The Quilcom Vectomorph



Design

The Vectomorph allows the exploration of synthesis using “vector” oscillators. This oscillator waveform is made up from 4 lines where each line is described by a level (affecting rate of change) and a point in time for the line to end. The start and end point of each cycle is zero so this needs 4 levels but only 3 time-points, since the end time of the cycle is the same as the start of the next cycle.

The fiendishly clever Martin Vicanek designed the oscillator which uses parabola oscillators and varies the amplitude and phase of each to produce linear sections. This method allows for further variations of the curviness of the lines by controlling the relative amplitudes of the parabola waves. The curviness subtly affects the higher harmonic content. The oscillators produce a clean sound due to employing anti-aliasing techniques.

In addition, a sawtooth wave can be added to increase the amplitude of higher harmonics. A noise source is provided (3 types) and a state variable filter.

The parameters that control the wave shape, noise level and filter settings can be modulated in real-time, and in the Vectomorph this is realised by shifting between 2 sets of controls. The shifting produces true morphing of the wave shape between the controls’ settings and can be achieved manually, with an LFO, or a multi-stage envelope generator, or any combination of these 3 sources.

There are 2 identical generators provided and each can be tuned individually to further increase the range of possibilities.

Front Panel

System section

On the left is the section for global MIDI settings and so on.

There is an LFO which can be set to modulate the frequency of the whole instrument and/or the phases of the 2 generators’ sawtooth oscillators. Obviously the phase modulation will only take effect if there is some amount of sawtooth level adjusted. If the LFO isn’t needed, turn the Depth to zero to save CPU and the green LED will extinguish.

Generators

The main section of the instrument is the Generator and there are 2 identical ones available. To choose which one to *view* there is a slide switch on the main panel, lower right. To choose which one to *listen* to, each has its own ADSR envelope generator (colour coded) and the Blue LED-switch will mute or unmute its ADSR. Note that if only one Generator is required then leave the other one off, to save on CPU usage.

The Wave A (lower) and Wave B (upper) controls set the 2 extremes of the morph range. These can be auditioned using the A-MORPH-B knob to get the desired result. The knob is active when its blue LED-switch is lit. The Morph LFO and Morph envelope can be turned on or off with their similar LED-switches. When initially setting the morph values it’s a good idea to just use the manual morph knob, then afterwards experiment with the LFO and envelope.

The Wave A and B controls not only provide for morphing the waveform but also the stereo pan position, selected noise type level and the filter parameters. Since different waveforms can have different overall amplitudes there is a morphing volume setting to re-balance the result over the morph range. Note that the noise and filter *type* are fixed over the whole morph range.

In the centre of the Wave A/B controls is the tuning for the Generator. This allows for octaves, fine detune, chords or whatever is required, by having different settings on each Generator.

Each Generator has a scope to help visualise the waveform. The scope only displays the vector oscillator and optional sawtooth waveform. In this way you don’t get to see any noise added or filter effect, and the scope level is not affected by the Generator volume settings. This makes it easier to set the basic wave shape while listening.

The Morph LFO can cyclically modulate the morphing. You can set the waveform, speed, depth and offset. The LFO is polyphonic for adding richness and interest and is unipolar to provide for the morphing. The Offset knob can move the operation range throughout the morph range. This is similar to using both the LFO and the manual knob together, so beware of interaction.

The Morph envelope also sweeps through the morph range and you can set the Amount of influence of the envelope. In addition there is a Velocity LED-switch which reduces the amount at low key velocities. This means you can set more morphing at higher velocities to give an improved expression response. The graphic envelope generator can produce a vast range of shapes. Right click on its window for options. Use its grey scroll bar to examine the envelope left to right, or drag the scroll bar up/down to zoom in or out.

Envelopes

Top right are the 2 exponential ADSRs for amplitude. Each is colour coded for its own Generator source. The velocity response is variable: Anti-clockwise is no response and clockwise means the amplitude is lower at low velocities. The Blue LED-switch mutes the whole Generator channel and this can be useful for auditioning each Generator separately, or reducing CPU by leaving it off if not required.

Effects

Next down is a basic effects section. The signal flow is top to bottom. If an effect is not needed leave it turned off to save CPU. The Distortion effect knob interacts with the Generator ADSR level settings so it’s possible to have a very wide range of distortion.

Preset Manager

There are 21 preset sounds created to demonstrate some of what’s possible but also to provide starting points for editing. In addition the INIT preset is good for starting a sound from scratch. This is especially useful for getting used to the vector oscillator’s behaviour.

Ring modulator

At the bottom right is the Ring modulator level knob. This is a stereo ring modulator operating on the stereo outputs from the 2 Generators. In order for it to work, both Generators need to be turned on (on their ADSRs). The green LED by the knob will only light if both Generators are running and the knob is not at zero. Leave it at zero if not needed to save CPU.

Tips

* When adjusting the parabola levels be aware that it’s the *relative* settings that count and they do interact. If you set them all to 50% you’ll get the same waveform as at 100% but at half the amplitude. You can practice with the INIT preset.
* If you just want to use the sawtooth then turn all the parabola levels to zero. The sawtooth will still be affected by the level and time settings but it will always be a sawtooth shape.
* Since the 2 Generators are independent you could use one for the main body of the sound and the other just for the attack phase.
* If both Generators are set for similar sounds, with morphing, you can use the Left/Right pan knobs set opposite between the Generators. This can create quite a remarkable stereo effect.
* Be aware of addition and cancellation effects as you morph. If one Wave direction is positive going and the other Wave is set as negative going, by an equal amount, you’ll get zero as a result in the centre morph range. However this may be useful in some situations.