COMP3004 Team Project: Neureset Direct Neurofeedback EEG device

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Use Cases

Use case 1: A New Session

Primary Actor: Neureset User
Stakeholders and Interests:
User: wants to complete a session
Precondition: User selects ”New Session” from device menu
Success guarantees: Session successfully completed and recorded
Main success scenario:

1. Timer showing remaining session time is opened, enter standby until EEG contact initiated
2. Once EEG contact confirmed, blue light, start timer
3. Read signal from electrodes over 1 min to establish baseline dominant frequency
4. Add offset of 5Hz to baseline frequency and apply treatment every 1/16 of a second over 1 second, turn on green light for treatment duration
5. Repeat steps 3 and 4 three more times, increasing the offset frequency by 5Hz each time
6. Read all signals over 1 min to calculate final baseline frequency for each site
7. Save data for the before and after dominant average frequencies for each EEG site, as well as the time and date of the session
8. End session, turn off blue light

Extensions:
1a. If battery is low(15%): display battery low warning. If battery reaches 5%: display battery critical warning. If battery reaches 0%: delete current session data, display battery dead notification, and shut off.
1b. If 5 minutes pass and all electrodes haven’t been connected: the device turns off and current session data is erased.
2a. If contact is lost during session or user presses pause during session: pause session, flash red light, and start beeping until contact is reestablished. If contact is not reestablished after 5 min: the device turns off and current session data is erased.

Use case 2: Viewing Session Log History

Primary Actor: Neureset User
Stakeholders and Interests:
User: wants to view the session log
Precondition: User selects ”Session Log” from device menu
Success guarantees: User is able to view a list of sessions on the Neureset device
Main success scenario:

1. Display time and date of sessions
2. User can scroll through sessions
3. User can select a session to view log
    a. Opens file containing beginning and end baseline frequencies for that session

Extensions:
1a. If battery is low(15%): display battery low warning. If battery reaches 5%: display battery critical warning. If battery reaches 0%: display battery dead notification, and shut off.

Use case 3: Setting Time and Date

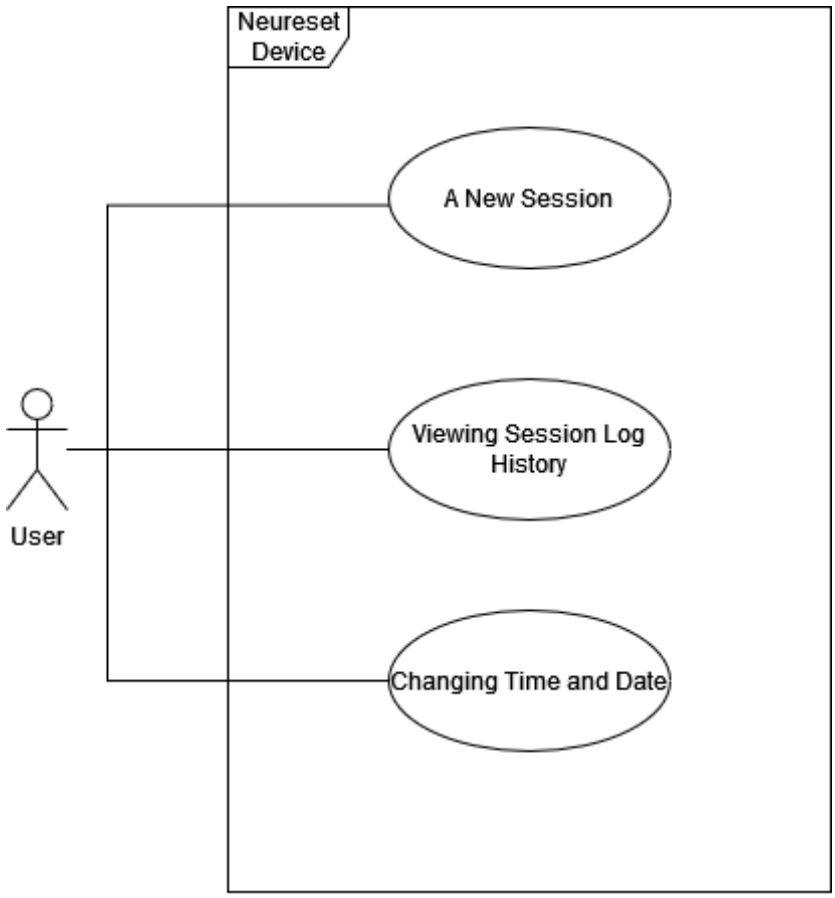
Primary Actor: Neureset User
Stakeholders and Interests:
User: wants to set the time and date
Precondition: User selects ”Time and Date” from device menu
Success guarantees: Time and Date are set
Main success scenario:

