Synthesizer

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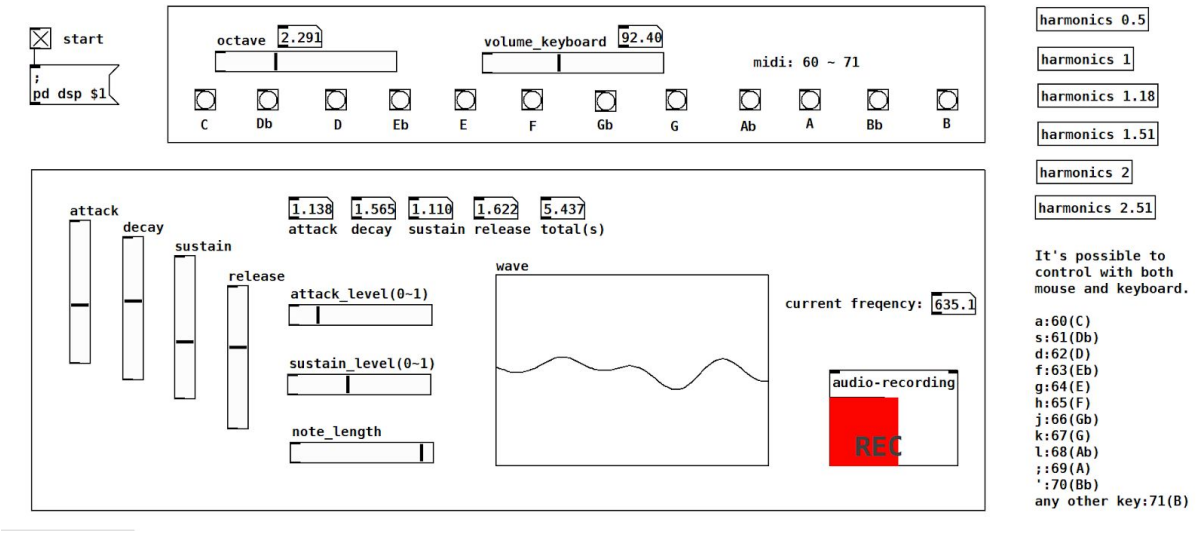

The synthesizer is made of three parts: note generator which could be controlled by both mouse and keyboard, an additive synthesizer using multiple sine-wave oscillators synthesising a harmonic tone, and envelope modifier.

Note Generator

The task of a note generator focus on align controllers([bang] or keys of QWERTY keyboard) to different notes. I used [select] to build. I chose MIDI note from 60 to 71 by their frequencies according to http://write.flossmanuals.net/pure-data/frequency/. (It can also be done with [mtof].)

When a mouse click or a key hit triggers the note generator, it first goes through [select] to bang the corresponding frequency, then it multiplies by octave number (controlled by octave slider, initialized as 1, with the range of 1 to 5, so user can play MIDI notes above 71) and sends out to [harmonics], as a part of additive synthesis module.

Additive Synthesizer

I used an abstracted subpatch named [harmonics]. Every [harmonics] receives a number of frequency, and transfer it to an audio signal. In order to build an additive synthesizer, multiple sine-wave oscillators should sound at the same time to produce a harmonic tone. I chose 0.5, 1, 1.18, 1.51, 2, 2.51 as multipliers, since they sound harmonically alltogether.

Envelope modifier

To make an audio signal sound more realistic and characteristic, it’s a must to make adjustments on envelope.

My envelope modifier can be controlled with eight sliders: attack, decay, sustain, release, attack level, sustain level, note length, and volume control.

The range 0~100 of ADSR representing for their percentage of note length. The attack level slider controls the maximum level at which the attack rises. The sustain level is the level during the main sequence of the sound's duration, until the key is released.

I used a subpatch [pd a_d_s_r] for ADSR time calculation(which can be seen by the output on main patch). I put [tabwrite~] to show waveform of current sound, and a number output showing current fundamental frequency of additive synthesizer, which equals to the frequency of current key hit/mouse click multiplies by octave number.

The composition by this synthesizer can be recorded with audio-recorder.

I initialized some parameters, so it’s easier to use. In order to make UI cleaner, I put [canvas] to show only elements for user control.