



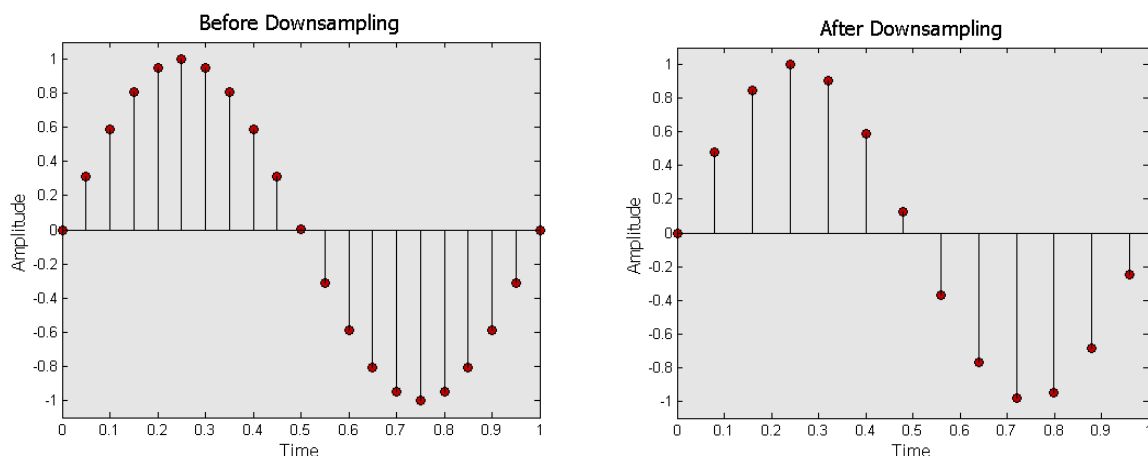
1.1.0 User Manual

Overview

Resampler is a flexible sample rate and bit depth reducer, commonly referred to as a bit crusher. It offers many algorithms, and many go beyond typical bit crushers because they are more mathematically complex and typically used for preserving good sound quality, not crushing. When stretched to their limits they act as crushers.

Sample Rate Conversion

Digital audio signals consist of individual samples occurring at periodic intervals. The desire in high quality audio systems is to have these samples very close together to approximate a continuous waveform. This means that the sample rate should be high. Only a high sample rate can effectively capture high frequency sounds. To bit crush the data we reduce the sample rate to a low level, and do a poor job of estimating what a sample should be if it happens to lie between the original samples.



After downsampling the audio is sparsely sampled. To go back into the mix the audio needs to be at the original sample rate. This time we use the sparse samples to generate new samples at the higher rate. Again, we do a poor job of estimating what the in between samples should be to add further crushing. The Down sampler and Up sampler sections of the Resampler control how this works.

Downsampler



Enable Switch

The switch can be used to bypass the sampler rate converter.

Algorithm

The Algorithm chooses how in between samples are chosen, called interpolation, and how much filtering is applied to control the amount of aliasing distortion. There are two forms of downsampling available, Classic and Modern. Classic has a simple lowpass filter followed by a basic form of interpolation used for centuries in mathematics. Modern is a DSP algorithm that would be found in a real sample rate converter, but it has been severely handicapped so that it acts as a crusher. As the number increases the quality gets better. As the quality gets better, artificially created high frequencies due to aliasing are prevented and the algorithm behaves more like a low pass filter.

Rate

The rate controls how sparse the samples are after downsampling. Sample Rate is equal to 1 divided by the time between samples. A lower rate is sparser and lower quality.

Volume Envelope

The volume envelope knob can be used to apply the volume envelope to the rate. Louder signals result in a higher rate. The invert button changes this so that louder signals would result in a lower rate.

Pitch Envelope

The pitch envelope knob can be used to apply the pitch envelope to the rate. Higher frequency sounds result in a higher rate. The invert button changes this so that higher frequency sounds result in a lower rate.

