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Introduction to Microprocessors and Multimedia

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Parametric Equalizer: User Manual

INTRODUCTION

In audio systems, equalization is generally used to adjust the tone of audio signals to better fit a desired use scenario. For example, a building or venue might be designed without acoustics in mind, and therefore may make bass sound more apparent. An equalizer is one tool which can remedy this problem; perhaps it could be used to lower more bassy tones while emphasizing higher ones.

A parametric equalizer is a form of equalizer which contains three dials: center/altered frequency, width of frequency, and amplification/attenuation of frequency. These dials may be adjusted according to levels that most effectively benefit the user - in the above example, the center frequency could be tuned to a low frequency, the width tuned to a relatively high value, and the attenuation tuned such that the bass is less overwhelming.

The following user manual will describe the functionality of the parametric equalizer GUI as well as several cases in which this parametric equalizer may be useful.

GUI OPERATIONS

About the GUI

The Parametric Equalizer GUI contains several elements: FFT Graphs, sliders, an audio selector, a microphone feedback simulator, audio playback buttons, and an fvTool launching button.

The two FFT¹ Graphs describe the audio signal before and after a filter produced by the equalizer has been applied. The graph of the original signal displays the magnitude of the amplitude of the original audio sample, as well as a preview of the filter that is applied to the sample. The graph of the filtered signal displays the magnitude of the amplitude of the filtered audio sample.

The sliders allow one to design a filter such that certain ranges of frequencies will be attenuated or amplified. For more information on these parameters, please consult the Technical Manual.

The audio selector allows one to select an audio file they wish to modify as well as determine the duration of the audio.

The microphone feedback simulator checkbox applies a 400 Hz tone to the audio sample to imitate feedback produced by a microphone.

¹ An fft graph is a way of visualizing an audio signal. For more information, please consult the Parametric Equalizer Technical Manual.

The two audio playback buttons simply play the original and filtered signals as sound files when the “Play Original” and “Play Filtered” buttons are pressed.

Altering an audio file:

To alter an audio file, first select an audio file from the dropdown menu on the right. Select the amount of time for which the audio will play. Next, play the original audio to hear an unaltered version of the audio sample. Adjust the sliders and see the difference between the original audio file and the newly modified audio file on their respective fft graphs, and press “Play Filtered” to hear your altered audio file.

Viewing a notch filter in fvTool

To view a notch filter produced by slider alterations, simply click the “View fvTool” button on the GUI. To learn more about notch filters, please consult the technical manual.

PRACTICAL APPLICATIONS OF THIS GUI

Frequency-Sound Correlation²:

The following frequencies correspond to specific sounds which can be heard in the Parametric Equalizer’s playable audio files. Amplify or attenuate these frequencies to hear more of or diminish these sounds³: ~**300 Hz** corresponds to a male voice, ~**500 Hz** corresponds to a female voice, ~**150 Hz** corresponds to “booming” bass, ~**700 Hz** corresponds to “honking” sounds, particularly guitar, >**1600 Hz** corresponds to a violin

Suppressing Microphone Feedback:

Oftentimes when working with audio systems in concert settings, theaters, or even lecture halls, microphone feedback is a massive issue, as it is obnoxious and distracts listeners. Use of a Parametric Equalizer can help silence microphone feedback.

To simulate microphone feedback in a selected audio sample, click the “Simulate Microphone Feedback” checkbox. This adds a 400 Hz tone to the sample to mimic microphone feedback. Play your audio sample using the “Play Original” button to hear the effects of the feedback.

To suppress this feedback, adjust the sliders into the positions as follows:

1. Altered Frequency: 400 Hz
2. Width: .1
3. Amplification/Attenuation: -50 dB

² Helpful graph at <http://www.fourmasterscaraudio.co.uk/caraudio/mid-range-frequencies-in-car-audio-systems/>

³ If a change is difficult to hear, consider expanding the width of the altered frequency or varying the amplification/attenuation.