EQoder Documentation

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June 18, 2023, V 0.1.5, work in progress

WARNING:
This plugin can generate very loud sounds. Therefore, EQoder has a limiter built in that cannot be switched off. The output sound can still be very annoying or pleasing (depending on your taste).

1 Introduction

The name EQoder is a wordplay between EQ and Vocoder, since you have to use it like a vocoder but the effect is a modulated cascaded Equalizer. In its resulting function it is close to an amplifying comb-filter. In order to use the effect, you need to control it with a midi input (or the internal keyboard). This is not possible with all DAWs. Please check the manual of your DAW how to do it. The routing is very different, so we cannot give you detailed instructions here.

Have fun!

Joerg aka audio-dsp.

2 Installation

The downloaded file is a standard zip file. It contains a readme.txt, a plug-in directory (.vst3) or an AU file (.component) and this manual. The first step is to copy the directory to the right place for VST3 / AU files.

2.1 Windows

For Windows™ the standard VST3-directory is:

`c:\Program Files\Common Files\VST3`

2.2 Mac VST

If you use the VST3 plugin, copy the .vst3 directory to

`/Users/yourUSERNAME/Library/Audio/Plug-Ins/VST3`

2.3 Mac AudioUnit

If you use the AudioUnit plugin, copy the .component file to

`/Users/yourUSERNAME/Library/Audio/Plug-Ins/Components`

2.4 Linux

For Linux copy the full directory to:

`/home/YourUSERNAME/.vst3/`

2.5 Preset (De)-Installation

After the first launch of the plug-in you will find all presets at the following location (necessary to remove them after you delete the plug-in). The presets are plain xml files.

```
Windows:
C:\Users\yourUSERNAME\AppData\Roaming\Jade Hochschule\EQoder

Mac:
/Users/yourUSERNAME/Library/Audio/Presets/Jade Hochschule/EQoder

Linux:
/home/YourUSERNAME/.config/Jade Hochschule/EQoder
```

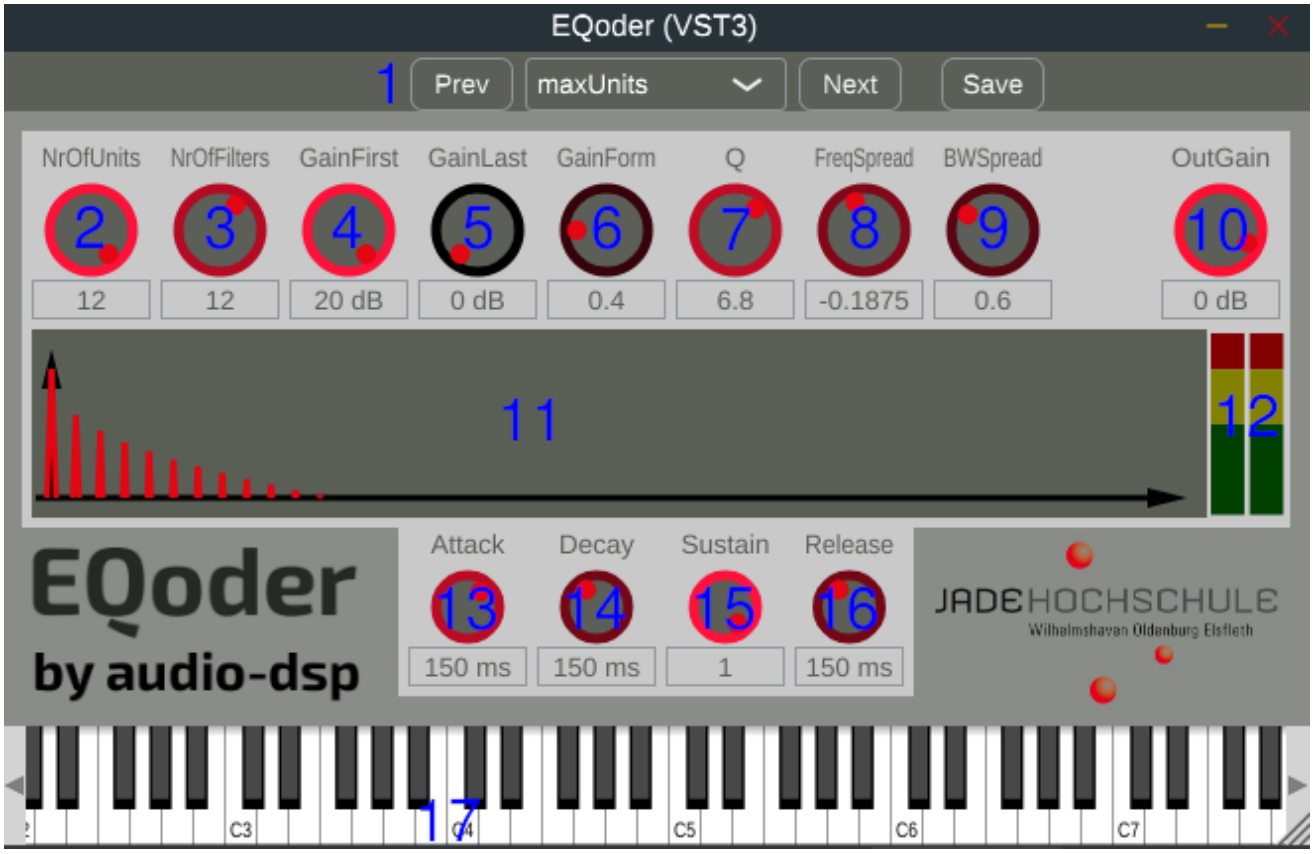
3 How it works

In its essence EQoder is a dynamic amplifying comb filter. One comb filter is called a filter-unit (or a voice). The fundamental frequency of each unit (you can have up to 24) is controlled by midi notes. The harmonic structure of the comb filter can be adjusted with several parameters.

