

RANDOLON

User manual

(Source randolon-2.04)

Forewords

This software is a prototype, designed for experimental music . It is distributed as a free product, but any commercial use is forbidden. The author gives it as an open source software that may be changed or improved by users. It is based upon the Max engine.

The author does not guarantee a perfect working, although this tool seems robust since several years of use , and apologizes not to be as competent as necessary to help the users according to their software and audio environments.

However you can communicate about your feedback and ideas of improvement to cep@imagimuse.net.

Table of contents

1. Introduction.....	3
1.1 Scope of the Randolon software.....	3
1.2 Overview.....	3
2. Randolon reference manual.....	4
2.1 Installation, starting up, set up and fast check-up.....	4
Mac OSX or WINDOWS installation, starting up and set up.....	4
On Windows :	4
2.2 User interface.....	5
Overview.....	5
Layout.....	5
Help.....	6
Use of the mouse and the alphanumerical keyboard.....	6
2.3 General controls (Control panel).....	6
Use of presets.....	6
Trimming the random variations fluidity.....	6
Master/slave control.....	7
2.4 Activation (Play panel).....	7
2.5 Setting up the MIDI parameters (Tracks panel).....	7
2.6 Setting up the base note and the fluctuating note (Pitch_framework panel).....	9
2.7 Setting up the rhythm (Time_framework panel).....	10
2.8 Programming the sequencer (Sequencer panel).....	12
2.9 Programming spacial trajectories (Spacial panel).....	15
2.10 Transformations of the sequencing.....	15
Time transformations:.....	16
Pitch transformations:.....	16
Intensity transformations:.....	17
2.11 Use of an external MIDI keyboard or of the alphanumeric keyboard.....	18
Sequencer programming.....	18
Transposition.....	18
Manual sequencing.....	18
MID thru.....	18
2.12 Sequencer in fractal mode.....	19
2.13 Master-slave operation.....	19
Slave sequencer:.....	19
Slave channel:.....	20
2.14 MIDI recording and play back (Play-back panel).....	21
3. Terminology adapted to the context.....	22
4. Randolon's musical principles.....	26
4.1 Swing rhythm.....	26
4.2 Pulse rhythm.....	26
4.3 Internal sequence tempo.....	27
4.4 Sustain.....	27
4.5 Pitch.....	27
4.6 Instruments.....	27
4.7 Intensity.....	27
4.8 Spacial position.....	28
5. Randolon technical data.....	29

1. Introduction

1.1 Scope of the Randolon software

Randolon plays musical sequences which evolve by repetition and variation. They come out as a stream of MIDI commands sent to one or more real or virtual synthesizers, external to Randolon and producing the required sounds.

The musical forms address the dimensions of time, pitch and presence. They can be designed as continuous, quantified, fractal or random figures, or complex combinations of these,

All settings are reachable and can be changed when playing, in order to improvise in real time or to achieve a composition thanks to the immediate feedback. The commands also can be recorded into MIDI files and so re-played later.

1.2 Overview

On the whole, the system consists to generate :

1. a *rhythm* of production of *events* in a time framework made from a part of regularity and from another part of *random*.
2. for each event, a pitch related either to a *base note*, whose the pitch is steady, or a *fluctuating note*, under constraints: scale, minimum, maximum, maximum deviation between consecutive pitches,
3. possible iterations of an evolutive *sequence motif*, based on the *rhythm* and the *base or fluctuating note*.

Each sound is characterized by the following MIDI parameters:

- half-tone scaled pitch, from 0 to 127
- micro-pitching (*pitchbend*) from + or – one half-tone by steps of about 1/64 tone.
- velocity, from 0 to 127
- aftertouch, from 0 to 127
- duration, from 40 to 10 000 ms (determined by sending a *note-off* after a delay)
- stereo position (pan), from 0 (left) to 127 (right)
- volume, from 0 to 127
- midi channel, from 1 to 16, possibly with a program number (instrument selection) and a soundbank number (instrument variant)
- port (or peripheral) MIDI, from 1 to 2

NB: all physical or virtual MIDI instruments are not able to process the whole parameter set. For instance, a « classical grand piano » naturally has no *pitchbend*.

