Centripidity

Poly-YAO

Introduction

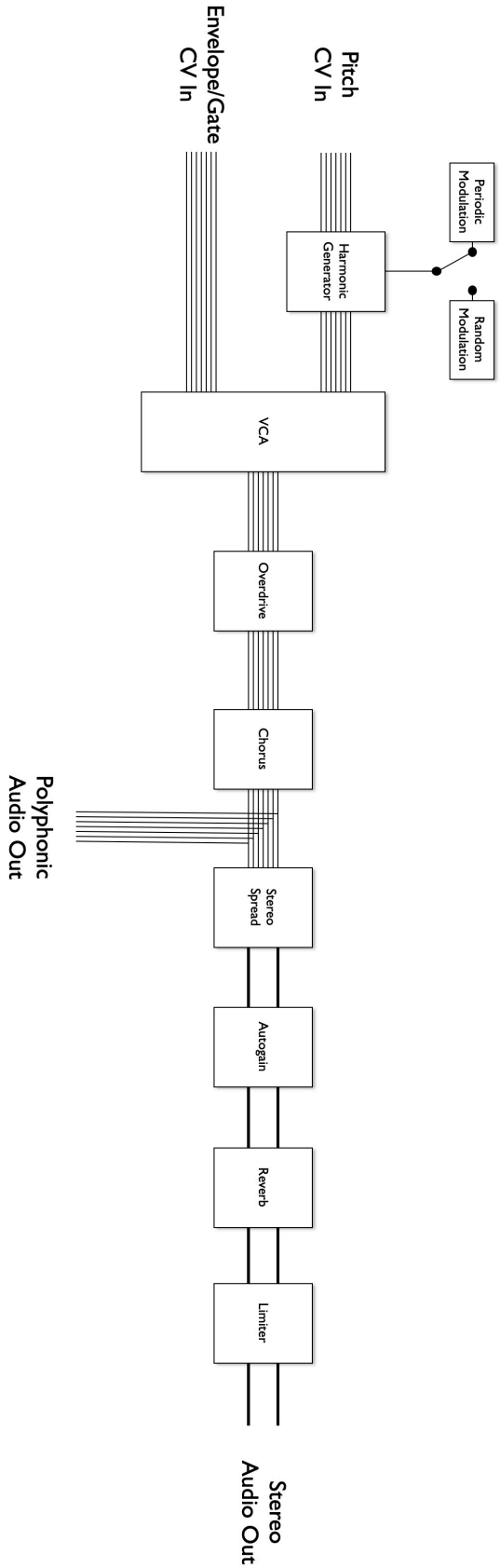
The basic block structure of the Poly-YAO is shown in the diagram overleaf.

Polyphonic pitch cv signals are fed into a collection of oscillators whose fundamental frequency is determined by those pitch cv values. However, a series of harmonic overtones are then added to each oscillator to enhance their timbre. The relative mix of overtones is not static but each has its amplitude modulated to some degree: either via a smooth periodic function or randomly.

The generated waveforms then pass through a VCA where their levels are controlled by the externally applied polyphonic gate/envelope signals.

Each poly-voice then undergoes, optionally, a series of post-processing modules, Overdrive, Chorus, Stereo Mix-Down, Autogain, Reverb and Limiting, before being passed out through a standard pair of mono audio jacks.

