

RESAMPLER

1.0.0 User Manual

Quick Start

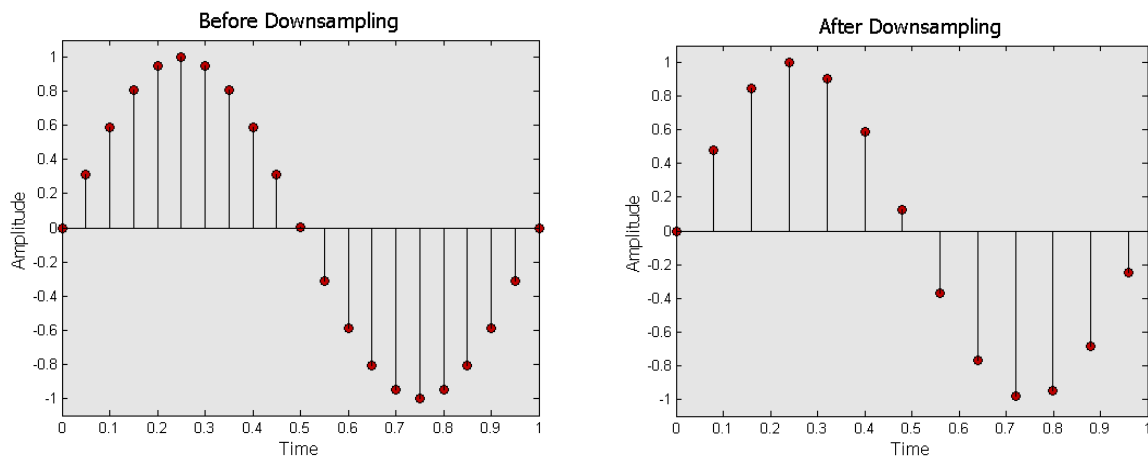
Resampler is an Audio Unit Extension that works as a plug-in inside host apps. To start using Resampler, open up your favorite host that supports Audio Units and add it as an effect.

Overview

Resampler is a creativity inducing bit crusher packed with audio algorithms stretched past their limits. Multiple flavors of sample rate reduction and quantization provide possibilities for sonic mayhem. There is complex math going on, but Resampler gives you plenty of options without getting bogged down in technical details. By trying a few different settings and tweaking the knobs you will be creating cool bit crushing effects in no time.

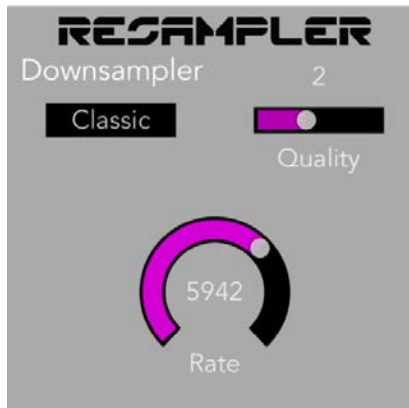
Sample Rate Conversion

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 signal we reduce the sample rate to a low level, which causes aliasing distortion dependent on the quality of the algorithm.



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. Resampler does a poor job of estimating the new samples to add further crushing. The Down sampler and Up sampler sections of the Resampler control how this works.

Downsampler



Mode Setting

The mode setting chooses how filtering and interpolation is applied to control the amount of aliasing distortion. There are two forms of downsampling available, Classic and Modern.

Classic has a lowpass filter followed by a typical form of interpolation from classical mathematics. This setting will give you the classic effect similar to other bit crushers. Modern is a DSP algorithm that would be found in a real sample rate converter, but it has been modified so that it acts as a crusher.

Quality

As the quality number increases, the filtering and interpolation are better, preventing artificially created high frequencies due to aliasing. You can hear more lowpass filtering on higher settings.

Rate

Rate controls how sparse the samples are after downsampling. Sample Rate is equal to $1/T$, where T is the time between samples. A lower rate results in sparser samples and lower quality.

