Team 24

Design Choices For Neureset Device Simulation

The main goal while designing the Neureset Device was to create an easy-to-use and effective interface that manages EEG waveforms during therapy sessions provided to patients. We wanted to focus on creating an interface that has no issues and can store and display the required data effectively so it results in a high user experience. Our design uses a centralized control system with one entity, the mainwindow class.

This class is responsible for managing all major interactive elements, such as buttons, timers, charts, indicators, and displays, which are essential for controlling the EEG waveform generation and session management in real time. It handles user interactions which includes capturing and responding to user inputs. It does this through buttons (up/down selectors for the menu) and actions (starting a new session, setting a date & time, and viewing log history). It also updates and manages elements such as progress bars, battery depletion, and real-time timer and clock displays. The mainwindow is also responsible for displaying the EEG data in real-time through the logging file. Some other significant files include the waveform_generator which is responsible for generating the waveform based on the specific electrode. We generated the Delta, Theta, Alpha, Beta, and Gamma waves based on the frequencies and amplitudes provided. The EEG graph starts from the simplest band and increases based on frequency for all 7 electrodes while taking each of the baseline/dominant frequencies into consideration.

The user interface, built using the Qt framework, is straightforward and user-friendly. It includes a main menu with three options: new session (starts a new session), session log (for viewing session history and date and time (updating date or time). We have added lights to indicate whether a session is running contact on (blue), contact off (red), and in progress (green). The UI also has a battery progress bar that shows the battery percentage and a power source button that lets the user charge the device if the battery is too low. There is a PC QTextEdit widget that is responsible for displaying all of the treatment session data which includes the dominant frequency calculations and session numbers. The treatment data is being logged in a .txt file as the session is running.

For testing and demonstration purposes within this project, we have intentionally reduced the treatment times of the Neuroset device to facilitate quicker cycles and evaluations. For example, the device is supposed to work for 21 EEG sites but we have reduced it to 7. The treatment session time is also reduced to 2 minutes and 21 seconds. Where the first minute is for the initial scan, 21 seconds to implement the treatment, and the remaining 1 minute is to analyze the sites. This adjustment helps streamline the testing process. Additionally, we also reduced the contact-off timer from 5 minutes to 20 seconds before powering off for efficiency when testing.

Our device also includes features like real-time adjustments to date and time, which help in scheduling and ensuring the accuracy of historical data. There's also a feature to review past session logs directly in the application, allowing users to look at previous sessions and plan future sessions accordingly.

All of the design choices mentioned above make the Neureset Device not only functional and reliable but also a versatile tool that will aid in research and treatment.