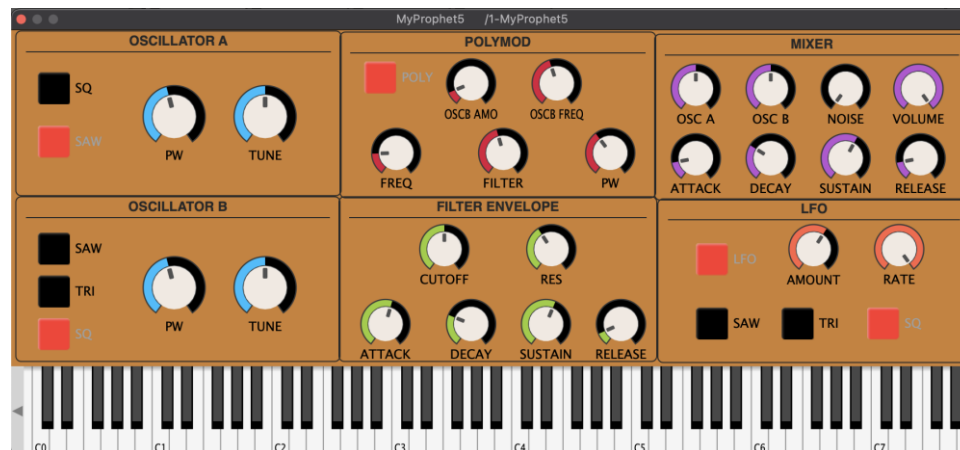


My Prophet 5 – Software Sound Synthesis Final Project

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For the final project of the course, I have been inspired by the design of the legendary synthesizer Prophet 5 by Sequential Circuits released in 1977. This synthesiser is known to be one of the first synthesizers with programmable memory and complex microprocessor usage and has been used by several well-known artists such as Michael Jackson, Madonna and Giorgio Moroder. Below, I share a screenshot of the plugin UI:



First of all I will explain the sound synthesis techniques used in this plugin:

- **Additive Synthesis:** If you turn off the Polymod section button, you will see that the sound output is composed of the sum of two oscillators (Osc A and Osc B) in which you can choose the type of waveform you want to add to the final sound. Having a square and sawtooth wave for the first oscillator and sawtooth, triangle and square waves for the second oscillator. In both oscillators you can modify the pulse width of each wave and tune the oscillator 30 cents above or below the frequency. All the oscillators are vco opcodes from Csound to emulate the analogue sound of the original synthesiser.
- **Subtractive Synthesis:** In the filter envelope section you will find a Moogladder opcode filter on the final output with an own envelope independent of the mixer envelope with ADSR control on them, also as is showed in the picture you can modify the Frequency Cutoff and Resonance of the filter.
- **Frequency Modulation Synthesis:** If you turn on the Polymod Section, the Oscillator B starts to modulate the Oscillator A with OSC A as final output, so you can change the modulation with "OSCB AMO" and the modulation frequency (0Hz – 400 Hz) with "OSCB FREQ", this modulation can be sent to the frequency on the oscillator A or the Filter Cutoff and also you can modulate the PW of the oscillator A with an integrated LFO.

As extra modules, the plugin has a mix section where you can adjust the envelope of the sound output, and the volumes of both oscillators. In addition, a white noise source has been added for possible drum design.

Finally, an LFO section (that you can switch on/off) has been added with the possibility to choose the type of waveform between sawtooth, triangle or square, this LFO go directly to the filter frequency cutoff and you can adjust the amplitude of the modulation with Amount knob and the frequency of the modulation with the Rate (0.5 Hz - 5 Hz) knob.

For the installation instructions simply unzip the file "MyProphet5.zip" in the folder where you run the plugins in your DAW where you will find the file "MyProphet5.vst3" and the source code "MyProphet5.csd".

This work has been done with the help of the Csound Floss Manual where different opcodes have been used with examples such as: vco.csd, lfo.csd, rand.csd (noise), moogladder.csd(filter). In addition, use has been made of the Cabbage manual for various design and signal routing issues. Finally, the Prophet 5 reference manual has been used to explain the routing of the signals between the knobs and the different ranges of use of the knobs. In relation with the things to improve as described in the manual, the following improvements are proposed:

- The use of a frequency knob on each oscillator to transpose the waveform.
- The use of a knob for the filter envelope amount where the envelope signal applied on the filter is attenuated as described in the Prophet 5 manual.
- Better routing of modulation signals through an external LFO that always works while the synthesiser is in use, with the ability to send that signal to more sources such as the frequency and pulse width of each oscillator.
- Improvement of the Polymod section where the frequency and amplitude values are adjusted and the jump in the knob movement feels more musical.