Semi-Parametric Equalizer using 20 Bands for Creating Arbitrary Frequency Responses

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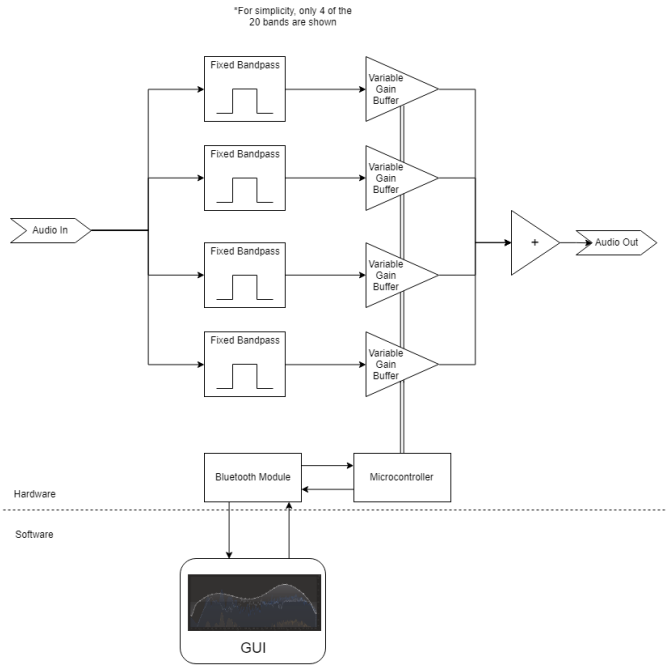

Many analog equalizers have only 3 bands, and offer relatively crude control over their frequency response. If one wanted to have finer-grained control over real-time audio, their current options are limited to large rack-mounted DSP units, expensive parametric equalizers tailored for profession applications, or software plugins. There is a current lack of affordable options for prosumers who want finer-grained control over real-time audio. The goal of this project was to create a small and relatively inexpensive semi-parametric equalizer to fill this niche.

The QWit allows the user to program nearly any arbitrary frequency response. Despite being digitally programmable, all equalization is done using analog filters, avoiding the delay associated with digital signal processing.

This is accomplished by using 20 second-order bandpass filters, where the gain of each filter is controlled by digitally-programmable potentiometers. Due to the large number of bands, the ability to control the gain of each allows the user to closely approximate almost any frequency response. Futhermore, the large number of bands negates the need for programmable Q control, which would have been expensive to implement.

The user is able to create the desired frequency response via the GUI on their computer or smartphone, which then computes the necessary band gains and sends the required potentiometer settings to the on board micro-controller. These settings are saved in EPROM, so that they can be automatically restored in the case of a power cycle.