Upsampler



Algorithm

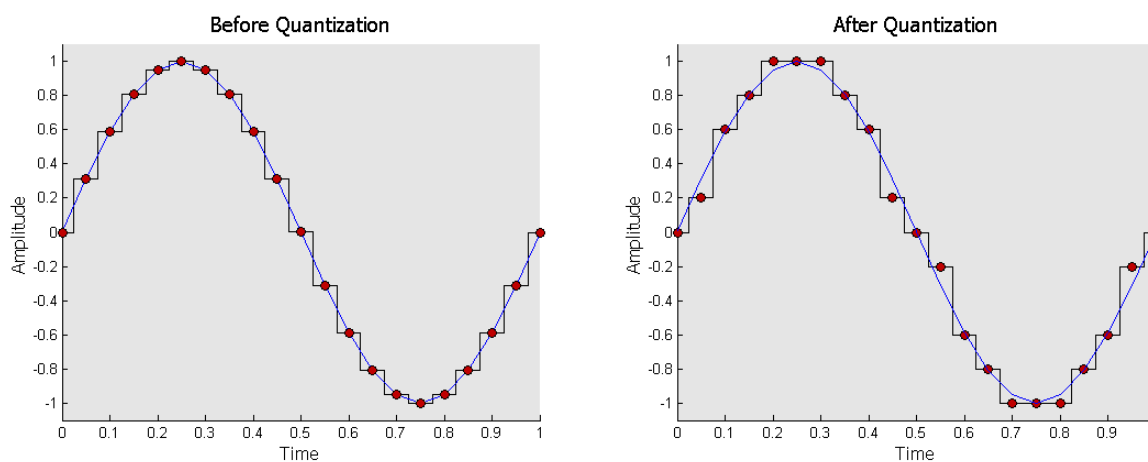
The upsampling algorithms are the same as the downsampling algorithms. See the Downsampler explanation.

Dry/Wet

The dry wet knob controls the output mix of Resampler, mixing processed and unprocessed signals.

Quantization

Digital audio signals consist of individual samples occurring at discrete amplitude levels. The desire in high quality audio systems is to have as many sample level choices as possible to approximate a continuous waveform. The bit depth controls the number of possible levels by the formula 2^{depth} . This means that the bit depth should ideally be high. CD quality is 16 bits which gives 65536 levels. Reduction of the bit depth results in distortion of the signal.



Quantizer



Enable Switch

The switch can be used to bypass the quantizer.

Algorithm

The Algorithm chooses how the new amplitude levels are chosen. The Scrunch algorithms perform quantization in the time domain. Scrunch 1 and 2 are the most common linear algorithms. Scrunch 2-5 are non-linear algorithms commonly referred to as “companding” algorithms. Scrunch 6 is floating point quantization. The Scatter algorithms perform quantization in the frequency domain in ways that might be found in an audio codec. These can be thought of as a very simplified lossy compression algorithm.

Depth

The depth controls how many amplitude levels are possible. A lower depth means less possibilities and lower quality.

Volume Envelope

The volume envelope knob can be used to apply the volume envelope to the depth. Louder signals result in a higher depth. The invert button changes this so that louder signals would result in a lower depth.

Pitch Envelope

The pitch envelope knob can be used to apply the pitch envelope to the depth. Higher frequency sounds result in a higher depth. The invert button changes this so that higher frequency sounds result in a lower depth.

Stage

The stage switch can be used to set the order of the quantizer with respect to the resampling operations. When stage is set to 1, the order is Quantizer->Downsampler->Upsampler. When stage is set to 2 the order is Downsampler->Quantizer->Upsampler. When stage is set to 3 the order is Downsampler->Upsampler->Quantizer.

CV Inputs



The CV inputs allow external modulation of the sample rate, bit depth, and dry/wet settings. These inputs are bipolar. When the input is negative the settings go below the current knob value. When the input is positive the settings go above the current knob value. Turn the knobs all the way down for unipolar CV control.

CV Outputs



The CV outputs provide unipolar CV for the volume and pitch envelopes. This allows the envelopes to control external devices.

Audio Connections



The audio connects route audio through the effect. A monaural input will have a duplicated output on both channels acting as a splitter.

KISS FFT

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