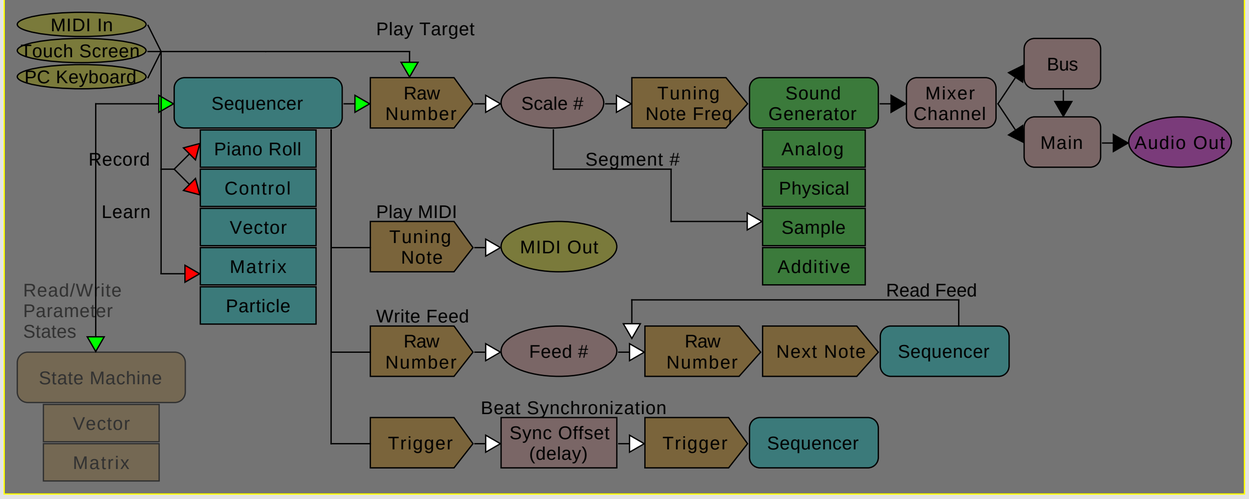
Summary

Dhalang is a standalone music station with internal synthesizers, samplers, sequencers, mixer and sound effects.
It is designed to be all-around tool for electronic microtonal and alt. tuning music composition, production and perfomance without the need for any other simultaneously running software ie. DAW or Host program.

Musical sequences can be created and edited in a traditonal multitrack Piano Roll sequencer or more experimental sequences can be created by various methods using the internal sequence generators. Music in defined tuning system and scales can be recorded to Piano Roll tracks from various sources including realtime MIDI input, polyphonic touch screen, qwerty pc keyboard or from the internal sequence generators. Parameter automation can be recorded and edited for both sound and sequence generating parts.

UDP network interface allows communication between several instances of Dhalang running on various devices to transmit tuning system and scales or to synchronize time speed and position between devices.

Pipeline



Sequence Generation

Piano Roll X 16 (Track1-Track16)

Traditional polyphonic multitrack step sequencer where the notation grid can be re-interpeted to the dimensions of the active tuning system and scale.

Control X 10

Control tracks for sequencing discrete and continous automation to various synth, mixer and sequencer parameters.

Recording instrument automation from external MIDI device must match the CC number of the control track.

All mixer and sequencer generator automation recorded from MIDI has to come from the modwheel.

Vector X 10 (Vector1 - Vector10)

Sequence generator that produces continous mathematical vector progression in 2D space.

X (time) and Y (pitch) have separate methods that can be generated with stochastic selection or programmed patterns.

Generation can be set to return to certain pitch point at defined intervals, or to record clips and to loop and variate them for defined periods.

Each generated note can have a generation of polyphonic extra notes for chord generation.

Vector State Machine is sub-sequencer for changing or interpolatin between different sets of parameters of all vector sequencers.

Ideal for rhythm-based, repetative and symmetric sequences or silent "ghost" vectors to function as master clock for other sequence generators through *Generator Synchronization*.

Matrix X 10 (Matrix1 - Matrix10)

Sequence generator that produces continous stochastic progress through first or second order Markov chains.

Like Vector, it has separate matrices for both time and pitch value generations that can be edited from the UI or generated by importing a MIDI file to be parsed and processed into Markov chain or by learning from live human playing from MIDI or other input.

Matrix State Machine is sub-sequencer for changing between different sets of parameters of all matrix sequencers.

Ideal for phrase-like sequences and computer aided accompany but also good for re-ordering sampler segments or loops.

Particle

A virtual 2D space that simulates particle physics with gravitation, collision and swarming mechanics.

Seed objects generate new particles with defined intervals that flow in the space until outside the screen.

Mass objects attract / pull towards particles from a defined point or orbit they are circling.

Surface objects receive particle collisions and interpet them to triggers of musical notes or sample segments.

Ideal for highly experimental music and sound effect use.

Notes: Recording hundreds of thousands of notes from particle surfaces to PianoRoll can flood the system memory and freeze the program.

Sequence Recording

In addition to recording sequences to Piano Rolls from MIDI or other input, all sequence generators can also write into PianoRoll tracks.

In order to record sequence generators to Piano Rolls they both ha be configured properly. To ease this process, Settings view has an "Auto-Connect" button that does this automatically for all active sequence generators.

All sequence generators can send notes to MIDI out channel that is defined in the Ext setting. External MIDI is always in 12-tone western equal temperament system.

Generator Synchronization

In the Settings view there are various selections for defining how sequence generators follow each other in time.

When a sequence generator follows another one, it causes a trigger to fire whenever the generator followed triggers a note (audible or not).