The 16 step sequencer enables to produce a serie including arpegges or chords whose pitches are relative to the base note, by defining, for each step, a pitch interval and some programmed or random variations of the other parameters, and possible serial transformations of the time and pitch sequence. Therefore, the sound production rhythm is allocated to the sequencer cycle processing, the fluctuating note pitch being re-valued at each *cycle start*.

The sequencer can also be used recursively, each step pitch becoming in its turn the base note, thus generating fractal shapes.

2. Randolon reference manual

2.1 Installation, starting up, set up and fast check-up

Mac OSX or WINDOWS installation, starting up and set up

(Note: previous versions of *Randolon.app* or *Randolon.exe* no longer work on recent MacOS and Windows systems.)

Ondolon requires Max/MSP software for MacOS or Windows

Download and install, it's free for runtime use: <https://cycling74.com/downloads>

The Ondolon folder can be located anywhere.

Make sure that *randolon.mxf* and *rdl_def.xml* are located in the same folder.

Launch the application by running the *randolon.mxf* file with Max. Max will open the Randolon window after about half a minute. Close the other Max windows.

Fast check-up

On Mac :

the default setting of the **out port 1** menu on *AU DLS Synth 1* is sufficient.

For more performance, in *Applications/Utilities/Audio Midi Set up*, set up IAC Driver Bus 1.

This enables this bus as software MIDI instrument input through Logic, GarageBand, ProTools, etc. Optionally set up **input port** on a MIDI external keyboard.

On Windows :

Set **out port 1** to *Microsoft GS wavetable synth* (or *GS Mic soundtable synthesizer*), otherwise to an external MIDI synthesizer or a specific computer aided music software like Cubase or others.

To proceed the fast check up :

1. In the Randolon starting window, on the **Tracks panel** first line, select in the *pgm* field: *1.acoustic_grand_piano* (also displayed above);
2. Click the **step** green key, on the **Play** panel. The loudspeakers should play the C4 piano note.
3. Check the orange **run** toggle, then do **step** : this note repeats with a 120 BPM rhythm. Modify this rhythm by the **pulse** orange slider in the right of the **Time_framework** panel.
4. Slide the **%_alea** orange slider toward the right to make the rhythm less or more fuzzy .
5. Slide up the **fluid** slider at the right of the **Pitch_framework** panel, in order to play random notes in the chromatic scale.
6. Select a **diatonic**, **blues** or another scale, eventually make several experiments.... if need, click the purple **init** key to loose from any jam in the MIDI flow.
7. Uncheck **run** to stop.
8. To reset to the default setting, click on the **default** purple key at the left of the **Control** panel.

For the rest of this reference manual, consult as necessary the chapters 3 and 4 to link the different features to Randolon's concepts and musical principles.

Several demonstration presets are provided in the /demo folder.

To load a demo, click on **load** in the **Control** panel, then find and select an XML file by the search window, then, make **init**, **run**, **step** (**Play** panel).

2.2 User interface

Overview

Types of settings:

- slider : horizontal, vertical or circular : continuous change on a value.
- multi-sliders : continuous variation for several similar parameters.
- double slider : to define a variation range.
- selector : horizontal or vertical ruler, made of n squares or buttons: selection among n positions.
- Menu : enables to select a choice ; the last done choice appears checked.
- toggle (check box): on/off selection, an X means the « on » position.
- key: trigger, flashing once.
- numeric box : input by mouse sliding.
- bar : horizontal or vertical ruler, similar to a selector, but several squares can be simultaneously selected.
- *track selector*: each track is symbolized by triangular icon.
- *pitch motif* : pattern made by 16 vertical 28-box bars; each bar, dedicated to a sequencer step, enables to set the pitches played by the different tracks. See operation details at 6 2.8. *Sequencer programming*.

Types of displays:

- slider
- textual display box or area : values, pitches, messages
- key flash

Color code:

- green : parameters for the sequencing
- orange, brown : settings for the time dimension,
- yellow : setting for the pitch dimension,
- blue : other sound parameters
- grey : real time displays
- purple : initialization management, presets
- white: disabled setting, because without impact on the current configuration (therefore accessible in a configuration change perspective)

Layout

The different settings are grouped inside areas of the Randolon window, called « panels ».

Left half : global settings:

- **Time framework**: panel for setting the time framework
- **Pitch framework**: panel for setting the tonal texture
- **Spacial**: spacial trajectories programming
- **Tracks** : panel for the track settings toward the **MIDI** channels
- **Sequencer**: sequencer use modes
- **Control** : control modes and presets
- **Play** : start/stop cycles

- **Play-back** : save/play recorded MIDI files.

