

JSynth Introduction and Instructions:

The JSynth is a polyphonic synthesizer that features 8 oscillators, 1 filter, 1 FM modulator, a noise generator, and an envelope.

The Oscillators:

The synth features 8 oscillators which are separated into two banks of four oscillators namely 'osc 1' and 'osc 2'. The osc 1 has 4 oscillators of different wave types - Sine, Saw, Square and Triangle. This bank produces fundamental frequency from the keyboard. The gain of the 4 oscillators can be adjusted using the 4 knobs in the osc 1 bank. The osc 2 bank also has 4 oscillators of 4 different types of waves including sine, saw, square, and triangle. But each oscillator can produce any frequency by adjusting the ratio knob. This way the user can add 8 different sounds of different frequencies together to produce a new sound. This is known as Additive Synthesis. The mute button at the banks can be used to mute the particular bank.

Osc Mixer:

The osc mixer gives a control fader to control the levels of osc 1 and osc 2. This section can be used to mix the output levels of two banks of oscillators. It acts as a master fader for oscillator banks.

Noise:

A white noise generator is built into the synth that can be added to the mixed sound from the oscillators. The noise section also has a Infinite Impulse Response IIR lowpass filter, that can be used to attenuate high frequency to modify the shape of the sound.

Filter:

The filter section contains the control for a low-pass filter. This filter is used to cut the high frequencies. The filter used is a Moog ladder filter based on the work of Antti Huovilainen, described in the paper "Non-Linear Digital Implementation of the Moog Ladder Filter" (Proceedings of DaFX04, Univ of Napoli). The Reso knob provides the resonance control for the filter. The filter section can be bypassed using the bypass button in the section.

FMod:

FMod section is based on FM or Frequency Modulation synthesis. In FM synthesis, the frequency of one oscillator (called the carrier) is modulated by the signal from another oscillator (called the modulator). The output of the modulating oscillator is added to the frequency input of the carrier oscillator. The bandwidth of the FM spectrum is controlled by the index knob in the FMod section.

Envelope:

Envelope is used to change the shape and amplitude of the signal. There are four parameters which control this - attack, decay, sustain, and release. This is also known as the ADSR Envelope. The attack phase determines how fast the signal reaches full volume before entering the decay phase. The decay determines the length of the drop from the peak to the sustain of the sound signal. The sustain determines the volume of a sound for the entire hold time between the decay and release phases. Finally, the release phase determines the speed at which a sound ends from the time you release the key.