In order to work with EQoder you route it as an insert filter after an arbitrary audio source (e.g. a synthesizer). Furthermore, you need to define a midi input source (midi file, keyboard, etc.).

You can use EQoder as a sound design tool or a melodic extension of your composition. Think of EQoder as a tool to play a second melody on the harmonic structure of your original sound, or as a further modulation source for each note of your favorite sound.

4 How to use



EQoder consists of four sections: The preset handler, the EQ parameter part, the displays, and the dynamic control of the EQ.

4.1 The preset handler (1)

The preset handler allows you to load and save presets. There are buttons to switch to the next or the previous preset. In order to save a new preset, just type the new name and press the save button. This button will always turn red, if you change any parameter of the given preset. Just press save to update the displayed preset. To delete a preset you have to manually delete the associated XML-file.

4.2 EQ parameter (2 to 10)

2. NrOfUnits: This parameter defines the number of filter-units. Think of it as the number of voices in a synthesizer plugin. The maximum number is 12. Changing this parameter during playback will lead to audio dropouts. Never automate this parameter. You can change the NrOfUnits to reset all internal filters (use it as a kind of panic button).

3. NrOfFilters: This parameter defines the number of peak filters per unit. Changing this parameter could lead to audio dropouts.

4. GainFirst: This parameter defines the gain of the first peak filter. This filter is always at the frequency defined by the midi note of the keyboard input (17 or external midi input),

and the played velocity controls the real gain between very low (vel = 1) and the maximum gain (vel = 127). We call this frequency f0 (fundamental frequency) for this manual.

5. GainLast: This parameter defines the gain at the last (defined by NrOfFilters) filter, and again velocity controls the strength.

6. GainForm: This parameter defines how the filter-gains are interpolated between first and last. For GainForm = 0, the form is linear (in the logarithmic domain). For example, if GainFirst = 10 and GainLast = 0 with 5 filters, you have gains between 10 to 0 with 2dB steps.

7. Q: It the Q factor of each filter. The actual Q factor is modified by the parameter BWSpread. High values will result in very steep resonant filters. Be aware that all filters of one unit are cascaded in series. If you choose the Q factor to be low, the gain per frequency will overlap. This could lead to a very high gain overall and internal non-linear distortions. You can prevent the internal distortions by reducing the OutputGain.

8. FreqSpread: This parameter defines the harmonic relation between the filters in one unit. For zero the filters are tuned to perfect harmonics (the second filter is tuned to two times f0, the third to three times f0 etc.). Lower numbers will reduce the frequency spread and higher numbers will increase it, e.g., for FreqSpread = 1, the filters are again harmonically tuned, but only to every second harmonic (the second filter will filter 3f0).

9. BWSpread: This parameter allows you to change Q factors for each filter. At BWSpread = 1, all Q factors are equal, for higher values the Q factor will decrease (broader filters) for higher frequencies.

10. OutputGain: This parameter is a simple gain to change the output level or rather the input level of the filter units. For standard linear time-invariant filters there are no differences. However, since we use a limiter and some internal non-linear clipping stages (necessary for stability), it is preferable to reduce the input.

4.3 Displays (11,12)

The left display shows all the parameters (2-9) and the resulting filter behaviors for one unit in a graph. This will help you to find the parameter settings for your purpose. The right display is a simple level display. Since we included a limiter at the output, the maximum is exact at the boundary between yellow and red. If you encounter this and the sound is harsh and you want it to be softer, reduce the gain with OutputGain (10). Sometimes you will notice pumping and strange level behavior. This will only happen, if you are way beyond the intended use of EQoder. However, if you like the effect, just use it for your creativity.

4.4 Dynamics per unit (13 – 16)

The four parameters control the dynamics of the EQ. Each unit has its own envelope. This is comparable to the level envelope control of a synthesizer voice.

4.5 The keyboard (17)

The keyboard helps you to play notes with the mouse to test the plugin settings. It will also show the incoming midi notes. Unfortunately, pitch bending und glide is not supported in this first version of EQoder.

5 The presets

The presets will give you a quick overview of what is possible with EQoder. Begin with a simple noise (pink or white) as a starting point for your input signal. Never forget to look to the output meter. If the lowest red bar lights up for the peak value display, it could be necessary to reduce the OutputGain value. This won't happen very often, since the internal limiter will smooth out short overloads without introducing distortions.

5.1 Source code

This plug-in is open source. You can find the source code here:
(https://github.com/JoergBitzer/EQoder)

We are aware that the quality of the code could do with improving. However, if you are familiar with JUCE, you will have no difficulty understanding what's going on. Please report issues at the GitHub repository.

6 Legal stuff

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