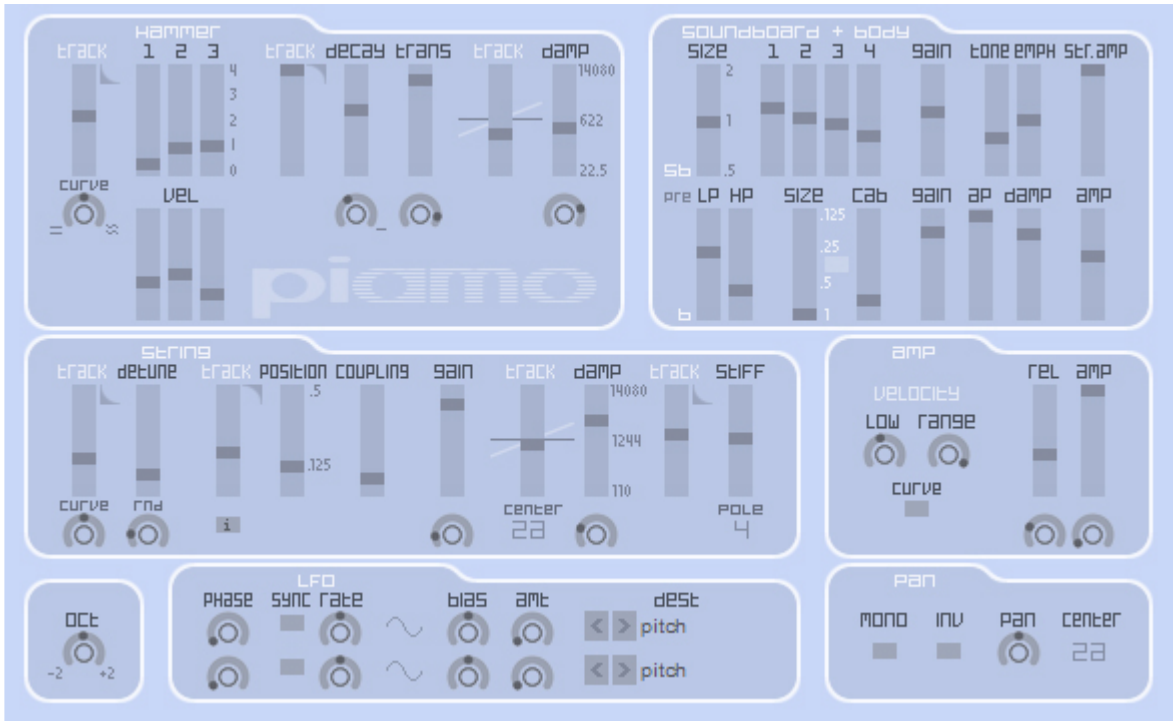
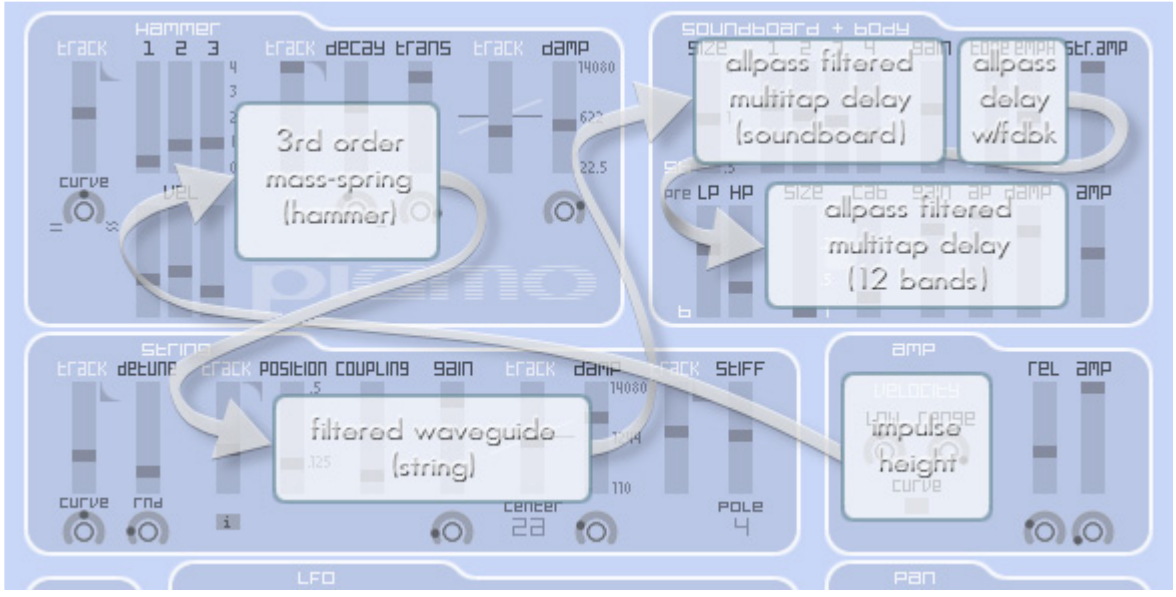


