MuseBox
An Audio Equalizer/Visualizer
Overview

♩ Read in frequency-domain analog sound wave
♩ Use FFT to convert frequency domain to time domain
♩ Equalize data in CPU by scaling
♩ Map changes in amplitude to visual screen
♩ Send to iFFT then to Audio Out
Design
FFT

Real Audio $\rightarrow$ FFT $\rightarrow$ Complex Frequency $\rightarrow$ IFFT $\rightarrow$ Real Audio
Visualizer

CPU (FFT) → Avalon MM → Visualizer

Address (Slot) → Avalon MM

Amplitude (Pixel Height) → Avalon MM

Slot → Visualizer

Pixel Height → Visualizer
Equalizer

Frequency Slots

31  72  150  250  440  630  1k  2.5k  5k  8k  14k  20k

CPU

Inverse Transform

Fourier Transform
Overlap Add Method