FFT Information

Audio 11 Group | October 21, 2019

This project uses four of the functions within the arduino.FFT library, including the functions Windowing, Compute, ComplexToMagnitude and MajorPeak. These functions call other functions occasionally, and they will be mentioned if necessary as well.

The Windowing function runs a loop equal to the number of samples required. During this loop, the specified windowType is what dictates the weighingFactor. Lastly, it checks whether or not the direction is forward, and if it is, do a compound multiplication with the current sample and the weight factor, as well as the sample equidistant from the other end of the data since the weighing function is symmetric.

The Compute function uses the real and imaginary data to compute an FFT. Reverse bits calculates the FFT using a nested loop that compares the real values to the imaginary values. The FFT then must perform a bit reversal sorting algorithm in order to have a time domain decomposition, meaning the bits are flipped left for right. Then, the frequency spectra is put back into the exact reverse order that the decomposition took place.

The ComplexToMagnitude function takes the magnitude of each complex number.

The MajorPeak function checks all values of the data to find the highest peak, then finds what the interpolated X for that value would be. In other words, the function finds the value at which the amplitude should be plotted and returns that value to the arduino.

References: http://wiki.openmusiclabs.com/wiki/ArduinoFFT https://www.norwegiancreations.com/2017/08/what-is-fft-and-how-can-you-implement-it-on-anarduino/ https://www.nti-audio.com/en/support/know-how/fast-fourier-transform-fft https://www.dspguide.com/ch12/2.htm