Frequency Analysis Using a Spectrogram

By: Michael Natenzon

October 5, 2016

1 PseudoCode

1.1 Inputs - All Numerical - "N" defined number of time points

- Time (Milliseconds)

  | Range: TimeLower - TimeUpper |

  | N = TimeUpper - TimeLower |

- Amplitude (μV)

1.2 Outputs - Spectrogram

- Time (Milliseconds) - X-Axis

  | Range: TimeLower - TimeUpper |

- Frequency (Hz) - Y-Axis

  | Range: FreqLower - FreqUpper |

- Power (μV^2) - Color Intensity
- Plot Title
- X/Y Axes Labels with Units
- Legend for Color Intensity

1.3 Function Name

- FFTandSpectrogram

1.4 Step-by-Step Instructions

1. Import Amplitude vs. Time (N time points [TimeLower to TimeUpper]) from 1 electrode into matrix
2. Apply FFT to data to generate Power vs. Frequency matrix
3. Plot Frequency (FreqLower - FreqUpper) on the Y-Axis vs. (TimeLower to TimeUpper) on the X-axis vs. Power as color intensity

   The power at a given time: Find the frequency at time point. It is mapped to the power through FFT.
4. Add X/Y-Axis (with units) labels
5. Add color legend for power (μV^2)
6. Add Title Indicating Electrode

2 Simulations

2.1 Is Everything Plotted Correctly?

1. Plot imported data from one electrode as Amplitude vs. Time (Plot 1)
2. Plot result of FFT as $\sqrt{Power}$ (ie. Amplitude) vs. Frequency (Plot 2)
3. Plot result of FFT as Power vs. Frequency (Plot 3)
4. Identify amplitude at a given time in plot 1. Find the amplitude in plot 2 and identify the associated frequency. Find this frequency in plot 3, and determine the associated power
5. Check that the spectrogram produced has all 3 data point (time, frequency, power) values correctly represented
6. Repeat steps 4 and 5 on two additional time values