1. Display time and date
2. User inputs new time and date
3. New time and date are saved to system

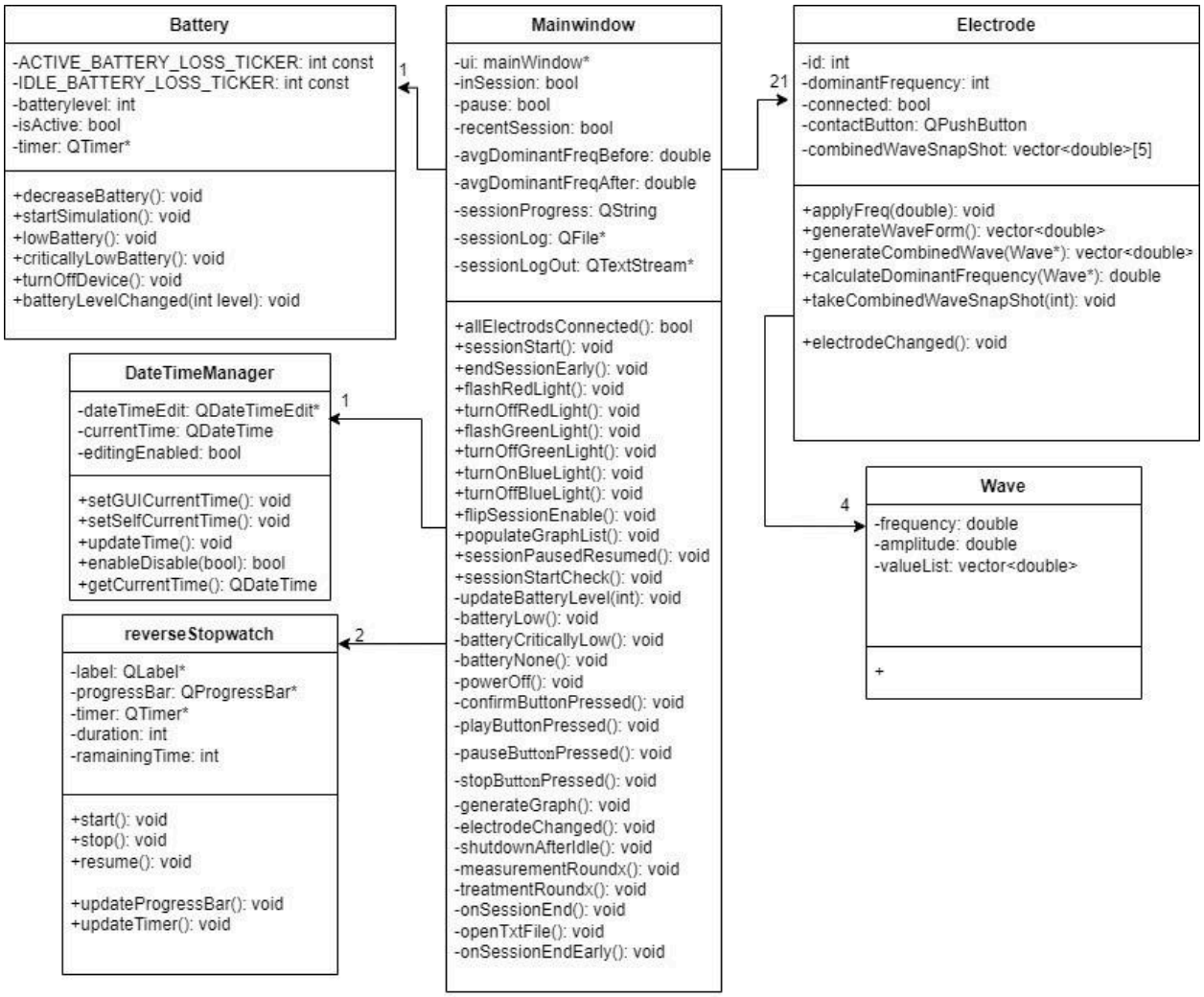
Extensions:
1a. If battery is low(15%): display battery low warning. If battery reaches 5%: display battery critical warning. If battery reaches 0%: display battery dead notification, and shut off.

