an easy addition of new sensors and valves.
- The product shall support an easy addition of new watering zones.
- The product shall prevent data from being exported.
- The product shall retain past watering schedules and parameters for a month so that a user can easily switch between settings.
- The product shall run on different control panels with different operating systems.
- The product shall display system parameters in a user-friendly interface.
- The product's user interface shall make use of graphics to make it more appealing to the user.
- The product shall prevent access to the user's confidential information by unauthorized parties.