Vulpus Labs

Chebysynth

Introduction

Chebysynth is a 16-note polyphonic MIDI synthesizer for Voltage Modular which uses additive synthesis, adding nine harmonics to a base frequency at different levels, to generate a range of timbres.

In addition to static harmonic volume control, represented by the traditional row of sliders, the synth has two envelope generators, which generate the usual Attack-Decay-Sustain-Release (ADSR) envelope curves. The first controls the amplitude of each note played. The second controls a boost or cut applied to each harmonic in the series, enabling the timbre of the note to be modulated by the envelope while it is playing.

Each note played can be voiced by up to eight harmonic oscillators, which may be varied slightly in pitch and stereo position creating a rich and dynamic sound. The “pitch spread” and “stereo spread” knobs evenly distribute a range of variation across the voices, while the “pitch drift” knob controls the amount of random pitch variation applied to each voice. A vibrato effect with controllable speed and depth is applied equally to all voices.

For more distorted or metallic tones, similar to those produced by FM synthesis, a “feedback” knob controls the amount of the harmonic-enriched signal produced by each oscillator that is fed back into the fundamental tone from which the harmonics are generated (using Chebyshev polynomials, as in Vulpus Labs’s popular Chebz oscillator).

The MIDI mod wheel is assignable to either the feedback amount, the vibrato depth, or the amount of harmonic modulation applied by the harmonic envelope.

Usage

The **ENVELOPES** section of **Chebysynth**'s panel contains two sets of ADSR envelope controls. Those in the **VOLUME** section affect the envelope applied to the amplitude of each note played. Those in the **HARMONIC** section affect the amount of cut or boost applied to individual harmonics by means of the row of knobs beneath the sliders in the **HARMONICS** section below. If these knobs are left in the middle position (0%), then the **HARMONIC** ADSR will have no effect on the sound of the note being played.

The **VOICES** section controls the number of oscillator voices assigned to each note played, with the **COUNT** knob setting this value between 1 and 8 inclusive. The **PITCH SPREAD** and **STEREO SPREAD** knobs control the amount by which the pitch and stereo position of the oscillator voices are spread out, creating richer timbres and additional stereo space.

The **HARMONICS** section has one slider for the fundamental tone (**0**), and one for each of the harmonics above that tone (**1-9**). In the middle position the harmonic is silent: each harmonic can be added either in-phase (slider above the middle position, up to 100%) or inverted (slider below the middle position, down to -100%). Below each slider is a knob which controls how much the harmonic envelope affects the level of that harmonic.

The **MODULATION** section contains controls for the **SPEED** and **DEPTH** of the vibrato effect applied to all voices, and the level of pitch **DRIFT** affecting every oscillator.

Finally, across the bottom of the panel, we have the **MIDI IN** jack, which receives MIDI signals, the **VOLUME** knob which controls the overall volume output of the synth, the **FEEDBACK** knob which controls the level of feedback applied to each oscillator voice, the **MOD WHEEL** selector which determines which parameter the MIDI mod wheel value is sent to, and the stereo output

jacks **L** and **R**. If only the left output jack is connected, then the stereo signal pathway is disabled and the **STEREO SPREAD** knob will have no effect.

Credits and Acknowledgements

Chebysynth was written by Dominic Fox in September 2023.

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