

Explanation of design choices

Below is a textual explanation as to what each class does to bring together a device called Neureset. This device is based off of LENS Neurofeedback system and is designed for a hypothetical consumer EEG direct neurofeedback. It can treat a variety of conditions like- ADHD, PTSD, TBI, anxiety, etc. It makes use of brain function and cognitive performance of humans. Below is the class-wise explanation of classes used to code this device out.

1. MainWindow:

- Manages the main user interface of the Neureset device.
- Controls menu options such as starting a new session, viewing session logs, and setting date/time.
- Handles session progress display, including timers, progress bars, and session status lights (blue, red, green).
- Manages session interactions like starting, pausing, stopping, and handling contact loss scenarios.

2. GraphWindow:

- Represents a separate window/widget for displaying EEG waveforms and treatment progress graphs.
- Provides a graphical interface for visualizing brain wave data during treatment sessions.

3. Electrode:

- Represents an EEG electrode used in the Neureset system.
- Generates random amplitude and frequency values for different brain waves (alpha, beta, delta, theta).
- Calculates and manages dominant frequencies based on amplitude and frequency data.

4. CentralProcessor:

- Acts as the central control unit for the Neureset device.
- Manages a collection of electrodes and their interactions during treatment sessions.
- Calculates baseline frequencies and amplitudes for individual EEG sites and overall baseline for all sites.
- Controls treatment rounds by adjusting electrode frequencies and handling session data.
- Communicates with UI classes to update graphs, display session logs, and manage device operations.

These classes work together to simulate the behavior and functionality of the Neureset device, including user interaction, session management, EEG data processing, and treatment delivery. Classes interact among each other in the following way:

1. Starting a New Session:

- User interacts with the MainWindow UI to start a new session.
- MainWindow communicates with CentralProcessor to initiate the treatment session by calling `applyFullTreatment()`.
- CentralProcessor manages the treatment rounds for all electrodes. It performs calculations to obtain their frequency and amplitude, which is then used by the CentralProcessor class to calculate the starting and ending baseline amplitudes and frequencies,

- CentralProcessor updates UI elements (such as progress bars, lights), and informs GraphWindow to display treatment progress. The CentralProcessor class sends a signal to the MainWindow with this information in order to create the dominant frequency graph in the UI.
 - When graphs for the individual electrodes are required, the MainWindow class requests the required info from the CentralProcessor class, which sends a signal with the individual electrode graph info for MainWindow to update the graph.
2. Handling Contact Loss:
- If contact is lost, CentralProcessor triggers alerts and manages the pause/beeping behavior.
 - MainWindow updates UI elements (lights, alerts) based on contact status.
3. Viewing Session Logs:
- User requests to view session logs through MainWindow.
 - MainWindow communicates with CentralProcessor to retrieve session log data.
 - CentralProcessor accesses saved session data and provides it to MainWindow for display.
4. Setting Date/Time:
- User updates date and time settings through MainWindow.
 - MainWindow updates the device clock and manages time-related functionalities during sessions.