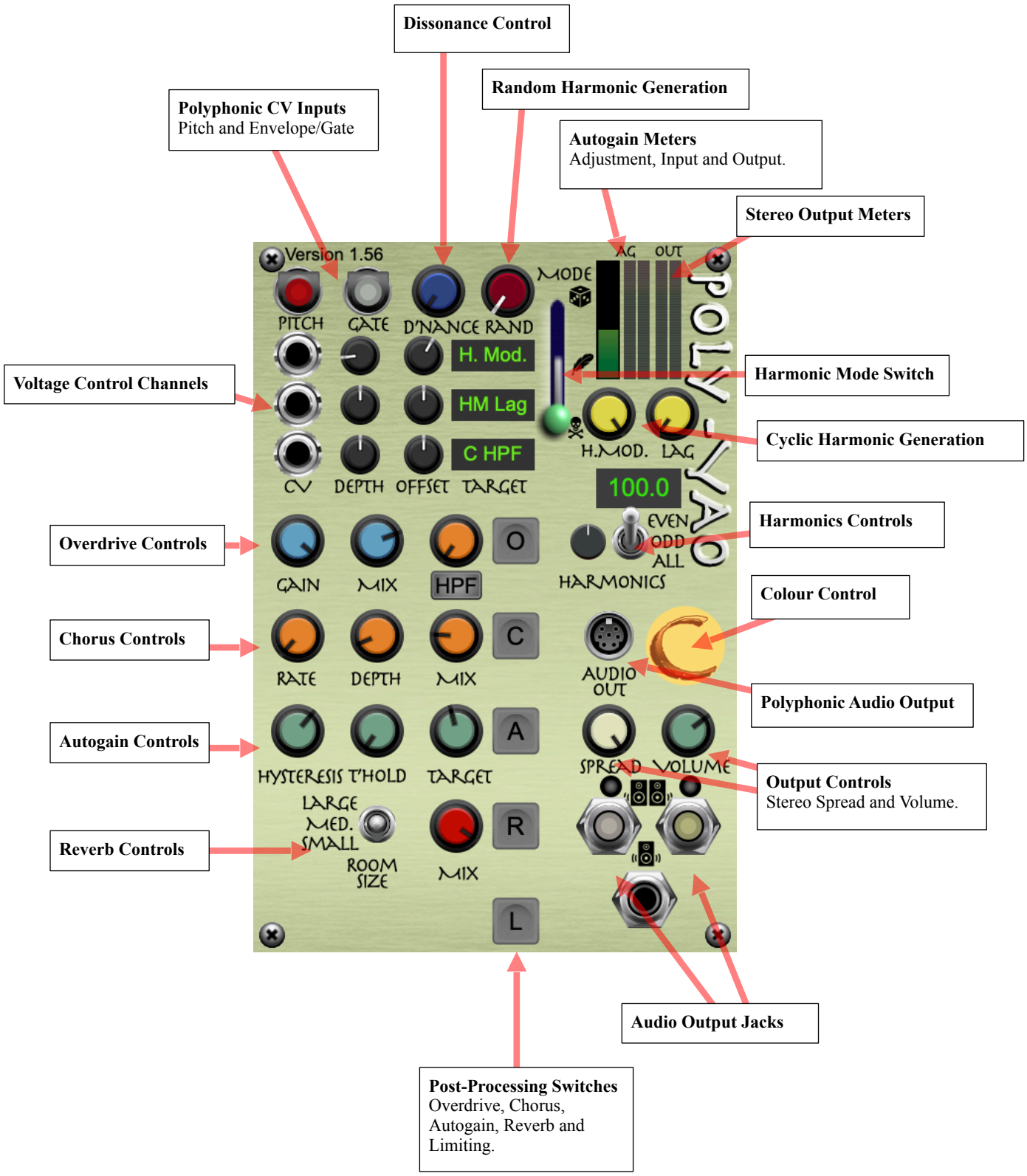
Three separate CV modulation inputs are provided, with variable depth and offset controls, that can be assigned to control any of the knobs on the interface.



Block Diagram for the Poly-YAO

The Interface

The figure below highlights all of the main controls and displays available on the Poly-YAO.



Basic Operation

Polyphonic Inputs

The pitch and amplitude of a particular voice at any given time will be controlled by the voltages applied to the corresponding channel on these two inputs.

Overtone Generation

On top of the fundamental frequency set for each voice a series of overtones will be added to enhance the timbre of the waveform. These overtones will not be static but will vary over time. That variation can be periodic or random.

Harmonic Controls

The ***Harmonic Switch***'s position determines whether all harmonic overtones will be generated or if it will be just the odd or even numbered ones. The ***Harmonic Limit Knob*** specifies the maximum harmonic that will be generated. If this is set to "1" then a sine wave will result.

The three-position harmonic ***Mode Switch*** controls how these extra harmonics are generated.

In the upper position they are random and the size of the random variation is controlled by the ***Random knob***. The higher it is set the larger the random variation which will manifest itself as a form of noise.

In the middle and lower positions the harmonic content will vary smoothly and periodically. The strength of each generated harmonic varies over time with a period determined by the ***Harmonic Modulation Knob***. The lower the setting of this knob the faster the variation will be. The ***Modulation Lag Knob*** introduces hysteresis between the position of the ***Harmonic Modulation Knob*** and the setting actually applied. The active value of this modulation parameter is always displayed in the window below these two knobs.

The difference between these two positions is that in the upper of the two any variation will produce a gentle transition to the new modulation rate but in the lower position the transitions will be considerably more abrupt, particularly at low settings of the ***Harmonic Modulation Knob***. This can generate very dramatic and sometimes harsh effects.

The ***Harmonic Modulation Knob and Modulation Lag Knob*** have no effect when in Random mode and vice-versa.

