

SOFTWARE

- **Arduino** is a powerful microcontroller. We use one to process the data from the brainwaves. Arduino offers a Fast Fourier Transform (FFT) package that we utilized to extract the dominant brain waves from the noise created by grid power interference and other environmental factors, and then transmit that data wirelessly. The receiver also employs an Arduino to control the pumps. The code allows for an AC signal coming from the brain to be converted into a pulse-width modulator, which can then be used to control the pumps. Moreover, the code allows for a visualization of the actual brain wave by plotting to an LCD screen.
- **Fritzing** is a schematic drawing software with a library of electrical components to choose from. We used this software to draw our circuit diagram.
- **Python**, is a high-level programming language used for mathematics simulations. We mainly used it to check our mathematical analysis for each stage of the circuit. We also used python to test the Fourier Transform by simulating the noise simultaneous to waves with a definite frequency. The FFT software flawlessly detected the dominant frequency.
- **NI ELVIS** (National Instruments Educational Laboratory Virtual Instrumentation Suite) was the main software used throughout the EEG project. NI ELVIS has numerous tools, including but not limited to: oscilloscope, bode plot, digital multi-meter (DMM), function generator, and data logger. We used these tools for testing variables, as well as for troubleshooting, each individual stage of the circuit to ensure the results matched with the theory and our mathematical analyses.
- **Bode Plot** was invented by engineer Hendrik Wade Bode in the 1930's. These plots show a frequency response by plotting a wide range of frequencies on the x-axis versus a wide range of gains on the y-axis. This can be done by hand, but is time consuming, laborious and prone to human error. In one touch the Bode Analyzer is able test a wide range of frequencies and plot the gain responses on one graph. This creates clear picture of the behavior of a circuit.