

Use Cases:

Use Case 1: User Initiates Session

Primary Actor(s): User, NeurofeedbackSystem

Description: The user begins a new neurofeedback session using the Neureset device, initiating the software's session management process.

Stakeholder and Interests:

- **User:** Successful start and conduct of the neurofeedback session for therapy or cognitive enhancement.
- **NeurofeedbackSystem:** Efficient session initiation, ensuring all system checks are passed and user settings are applied.

Preconditions:

- Device is powered on and functional.
- User is wearing the EEG headset correctly.

Success Guarantee(s):

- Session begins with all necessary preliminary checks (e.g., device connection, battery status) completed successfully.

Main Success Scenario:

1. User selects the option to start a new session from the device UI.
2. NeurofeedbackSystem performs initial checks, including device connection and battery status.
3. System loads user-specific settings and preferences.
4. Baseline calculations for each EEG site are initiated.
5. Real-time session progress is displayed on the device, marking the session as active.

Use Case 2: System Calculates Overall Baseline for All EEG Sites

Primary Actor(s): NeurofeedbackSystem

Description: Before the treatment application, the system calculates a baseline for each of the 21 EEG sites to establish a reference for the session's neurofeedback intervention.

Stakeholder and Interests:

- **User:** Accurate baseline measurement for effective treatment.
- **NeurofeedbackSystem:** Precise calculation of baselines for optimal treatment application.

Preconditions:

- Session has been initiated.
- EEG headset is properly connected.

Success Guarantee(s):

- Baselines for all EEG sites are accurately calculated and recorded.

Main Success Scenario:

1. The system reads EEG signals from the headset.
2. Calculates the average dominant frequency for each EEG site over a period of five seconds.
3. Stores the baseline data for each site to use in treatment application.

Use Case 3: Treatment Application and Session Completion

Primary Actor(s): NeurofeedbackSystem

Description: The system applies the LENS treatment protocol to each EEG site based on the previously calculated baselines and concludes the session with comprehensive data logging and reporting, ensuring all data is properly saved and available for review.

Stakeholder and Interests:

- **User:** Seeks an effective and safe treatment, followed by a detailed summary of the session's outcomes for better understanding and future planning
- **NeurofeedbackSystem:** Aims to deliver accurate and timely neurofeedback treatment and ensure session data is thoroughly logged and securely stored.

Preconditions:

- Baselines for all EEG sites have been calculated.

Success Guarantee(s):

- Each EEG site receives treatment according to the LENS protocol.
- The session concludes properly, with all data securely logged and ready for review.

Main Success Scenario:

1. Treatment Initiation:

- The system reads EEG signals from the headset.
- Calculates the average dominant frequency for each EEG site over a period of five seconds.
- Stores the baseline data for each site to use in treatment application.
- Begins treatment applications for the round's EEG sites.
- Applies the round's offset frequency to the baseline frequency every 1/16th of a second over a duration of 1 second concurrently on all 21 EEG sites.
- User is informed of the treatment delivery through UI indicators.

2. Session Completion:

- Treatment application completes for all EEG sites or the user ends the session manually.
- System calculates post-treatment baselines.
- Session data, including pre- and post-treatment baselines, treatment specifics, and performance notes, is saved by the system.

- The user accesses the session log history through the device or PC UI for review.
- The system provides a session summary to the user.
- System resets for the next session or shuts down, ensuring all critical operations have been concluded.

Extensions/Alternatives:

- **User or System Initiated Early Termination:** If a session needs to be terminated early due to user request or system-detected issues (like disconnection or power loss), the system handles the termination.

Use Case 4: Comprehensive Data Logging, Review, and Therapy Planning

Primary Actor(s): User, Therapist (optional), NeurofeedbackSystem

Description: Following the completion of a neurofeedback session, the system logs detailed session data for later review. The user, possibly with a therapist, reviews this data to monitor progress, understand the therapy's effectiveness, and plan future sessions.

Stakeholder and Interests:

- **User:** Desires a thorough understanding of therapy progress and session outcomes to guide future sessions.
- **Therapist (optional):** Seeks to provide professional analysis and recommendations based on detailed session data to optimize the therapy plan.
- **NeurofeedbackSystem:** Ensures accurate and comprehensive data logging for effective review and planning.

Preconditions:

- A neurofeedback session has been completed and logged.
- The user opts for a review, independently or with a therapist.

Success Guarantee(s):

- Session data is securely logged, facilitating review and informed therapy planning.

Main Success Scenario:

1. Session data, including pre- and post-treatment baselines, treatment specifics, and performance notes, is saved by the system.
2. The user accesses the session log history through the device or PC UI for review.
3. For reviews involving a therapist:
 - a. The user shares the session data with the therapist, either in-person or via a secure digital platform.
 - b. The therapist provides insights and recommendations, utilizing the session data to advise on adjustments or confirmations of the treatment plan.
3. For independent reviews:
 - a. The user assesses their progress or plans for future sessions based on this data.
4. Any insights, recommendations, or therapy plan adjustments are logged for future reference.

Extensions/Alternatives:

- **Remote Therapy Session Review:** If a therapist is involved but cannot meet in person, with data shared electronically.

Use Case 5: Handling Device Disconnection

Primary Actor(s): NeurofeedbackSystem

Description: The system detects and responds to a disconnection between the EEG headset (electrodes) and the device, ensuring the session can be safely paused or terminated.

Stakeholder and Interests:

- **User:** Ensures the session is safely paused or terminated in case of disconnection, preventing incomplete treatment.
- **NeurofeedbackSystem:** Maintains session integrity and safety by responding promptly to hardware disconnections.

Preconditions:

- A neurofeedback session is actively in progress.

Success Guarantee(s):

- The system alerts the user and manages the session appropriately in case of disconnection.

Main Success Scenario:

1. The system detects loss of connectivity with the EEG headset.
2. The user is alerted via the UI.
3. The system attempts to re-establish connection for a predefined timeout period.
4. The session is safely terminated.

Use Case 6: Handling Power Loss or Low Battery

Primary Actor(s): NeurofeedbackSystem

Description: The system detects low battery levels or imminent power loss and ensures the session is ended safely.

Stakeholder and Interests:

- **User:** Assurance that sessions are not abruptly interrupted and data is not lost due to power issues.
- **NeurofeedbackSystem:** Efficient management of device power to prevent sudden shutdowns.

Preconditions:

- The device is powered on and a session is in progress or about to start.

Success Guarantee(s):

- The device conserves enough power to safely end the session and alerting the user appropriately.

Main Success Scenario:

1. The system continuously monitors the device's battery level during a session.
2. Upon detecting a critical battery level, the system alerts the user.
3. The device shuts down safely after ensuring all critical operations have been concluded.