Design decision notes:

Use Case Diagram

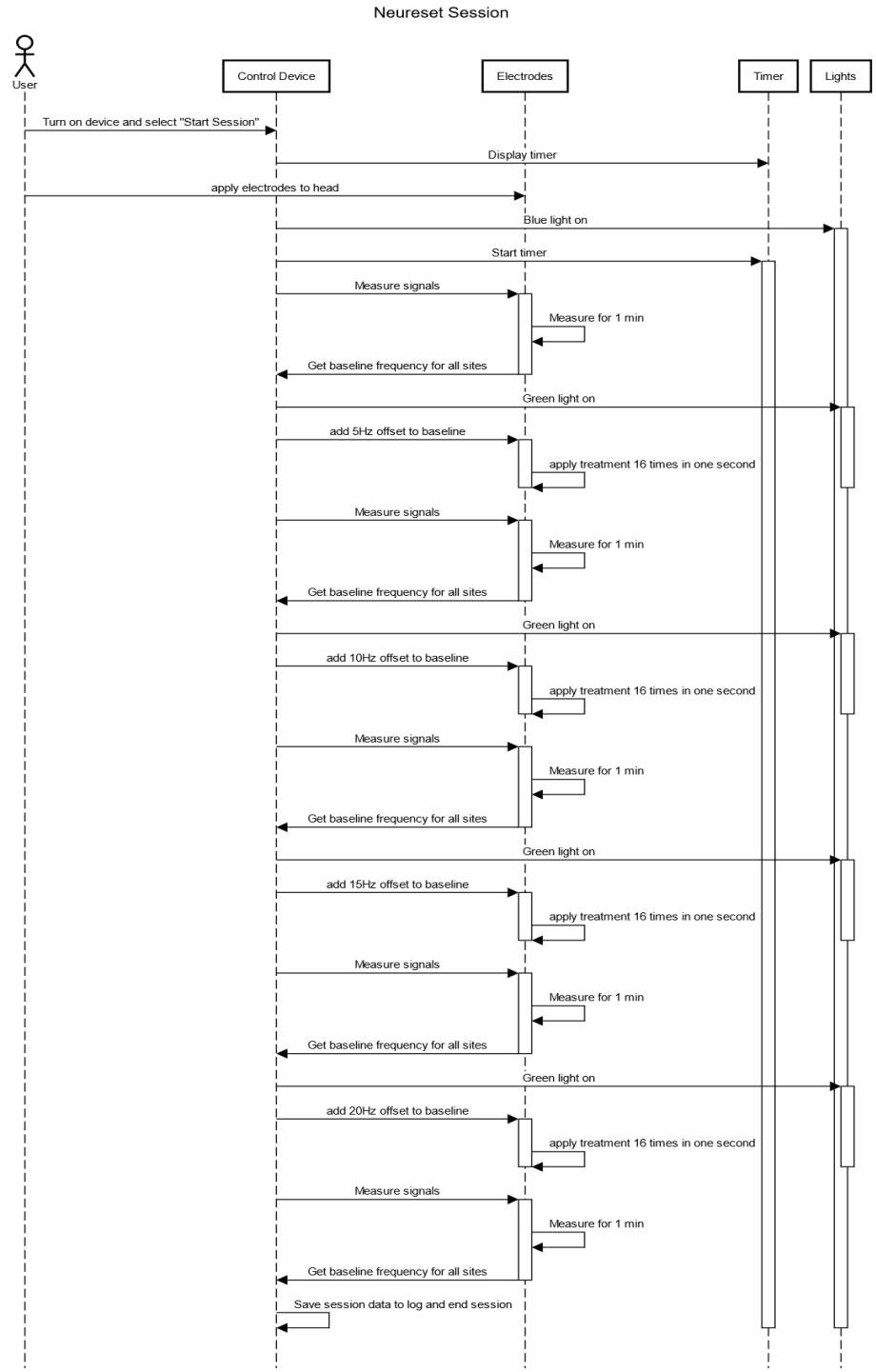


UML Class Diagram