Sequence generators have a Sync Offset setting that defines a delay (defined by the generator's Grid resolution) for the received trigger firing. Sync Skip defines in what intervals triggers will be listened, making gaps into the synchronization.

Network

The UDP network interface features simple communication protocol for various software instances running in several devices or in a single one.

It is used for transmitting scales and tunings between program instances and also for synchronizing time (speed and position)

Time synchronization is designed to be active only until all instances are synchronized. By having it in receiving mode all the time causes skips in local time advancement.

Scales

Scales work as mapping layers that interpret note numbers (0-1024) into programmed subsets of the tuning system. Scales also map note numbers to sample segment numbers.

The minimum scale size is four notes and the maximum is 32.

When using diatonic or other smaller scales, it is reasonable to switch MIDI input mapping into diatonic (Settings -> MIDI I/O) where only the "white keys" are mapped to all note values.

Notes: Recording playing in a scale that is different than the scale assigned to the Piano Roll track is possible but only those notes are saved that are shared by both scales.

Changing the Scale of a Piano Roll track that has notation in it, converts the notation data in a similar way: If new scale size does not match old scale size, data is re-interpreted by leaving out the notes which the scales do not share.

Feeds

Number feeds transmit note number values between sequence generators and Piano Rolls.

When generator receives a feed number update from the feed it is configured to read, it replaces the current pitch position with the value interpreted from the feed value.

It is possible for a sequence generator to change it's octave to the one in Feed number or just receive the pitch and staying in the previous octave of the generator.

Tips: Setting a group of sequence generators to read together the same seed number that is written by a "master" generator makes receiving generators act as if listening and following the same tonal movement and playing very uniformly.

Sound Generation

Analog X 8 (AL1 - AL8)

Analog-style monophonic subtractive synthesizer with six oscillators, two filters, two LFOs, vibrato/FM modulator with own LFO, overdrive unit, envelopes for oscillator, filters and output volume.

Ideal for simple synthesized sounds like drums and percussion, basses, synth leads, arpeggions etc..

CPU load : Low, RAM Load: Minimal

Tips: As being the lightest on CPU load, this synthesizer is cheap ingredient for realtime audio.

Additive X 1 (ADDT)

Additive polyphonic 16-voice synthesizer with up to seven overtone oscillators each with own configurable pitch ratio, volume envelope and pitch-filtered noise generator. Features an oscillator vibrato with LFO and an overdrive unit.

Ideal for polyphonic instruments like keyboards, chords and chromatic percussion.

CPU load : Medium to High, RAM Load : Minimal

(Chords with seven overtones increase CPU load significally)

Tips: Overtone volume envelopes are the key to unique sounds.

Physical X 4 (PM1 - PM4)

Monophonic complex subtractive synthesizer implementing several physical modeling techniques from simple string models to complex vibrating shapes. Features six oscillators, physical excitation sources, two LFOs, multimode envelope, overdrive unit and a resonator delay.

Ideal for complex rich sounds from electric guitars to strings, brass and wind instruments. Also good for experimental sounds.

CPU load : High, RAM Load : Minimal

Tips: This synthesizer is limited to physical modeling only and a fundamental acoustic modeling (chorus, reverb..) of the instrument must be applied from the mixer section.

Sample X 6 (SP1 - SP6)

Polyphonic 16-voice sampler with sample data segmentation, filters, overdrive, variation and a granulizer for each voice.

The data loaded defines how it sounds. It can act as an tonal instrument with a single segment and it's sustainn loop or as an oneshot samplebank with multiple segments.

CPU load : Low to High, RAM Load : Medium to High

(Polyphonic granulizers increase CPU load significally)

Notes: Large sound or clip of music can be auto-segmented and the segments assigned to correspondig notes. Each segment has own pitch, volume and pan and their variations.

Tuning

Tuning system defines what note frequencies the sound generators are able to play.

It defines the ratios of the intervals and the base frequency value that works as the center of the tuning from where all rest frequencies are calculated. In the western standard, base frequency is 440 Hz for middle A or 261.63 Hz for middle C.

Tuning System Editor (Custom System) can produce new original tuning systems with several methods and supports Scala files.

Sample Rate & Quality

Mac OSX and iOS versions have a setting for program engine samplerate, that defines the sampling quality of the whole DSP. All the oscillators are already 2X oversampled but rising the samplerate over 44,1 khz will improve the overall sound quality significantly, especially the Physical synthesizer on high note frequencies.

On Linux version, the sampling rate is defined by the Jack Server.

Improving the sound quality also multipilies the CPU load meaning the more quality is needed the less instruments and effect can be run on realtime.

Offline rendering is not affected by a too high CPU load for clean realtime audio, and will always produce clean high quality audio files.

MIDI CC

All sound generators can be controlled with polyphonic MIDI CC messages.

The CC mapping by default is General MIDI compatible but can be switched to alternative device-specific mappings for MIDI controllers without CC re-mapping capabilities.

Mixer

The Mixer has individual stereo channels for all the sound generators and four stereo BUS channels with various stereo effect units and a stereo main channel with a sound limiter.

All sound generator channels can send signals to the four busses or straight to the main output. Main output can be recorded live to buffered stereo audio file.

Effect units have a moderate low CPU load excluding the Reverb unit.

On the Linux version, it is possible to start the program in a Multi-Output mode where all the individual tracks and busses have individual Jack output ports for external software mixing and recording.

Tips: By routing a group of same type instruments (i.e drums) into the same bus channel, CPU load is conserved and the mix is processed in a way similar to real-life mixing desks.