Upsampler



Mode Setting

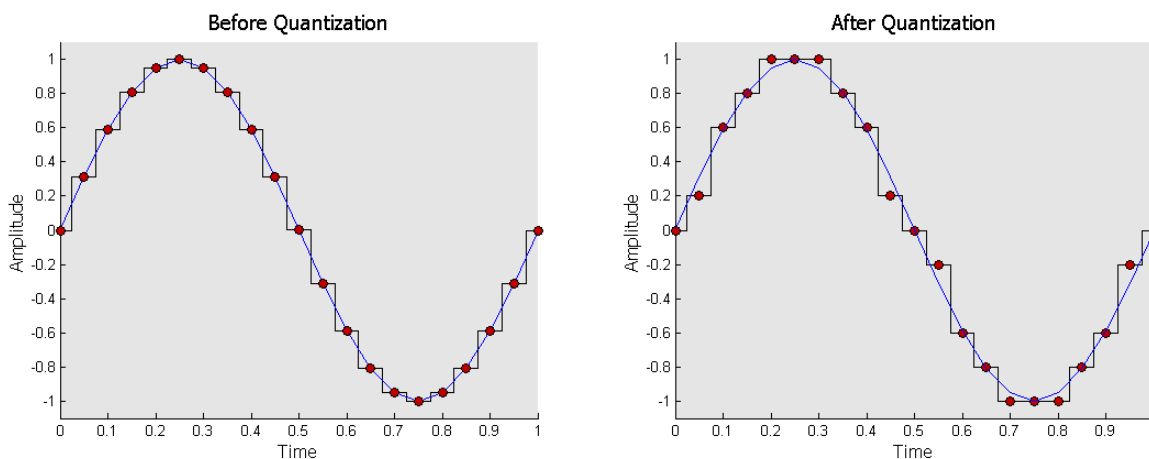
The mode setting chooses how interpolation is applied to control the amount of distortion. Classic has a typical form of interpolation from classical mathematics. Modern has more ideal interpolation but has been modified to not quite work properly, based on the quality setting.

Quality

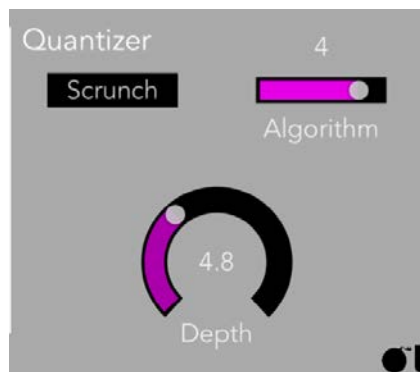
As the quality number increases, the interpolation is better approaching a more ideal replication of the downsampled signal. Of course, it's not ideal; this is a bit crusher after all.

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



Mode Setting

The mode setting chooses how the available amplitude levels are chosen and how they are applied to the signal. The Scrunch algorithms perform quantization in the time domain. The Scatter algorithms perform quantization in the frequency domain.

Algorithm

In Scrunch mode, algorithms 0 and 1 are the most common linear quantization algorithms. 1-4 are non-linear algorithms commonly referred to as “companding” algorithms. Algorithm 5 is floating point quantization. In Scatter mode, algorithms 0 and 1 are quantization of the FFT. 2 and 3 are quantization of the MDCT. Algorithm 4 is peak starving of the FFT. Algorithm 5 is peak starving of the MDCT.

Depth

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

Routing



Mode Setting

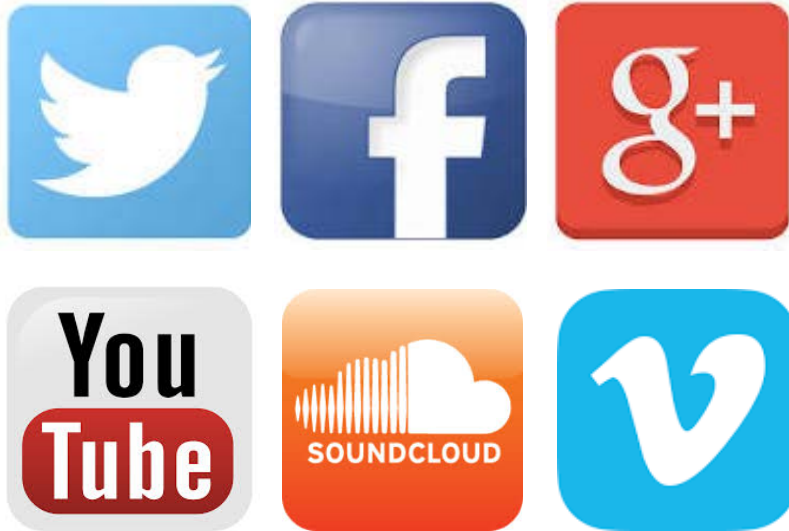
The mode setting can be used to set the order of the quantizer with respect to the resampling operations. The options are quantizer first: Quantizer->Downsampler->Upsampler, quantizer in the middle: Downsampler->Quantizer->Upsampler, or quantizer last: Downsampler->Upsampler->Quantizer.

Mix

Mix controls how much of the processed, or wet, signal is included in the output.

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KISS FFT

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