

# Work Diary on Equalizer Project

Jacob Møller  
Aalborg University  
Sound Processing

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# Todo list



**Part I**

**2014**





# Chapter 1

## September

### 1.1 September 25, 2014

The project is planned to be carried out as a mini-project. A mini project is required as an evaluation subject for discussion at the examination. A parametric equalizer is normally the first step after the gain control in an audio-mixer channel. Therefore, it is of great interest to design such a technology. This is being planned to design a digital equalizer and it would be awesome to implement it as a VST-plugin in C++.

#### 1.1.1 Starting the Equalizer Project

The starting point is building the EQ from the book by Orfanidis called Introduction to Signal Processing(reference will probably not be put in this worksheet). The basic function on z-domain is described as

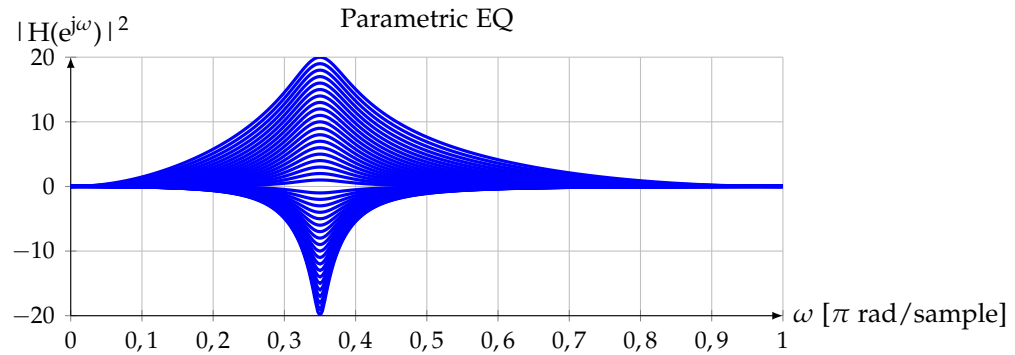
$$H(z) = \frac{\frac{G0-GB}{1+\beta} - 2\frac{G0\cos\omega_0}{1+\beta}z^{-1} + \frac{G0-GB}{1+\beta}z^{-2}}{1 - 2\frac{\cos\omega_0}{1+\beta}z^{-1} + \frac{1-\beta}{1+\beta}z^{-2}} \quad (1.1)$$

where

- $\beta = \sqrt{\frac{GB^2-G0^2}{G^2-GB^2}} \tan \frac{\Delta\omega}{2}$
- $GB$  is the gain at the cut off frequency.
- $G0$  is the reference gain, which usually is preferred to be 1 for unity gain.
- $G$  is the gain factor, which can be used for both boost and cut.
- The tangent part is derived through the bilinear transform.

Tag(s):  
Starting The EQ-Project (starting)

Author(s):  
Jacob Møller (jm)



**Figure 1.1:** EQ with Gain from -20dB to +20dB

### 1.1.2 The first test in MATLAB

In this test the first MATLAB implementation is designed and tested. It is implemented with  $GB$  as the arithmetic mean. This is done to handle the zero-crossing problems.

$$GB = \frac{G + G0}{2} \quad (1.2)$$

Figure 1.1 shows what goes on when varying the gain  $G$  from  $-20$  to  $20$ dB

It is needed to change the gain definition of  $GB$ , in order to get the same characteristic in both boost and cut region. The obvious approach is to implement a sign change for boost and cut regions.

Tag(s):  
MATLAB (matlab)  
Testing (test)

Author(s):  
Jacob Møller (jm)

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