Dissonance

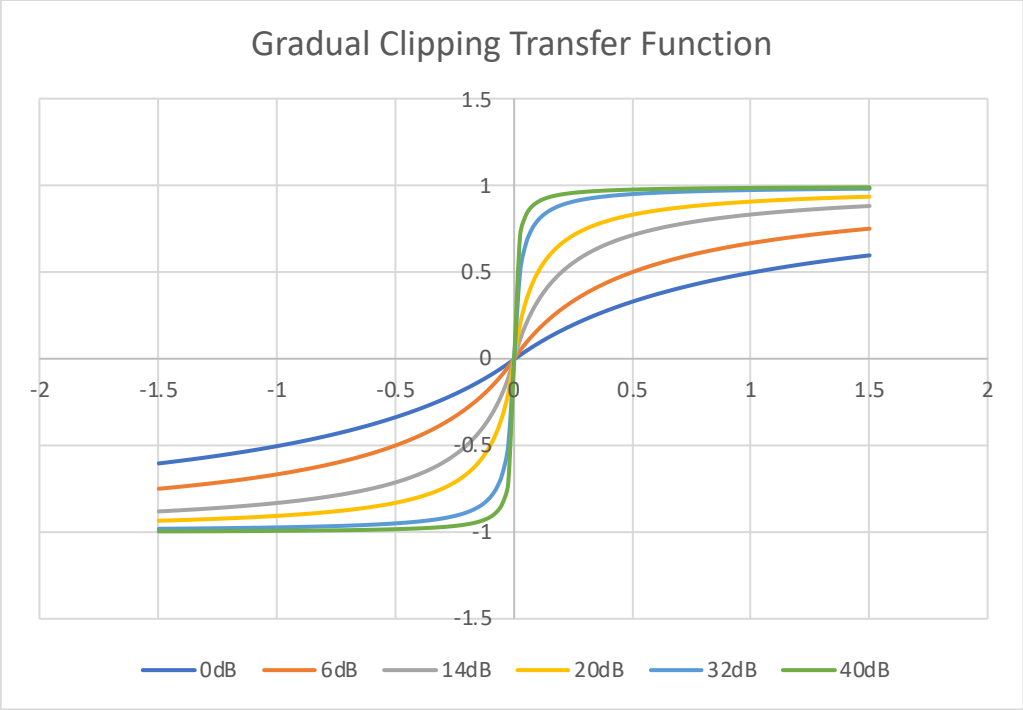
Whether generated randomly or periodically each overtone will normally be an exact integer multiple of the fundamental frequency. However, using the ***Dissonance Knob*** it is possible to shift these overtones away from their perfect harmonic position. The higher the value set on this knob the further the shift from a pure harmonic. This introduces some dissonance into the sound and often creates a metallic character.

Post-Processing

After generation the waveforms can optionally be passed through a series of post-processing operations.

Overdrive

This effect applies a gradual soft clipping algorithm to flatten out the tops of the waveform. The higher the value of the ***Drive Control*** the more clipping occurs. The output of this effect is a mixture of the overdriven and unaffected waveform. The ***Mix Knob*** determines the degree of mixing with higher values adding more of the overdriven signal.



Chorus

A traditional, if somewhat extreme chorus effect can be applied by engaging this section. Knobs are provided to control ***Rate***, ***Depth*** and ***Mix***. There is also a switch to engage a high pass filter and a knob above it to control the cutoff frequency of the filter. Note that the filter is only applied to the wet chorus signal and not the dry signal that is mixed in.

This is the last point in the signal chain where the full polyphonic audio can be extracted via the ***Polyphonic Audio Out Jack***.

Stereo Field

The next stage of processing is collapsing all of the voices to a single, stereo pair. A ***Spread Control*** is provided to set the width of the stereo output field. At its lowest setting the output will be mono and at higher settings the various voices will be distributed across the field.

Autogain

Autogain seeks to keep the output volume at a reasonable constant level by continuously varying the gain applied to the stereo signal. It makes it possible for single notes and multi-note chords to produce

similar volume levels is that is desired. It constantly monitors the RMS signal level, averaged across the two channels, and compares it to a target output level set on the ***Target Knob***.

The ***Hysteresis Knob*** controls how rapidly the RMS signal measurement will respond to changes in input level and hence serves as a kind of Lag control for the system.

To avoid low level signals being oversimplified and hence raising the noise floor the unit only applies its make-up gain when the RMS input level is above a certain threshold. That threshold can be controlled via the ***Threshold Knob***.

The Autogain section provides three meters to indicate what is going on. The first shows the current make-up gain applied by the system, the second is the RMS level of the input signal and the third the RMS level of the output. The meters show RMS levels and span the range from -60dB to +12dB.

Hovering the mouse pointer over the meters will provide a real-time display of the levels in dB.

Reverb

The stereo output of the Autogain process then passes into a digital reverb where controls are provided for ***Room Size*** (a three-position switch) and ***Mix***.

Audio Output

Finally the signal appears at the stereo output jacks after passing first passing through a variable attenuator/amplifier capable of providing a gain change of between -60dB and +24db, and then finally a Limiter to remove any stray peaks. A single Mono output jack is also available,

Meters in the upper-right of the module show the RMS output level of the stereo outputs and hovering over them will show show the precise level in dB.

Above the stereo output jacks are LEDs that illuminate whenever the output exceeds ±5V.

Background Colour

The background colour of Poly-YAO modules can be changed either individually or globally for all instances of this module. Clicking on the round Centripidity "C" logo will open the colour change dialog.