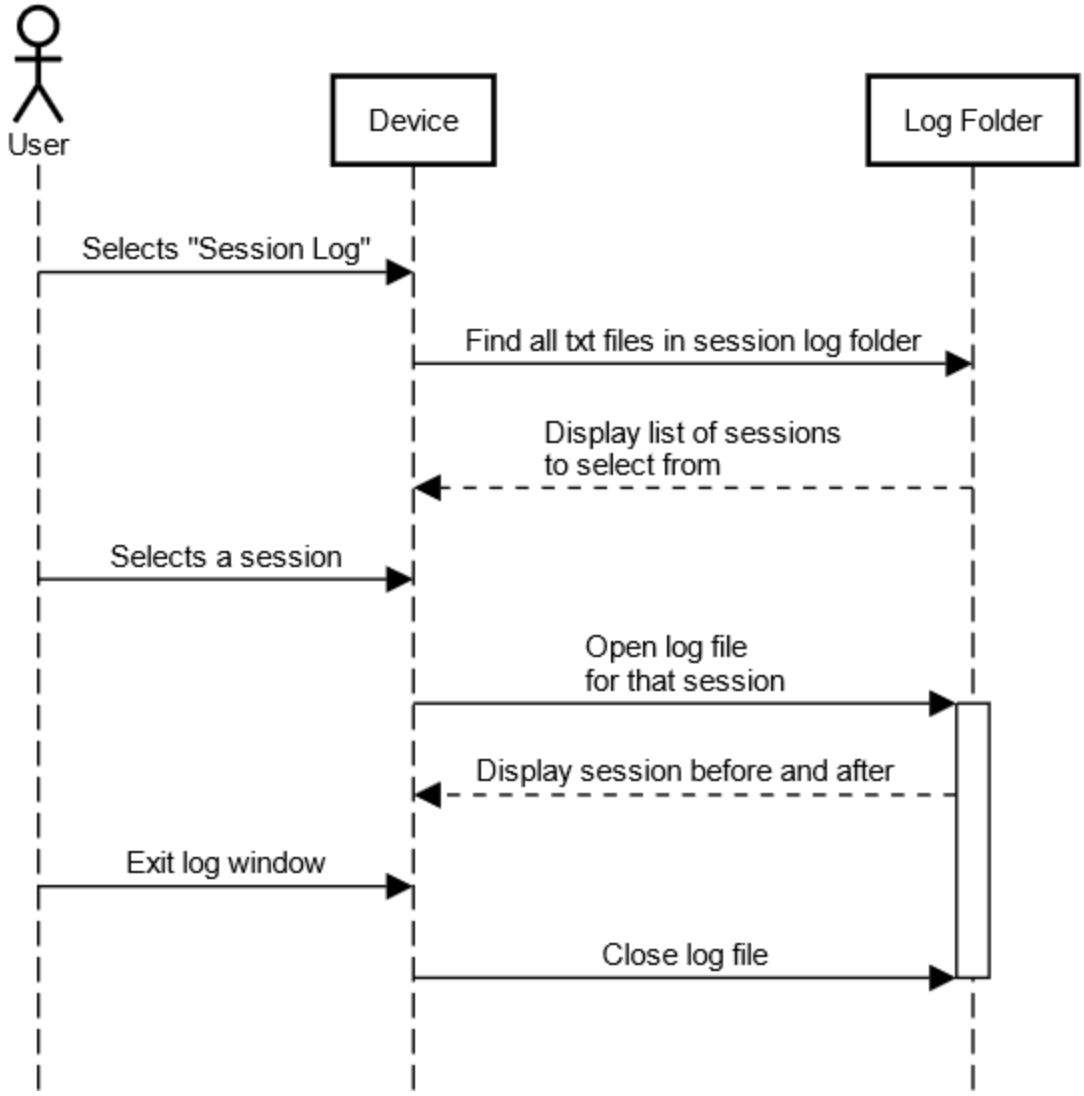


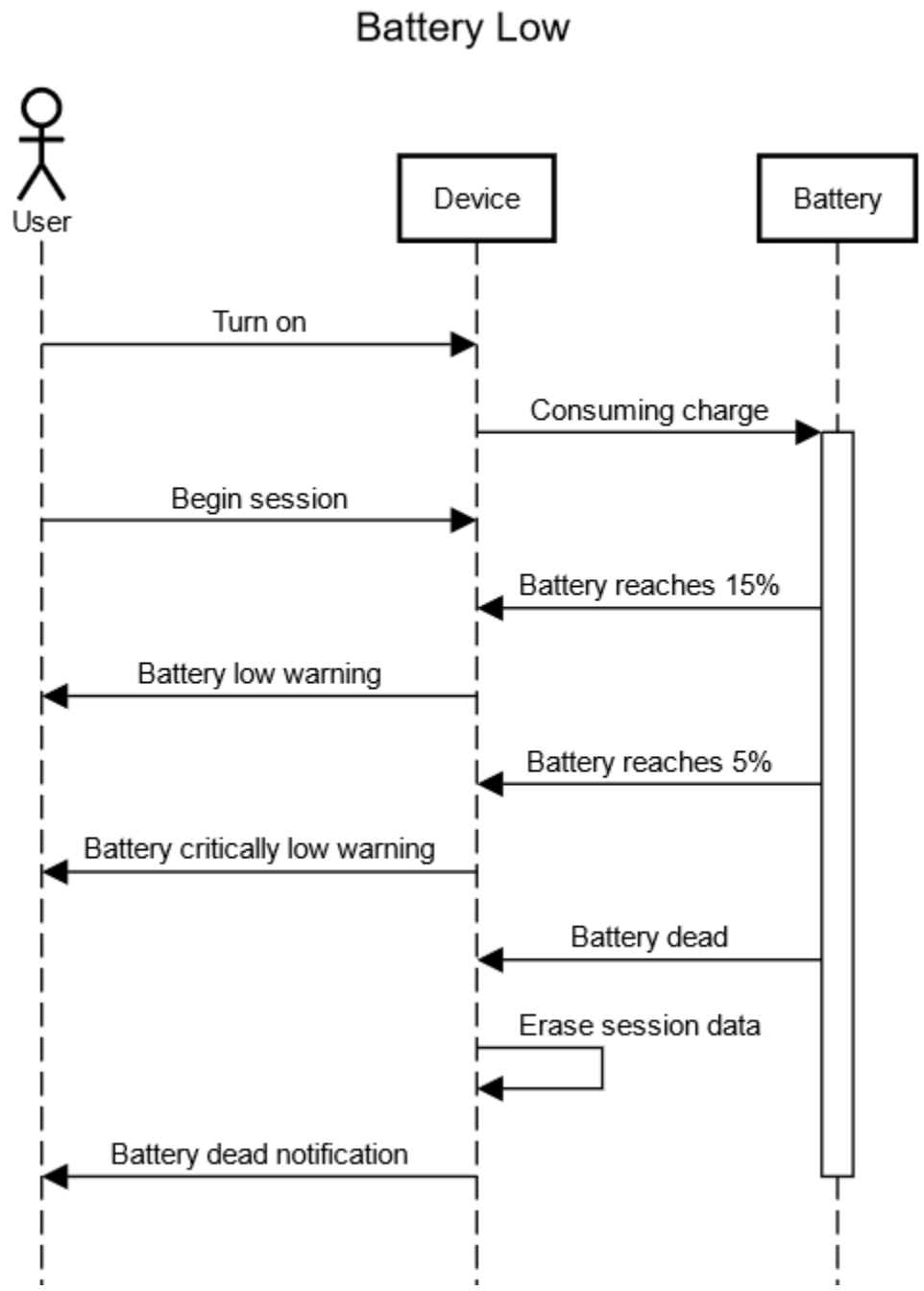
Sequence Diagram

Normal operation