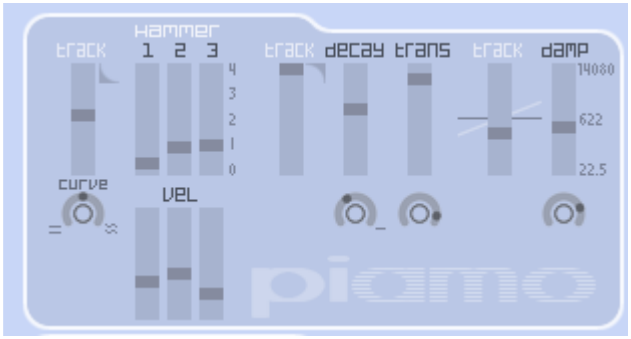
Piamo VST

"What would a simple physically modeled piano sound like?"

Piamo ("I love Pi") provides the performance benefits of modeling in a low computational form.

The fundamental elements of the piano are modeled to create a timbrally expressive instrument less convincing than the excellent commercial emulations.





hammer

Piano hammers are constructed from layers of felt of which the hardness is regulated to produce timbre. The hardness, or springiness comes into play when the hammer impacts the string, creating harmonics by bouncing before the hammer is lifted.

The hammer is emulated with a 3rd order mass-spring. Mass-springs have sinusoidal oscillation and exponential amplitude decay. Each mass-spring is tuned to the fundamental frequency of the note plus up to four octaves, appropriate for modeling the first harmonics of the string.

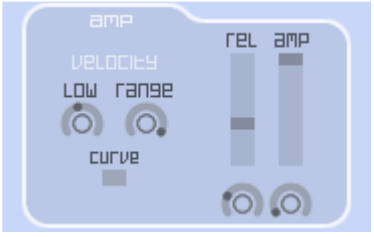
The timbral complexity of a real piano is especially pertinent to synthesis in the lower register, exhibiting harmonic interaction in the coupling of the strings and soundboard at the bridge. To replace some of the higher harmonics lacking due to the low complexity on this model, additional tracking can be applied to raise the mass-spring frequencies towards the lower octaves.

The pitch of cascaded mass-springs will spread outwards in response to higher transduction. Lower settings are probably more appropriate for emulation.

Being computationally efficient, Piamo does not model the hammer being lifted and applies the decay period of the mass-spring to the string waveguide. High decay levels can muffle or reinforce the fundamental pitch or partials by oscillating for up to a number of seconds.

The duration of contact decreases with dynamics in acoustic pianos, sharpening the harmonics of loud notes.

The mass-spring output is low-pass filtered at 12db/octave. Key tracking of the damping filter is at a linear scale from 0 to 1, centered at the same key as the string damping filter. Note that the diagram on the tracking slider illustrates the linear slope for the user, it's indication of the center position is incidental.

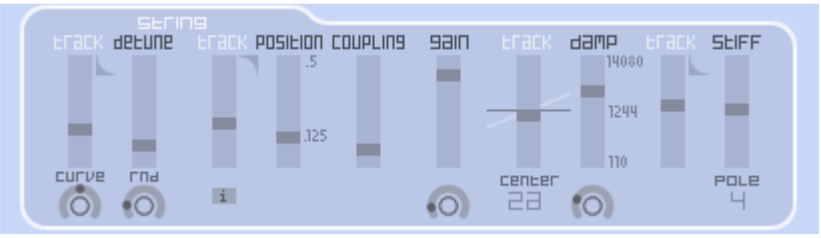


The amplitude of the impulse used to drive the hammer is set on the amp panel, the range being applied starting at the low coefficient. Velocity curve is selectable from linear to exponential (curve highlighted), producing a noticeable softer response in mid range velocity.

