Vulpus Labs

Scapegrace

Introduction

Scapegrace is a randomising stereo delay effect module for Voltage Modular. It maintains a rolling 16-second memory of its input, and when triggered selects a random slice of that memory to replay.

Up to 16 slices can be replaying simultaneously, and the replays can be fed back into the memory buffer. Each replay slice is faded in and out with a controllable fade length, and can be randomly panned within a controllable stereo width.

The length of each replay slice is also randomised, within a controllable range. A slight pitch change can be randomly applied to each replay, also within a controllable range of up to plus or minus half a semitone. Finally, slices can be replayed at double speed, or in reverse , either all the time, none of the time, or randomly.

Theory of Operation

The Scapegrace module continually captures its input signal into a rolling 16-second buffer. It has up to 16 "voices" which at any time can be replaying a slice of the recorded buffer with various effects applied. Voices are triggered by an input trigger signal: each time it fires, a new voice is added to the stack (unless the maximum number of voices are already playing).

Unlike a deterministic delay effect with tempo-synchronised taps, Scapegrace is intended to produce a continuously varying soundscape derived from the musical material that is fed into it.

Effects

The effects that can be applied to Scapegrace's replay voices are as follows, in order of application:

- **Reverse**: the slice of recorded audio is played backwards.
- **Pitch modification**: the slice of recorded audio is played at slightly increased or reduced speed, modifying its pitch randomly by up to half a semitone up or down within a controllable range.
- **Double speed**: the slice of recorded audio is played twice as fast, raising its pitch by one octave.
- **Pan**: the slice of recorded audio is panned left or right by a randomised amount within a controllable given stereo width.
- **Fade in/out**: all slices of recorded audio are replayed with at least a 100ms fade in and fade out effect applied, to eliminate clicks caused by starting replay in the "middle" of a sound. The fade in/out duration can be increased up to 100% of the total duration of the slice (i.e. for half of its length it is fading in, and for the other half it is fading out).

The "reverse" and "double speed" effects are applied probabilistically, with a controllable probability ranging between 0% (never) and 100% (all the time).

Feedback

Voices can be fed back into the recording buffer, with the result that voices may be replaying parts of previous replays. This can result in reversed portions being reversed back into playing forwards again, or double speed portions playing at quadruple speed. The amount of feedback is controllable: a little goes a long way, a lot can produce a wall of fluctuating sound.

The feedback circuit is limited at 0dB, and filtered slightly at the high and low ends, to eliminate runaway loudness or musically unpleasant rumbles and buzzes.

CPU usage

In terms of CPU usage, Scapegrace follows a "pay for what you use" principle: effects whose "amount" is set to zero, or which have not been randomly chosen to be applied to a given voice, are wholly bypassed and incur no CPU cost. This includes the randomised panning, reverse, double speed and pitch modification effects.

However, although Scapegrace can easily be used to process a mono input, a stereo signal path is used throughout internally: all processing is applied to "both" channels even if the right channel is simply a replica of the left.

Controls

The **L** and **R** jacks in the **INPUT** section of the module are for the left and right input signals. If only the left jack is connected, its input is copied over into the right channel.

The **TRIG** jack receives the trigger signal that causes a replay voice to be started. It can be triggered by a single 5.0v spike, or by any signal crossing over into positive voltage.

There are eight controllable parameters, each of which has both a control knob and an input jack for a control signal. If a control signal is patched into the input jack, it "scales" the value of the parameter from the lowest possible (at -5.0v) to the current value of the knob (at 5.0v).

These parameters are:

• **SIZE**: Each replay slice when triggered is set to a random size within the range controlled by this parameter

• **FADE**: Each replay slice is faded in and out. This parameter controls the length of the fades.

- **WIDTH**: each replay slice is panned randomly left or right, within a stereo width controlled by this parameter.
- **FBCK**: controls the level at which replay voices are fed back into the input buffer.
- **MIX**: controls the mix between the dry input signal and the replay voices.
- **REV**: controls the probability that a replay voice will play its slice of the recording buffer in reverse.
- **DBL**: controls the probability that a replay voice will play at double speed (hence pitched up an octave).
- **MOD**: controls the maximum amount of random pitch modification that is applied to each replay voice, up to a maximum of +/- half a semitone.

Finally, the **L** and **R** output jacks in the **OUTPUT** section are the stereo outputs of the module.

Credits and Acknowledgements

Scapegrace was written by Dominic Fox in December 2022.

Thanks are due to RJ at The Film Atelier for giving me the seed of the idea, in a discussion about "drifting" loopers (a more challenging project, for another time).

Steven Sauvé beta-tested the module and made helpful suggestions about the UI and functionality. His attention and encouragement, as its first user, are greatly appreciated.

Thanks to the developers at Cherry Audio for their great products, especially Voltage Modular.