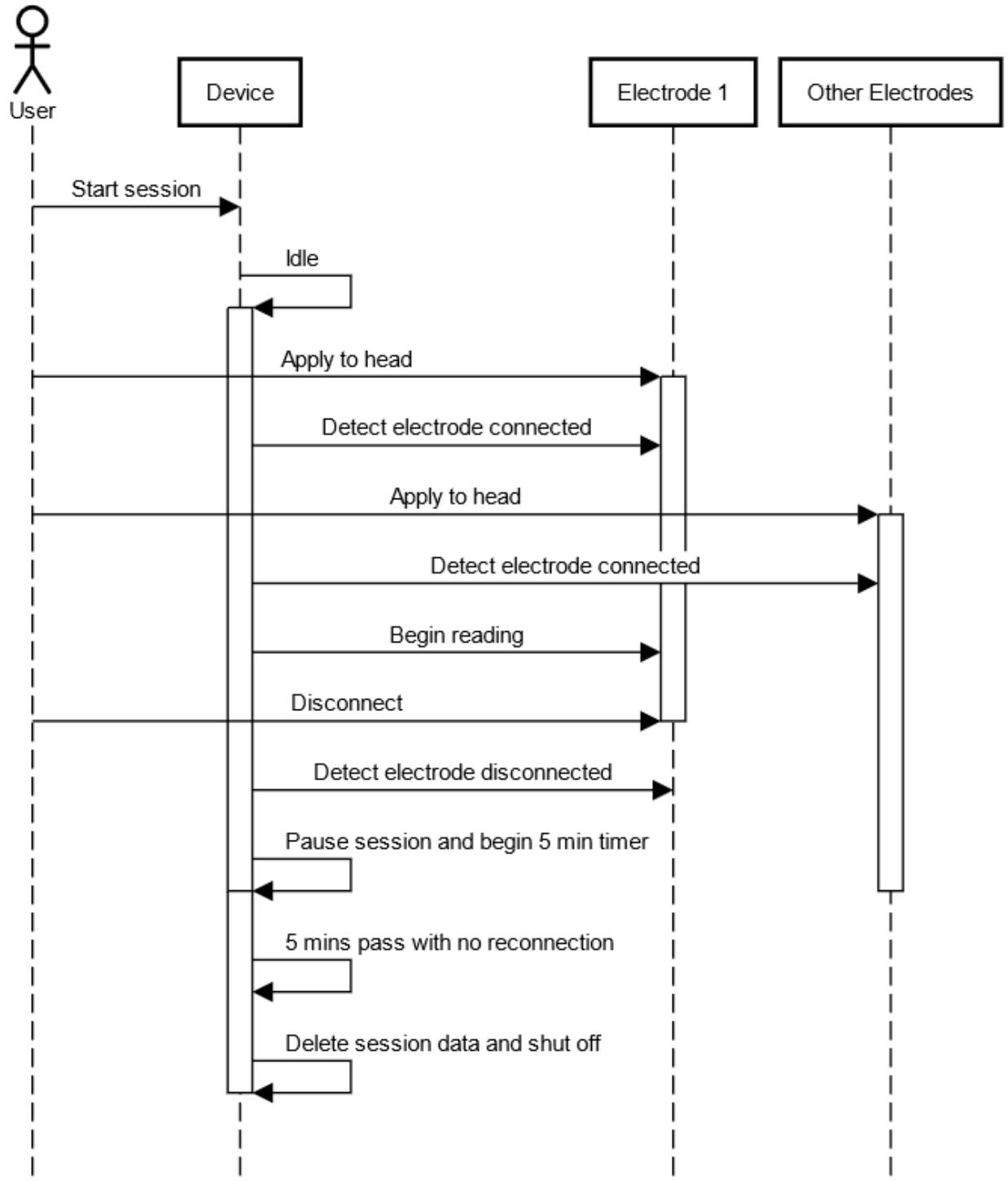


View Session Log

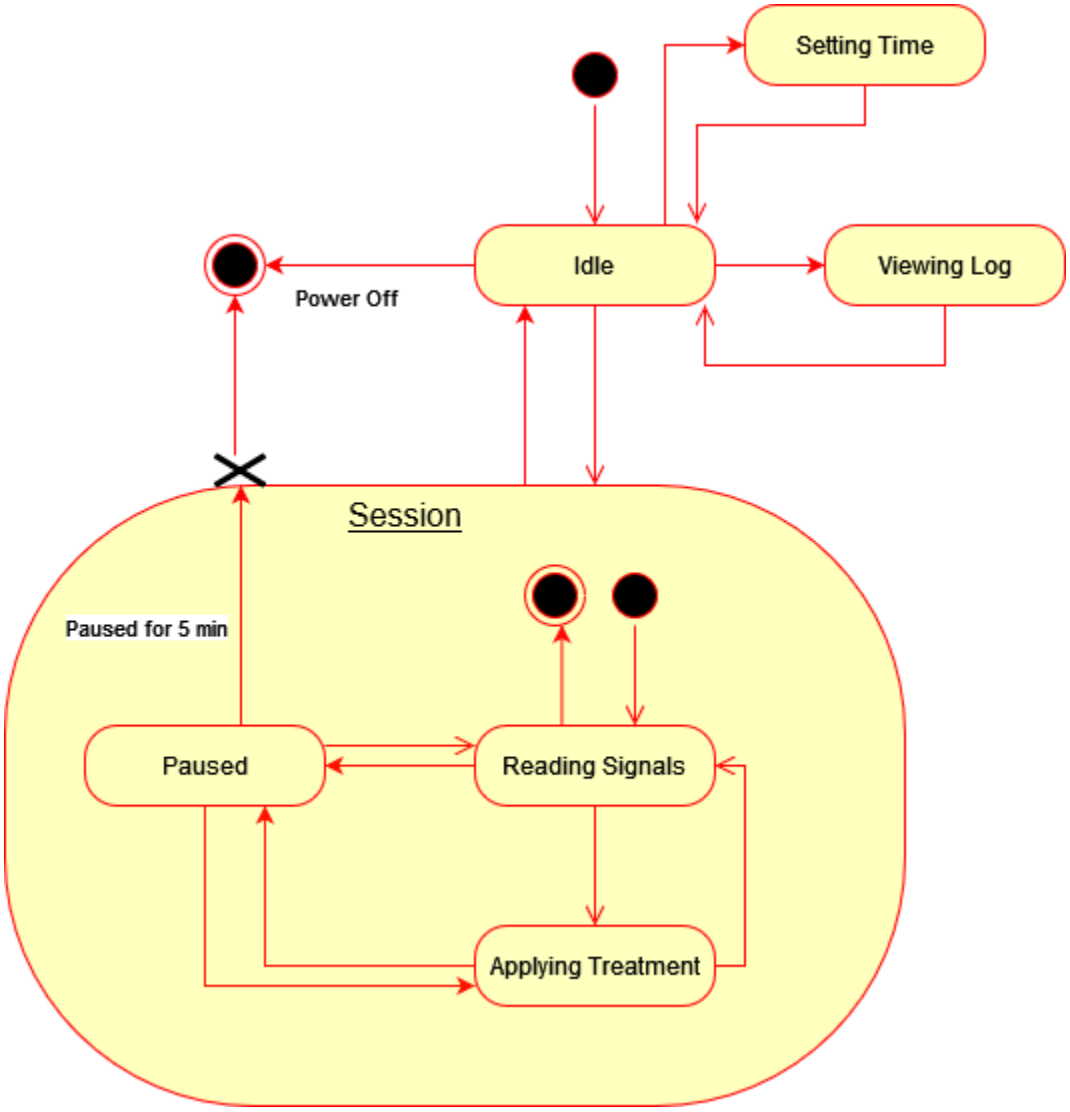



Battery Low
User
Device
Battery
Turn on
Consuming charge
Begin session
Battery reaches 15%
Battery low warning
Battery reaches 5%
Battery critically low warning
Battery dead
Erase session data
Battery dead notification

