**Assignment 3: Elevator System Controller in**

**Qt C++**

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With Assignment 2 you have delivered your first version of design to Raven Elevators Inc. (REI) and the company is confident that you can implement a high quality elevator control system in Qt C++. REI asks you to proceed with the implementation and testing. Understanding that design is typically fine-tuned during implementation, REI also asked you to update the documentation. You will be delivering use cases, design documentation, source code, tests and traceability matrix.

Learning objectives:

* Exploring Qt architecture and functionality
* Implementing an elevator system controller using Qt C++ and updating your design as needed
* Implementing variability in elevator allocation strategy
* Building a requirements traceability matrix

Deliverables:

* Use cases (can borrow from A1 & grading feedback)
* Design documentation – structure and behavior – updated as needed (can borrow from A2 & grading feedback)
  + UML Class diagram
  + Sequence diagrams for these scenarios: 2 scenarios for the basic use cases for 2 of the strategies and 5 safety features scenarios (total of 7 sequence diagrams)
  + Activity or state diagram
  + Textual explanation of your design decisions
* Implementation
  + Source code of your Qt C++ project
  + Tests based on scenarios specified in design
  + Your implementation should have 1) a GUI that drives the program and 2) console output to display events such as floor button presses, elevator arrives, door opens, etc.
* Traceability matrix (can borrow from A2 & grading feedback)
  + Update the traceability matrix from A2 to include “implemented-by” and “tested-by” columns

**Use CASE 1: Operating the Oasis Pro**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned off

Minimal guarantees:

Success guarantees: Device works and shuts down when done

Trigger: user uses oasis pro

Main success scenario:

1. User inserts the battery
2. User presses power button to turn on device
3. CES device gets powered on
4. Display menu shows
5. Battery level indicates the remaining battery
6. User selects session length
7. User selects a session type
8. Electrical connection gets tested
9. User adjusts intensity
10. Session begins
11. Session finishes
12. Device shuts down when completed session

Extensions:

5a. If battery level drops below critical level, then warning message “low battery” is shown

6a. If user selects session length from menu, go to use case 2

7a. If user selects session type from menu, go to use case 3

8a. If user selects connect test, go to use case 4

9a. If user selects intensity from menu, go to use case 5

10a. If user selects ending a session from menu, go to use case 6

11a. If user holds select button to save user preferences, go to use case 7

**Use CASE 2: Select Session Length**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned on and session length selected from menu

Minimal guarantees: Device shutdown

Success guarantees: Sets session length

Trigger: user selects session length from menu

Main success scenario:

1. User is given a list of session lengths (4 presets)
2. User selects a length from the list by using the navigation buttons and presses OK to confirm
3. Frequency and mode icons associated with session lights up to indicate it being used
4. Back to use case 1 step 7

Extensions:

2a. If no number is lit, then group has no sessions programmed into it

**Use CASE 3: Select Session Type**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned on and session length selected from menu

Minimal guarantees: Device shutdown

Success guarantees: Sets session type

Trigger: user selects session length from menu

Main success scenario:

1. User is given a list of session types (4 presets)
2. User selects a type from the list by using the navigation buttons and presses OK to confirm
3. Frequency and mode icons associated with session lights up to indicate it being used
4. Back to use case 1 step 8

Extensions:

**Use CASE 4: Connection Test**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned on and session starting

Minimal guarantees: Device shutdown

Success guarantees: Connection is good

Trigger: user selects session

Main success scenario:

1. Device checks for electrical connection
2. Status of connection is displayed
3. Back to use case 1 step 9

Extensions:

1a. If ear clips are disconnected, device with pause session and wait for ear clips reconnection

**Use CASE 5: Selecting Intensity**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned on and session starting

Minimal guarantees: Device shutdown

Success guarantees: Intensity selected

Trigger: user starts session

Main success scenario:

1. Display shows intensity level
2. Intensity adjusted by user using up and down buttons
3. Back to use case 1 step 10

Extensions:

**Use CASE 6: Saving User Preferences**

Primary Actor: User

Scope: CES Device

Level: User Goal

Stakeholders and Interests:

User – wants to use the device

Device – works as intended

Precondition: CES device is turned on and session done

Minimal guarantees: Device shutdown

Success guarantees: Preferences saved

Trigger: user starts session

Main success scenario:

1. User holds select button for one second
2. Display shows an animation for saving preferences
3. Back to use case 1 step 12

Extensions:

**Traceability Matrix**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ID | Requirement | Related Use Case | Fulfilled By | Test | Description |
| 1 | Power: “Turn On/Turn Off” and “Ending A Session” as described on p4 of the manual | **Operating the Oasis Pro** | Battery, Power, Therapy, User, Session | Basic use | Basic use case of the CES device on/off. |
| 2 | Battery level: battery level and battery low warnings as per “Battery Level” section on p5 of the manual. Your simulation should handle battery depletion as a function of length of therapy, intensity, and connection to skin. | **Operating the Oasis Pro** | Battery, Power, User | Basic use | Basic interface for battery of CES device. |
| 3 | Selecting a session: as per “Selecting A Session” on p5 of the manual but only with 3 groups (20min, 45min and user designated) and 4 session types per group. You can choose any 4 types from p12 of the manual. | **Select Session Length** | Therapy, User, Connectivity, Frequency, Intensity, Session | Basic use | Basic use case of selecting a session |
| 4 | Connection test: as per “Connection Test” on p6 of the manual. | **Connection Test** | User, Connectivity | Basic use | Basic connection testing before a session |
| 5 | Intensity: as per “Adjusting Intensity” on p7 of the manual. | **Selecting Intensity** | User, Intensity, Session | Basic use | Basic use case of user adjusting intensity |
| 6 | Record: users can choose to record a therapy and add to treatment history. Therapy session information to be recorded: session type, duration and intensity level (if changed during therapy choose last selected intensity level). There would be additional interface needed beyond what Oasis Pro offers to implement this feature, and it is up to you  design it. | **Recording and Replaying Session** | Therapy, User, Frequency, Intensity, Session | Post session | Basic saving of session after a session is completed |
| 7 | Replay: users can replay selected treatments from history of treatments. | **Recording and Replaying Session** | Therapy, User, Frequency, Intensity, Session | Replay button | Basic use of replaying previous sessions |