Due to the performance of the model, none of the presets use velocity modulation of amplitude.

Release amplification is applied to the string as the cabinet is a summed (non-polyphonic) process.

High polyphony uses with long releases may produce clicks. I don't consider Piamo to be a strong enough emulation for piano compositions requiring high polyphony. Piamo versions with additional voices are available if necessary.



string

The string model consists of two detuned waveguides coupled at the virtual bridge. Randomised detuning is seeded by the note value and the rnd coefficient, so that nudging it slightly will produce a different 'keyboard.' Holding [ctrl] allows for fine tuning of all parameters.

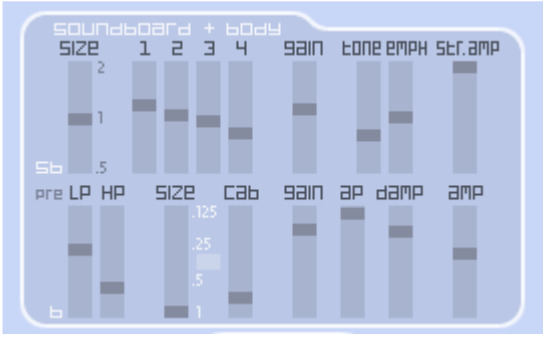
I read that the hammer striking position on modern pianos curves from 1/8th towards 1/16th at the highest notes. A shorter ratio produces a brighter tone.

Coupling is used to increase sustain and can produce realistic phase effects at low settings. Detuned strings were implemented on acoustic pianos to create a decay effect by phase. Note that Piamo lacks the third string present on higher piano keys.

String stiffness is modeled with 6th order allpass filters, the frequency dependent phase delay of which simulates the faster transmission of high frequencies in stiff metal wires.

The waveguides are shortened by the delay response at the fundamental, so that a combination of high pitch and allpass settings may exceed the playable range and sound as a soft click. The widest playable key range can be found by setting the stiffness coefficient at the highest note then raising the track parameter while auditioning the lowest note in the desired range.

Synthesists may wish to know that the dsp algorithm runs right to left, ie. allpass filtering precedent to 12db damping and coupling.

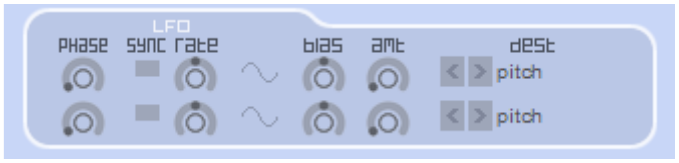


cabinet (soundboard and body)

Intended as a modest emulation, the initial cabinet resonator consisted of a set of twelve delays tuned to the lowest octave of strings. A 'soundboard' multitap delay was added to diffuse the signal before this stage and reduce 'thudding.'

The output from the soundboard delay network is routed through an allpass delay stage with feedback (labeled 'tone' and 'emph') before the twelve tap body delay network. Raising the cab parameter irregularly shortens the twelve delay lengths to provide variation.

String amplification is parameterised for auditioning the cabinet during patching.



LFO

Standard LFO implementations may be synced to host rate at 64, 32, 16, 8, 4, 2, 1, 2/3, 1/2, 1/3, 1/4, 1/6, 1/8, 1/12, 1/16, 1/24, 1/32, 1/48 and 1/64 measures.

String parameters are calculated per note to save cpu so that pitch et c. do not respond cyclically to modulation. LFOs may be used to apply variation to these parameters, or to modulate the cabinet in realtime.

pan

The pan control functions as a width parameter when not in modo mode. Widely panned voices (greater than 80%) are softlimited to vary stereo imaging. Cabinet output is always mono and probably of low frequency content, making further stereo processing complementary to emulation.

License

Piamo VST may not be redistributed without permission. There is no expression of guarantee due to the use of third-party resources.

Piamo VST is made with SynthEdit - http://www.synthedit.com

© 2009 Rurik Leffanta - All Rights Reserved

http://www.xoxos.net