Connection Loss



State Machine Diagram



Requirements Traceability Matrix

ID	Requirement	Related Use Case	Fulfilled By	Implemented By	Tested By
1	User selecting “new session” starts a new treatment session	Case 1. precondition	Mainwindow	sessionStart()	Clicking the “new session” button initiated the session
2	Timer showing remaining session time during a session	Case 1. 1	Mainwindow ReverseStopwatch	inSession: bool sessionTimer	Timer appears during session and changes back to default timer during pauses
3	Connect electrodes to participant and have it shown on UI to start session	Case 1. 1	Mainwindow Electrode	allElectrodsConnected() electrodeChanged()	Clicking connect on each electrode properly activates each electrode and enables starting the session
4	Read signals from the electrodes to get dominant frequency	Case 1. 3	Mainwindow Electrode	measurementRound() calculateDominantFrequency()	Running the session and checking the frequencies of each electrode after measurement round 1 and that they properly create the dominant frequency
5	Apply treatment using the electrodes applying a 5Hz offset of the dominant frequency over 1 second 16 times	Case 1. 4	Mainwindow Electrode	treatmentRound() applyFreq()	Print dominant frequency before and after the treatment is applied
6	Save frequency signals into the session logs	Case 1. 7	Mainwindow	onSessionEnd() sessionLog()	Run a full session then check the session log to see if it is saved properly
7	Turn on blue light during session	Case 1. 2	Mainwindow	turnOnBlueLight()	Start session to check blue light

ID	Requirement	Related Use Case	Fulfilled By	Implemented By	Tested By
8	Turn on green light during treatment	Case 1. 4	Mainwindow	flashGreenLight()	During the treatment check if green light is on
9	Flash on red light while contact lost	Case 1. 2a	Mainwindow	flashRedLight()	Disconnect electrodes to see if red light turns on
10	Display battery level	Case 1.	Mainwindow Battery	updateBatteryLevel() Battery in Main window	Make sure battery goes down during session and while idle
11	If battery is low 15%: display battery low warning.	Case 1. 1a	Mainwindow Battery	batteryLow() lowBattery()	Make sure battery is at 15% when the popup happens
12	If battery reaches 5%: display battery critical warning.	Case 1. 1a	Mainwindow Battery	batteryCriticallyLow() criticallyLowBattery()	Make sure battery is at 5% when the popup happens
13	If battery reaches 0%: display battery dead notification, and shut off	Case 1. 1a	Mainwindow Battery	batteryNone() powerOff()	Make sure battery is at 0% when the popup happens
14	User selecting ”Session Log” from menu does the following: Display time and date of sessions and Scroll through sessions.	Case 2. Precondition 1, 2	Mainwindow	confirmButtonPressed()	Run a few sessions then select the session logs and make sure they appear on the sessions log menu
15	User can select a session to view log	Case 2. 3	Mainwindow	confirmButtonPressed()	Run a few sessions then select the session logs to make sure they saved and are selectable
16	User selects ”Time and Date” from device menu: Displays time and date	Case 3. Precondition, 1	Mainwindow DateTimeManager	confirmButtonPressed()	Select “time and date” button in menu to see time and date

ID	Requirement	Related Use Case	Fulfilled By	Implemented By	Tested By
17	When the user inputs a new time and date. New time and date are saved to the system.	Case 3. 2,3	Mainwindow DateTimeManager	confirmButtonPressed() updateTime()	Attempt to put in a new time and date to see if it works
18	Making sure a session applies 4 sets of treatments	Case 1. 5	Mainwindow Electrode	measurementRoundx() treatmentRoundx()	Check the logs to check if the frequencies properly change during each treatment
19	After 5mins without all electrodes connected device turns off	Case 1. 1b	Mainwindow	endSessionEarly()	Wait 5 minutes in idle to check the endSessionEarly() function