Right half: 16 step sequencer with identical settings.

On the sequencer left and against the related settings, the transformation panel:

- **Time_transfo**: sequence transforming
- **Intensity**: intensity modulations
- **Pitch-transfo**: pitch transforming.

Help

When a setting is hovered by the mouse pointer, its function is displayed in the bottom of the Randolon window.

Use of the mouse and the alphanumerical keyboard

The sliders are taken into account in real time. The factory default setting (0, maximum or center, set up by design) may be fastly got by a double click.

Numeric input fields are set up by a vertical mouse slide.

The keyboard can also be used to trigger the sequencer events in real time, or to control MIDI files playbacks (see § 2.11)..

2.3 General controls (Control panel)

Use of presets

The *preset* area is in the **Control** panel of the user interface. The textual box displays the last loaded *preset* .

At start up, the user interface is configured according to the *default* preset.

Click on **default** to get back to this configuration.

Click on **save** to save the current configuration into a disk file.

Click on **load** to get back a previously saved configuration.

Click on **save_new_default** to save the current configuration as default configuration.

Click on **factory** to get back the factory default configuration.

Be careful that a configuration saved as a preset guarantees a repeatable playing only if all parameters of the type *random* , *alea* or *fluid* are set to 0. The exact playing repeatability is only carried out by the MIDI recording and play-back feature.(see § 2.14).

The **out port 1**, **out port 2**, **input port** settings are not saved into the presets in order to simplify the presets portability between systems having different MIDI devices configurations.

Trimming the random variations fluidity

Turbulence_fluidity circular slider: controls a common fluidity of the random variations of the following parameters, when they are modulated by a *random* function :

- *timeshift*, *sustain* and *microtones* (on every sequencer step)
- intensity envelope (on the *Intensity* panel)

- **volume** and **pan** (on the *Spacial* panel)

For these parameters :

- when the slider is at the right end (default), the fluidity is maximum within the variation range.
- when the slider is at the left end, the parameter value is frozen on the starting position and do not change.
- when the slider is between, the random values are more or less restrained.

Master/slave control

See further the paragraph 2.13

2.4 Activation (*Play panel*)

In the **Play** panel:

- **init** key: general reset, recommended before any new operation :
 - to erase the context of the previous one
 - to eventually reset the MIDI channels (see below the *pgm* setting).
- **step** key: production of a single event.
- **run** toggle then **step** : production of a stream of events until a new click on **run**, which complete the current cycle until its last note end. Then the stream is stopped.

The textual box at the panel bottom shows the different activation states :

- *idle* : inactive
- *cycle_playing_on* : active during a cycle, until the last programmed note is released (*note-off*)
- *playing_on* : active, but waiting for the next programmed cycle
- *waiting_step_to_start* : waiting for a **step** after a **run** was enabled
- *step_mode* : after each cycle played in step by step.

The timer box of the **Play-back** panel counts up the *cycle_playing_on* time when **run** is on, possibly to be re-played in *play-back* mode. During this counting up, the *run* toggle is darkened.

The toggle **Kb** enables to trigger the *step* from an external MIDI keyboard.

2.5 Setting up the MIDI parameters (*Tracks panel*)

Randolon can manage 8 output tracks allocated to MIDI channels.

The tracks have common settings and specific settings. From left to right :

thru toggle (purple)	Overlaying by an external MIDI keyboard (the pitch is displayed just above).
Chan. menu	Assigns a MIDI channel to the track, from 1 to 16 for port 1 and from 17 to 32 for port 2 (see also the MIDI preferences); also used to assign the number of another Randolon which is set up in slave channel mode (<i>slave chan</i>), numbered from 33 to 48. See also the § 2.13 about the master/slave operations.
Pgm menu	Selects a <i>General MIDI program</i> number from 1 to 127, or 0 (default!) if not used or if the program is locally assigned on the synthesizer related to this

	channel itself. Nevertheless, a number > 0 must be entered so that the channel can receive the <i>General Midi</i> reset controls 121 and 123. A -1 <i>pgm</i> value means that the <i>pitchbend controls</i> , useful for <i>microtones</i> and <i>slide</i> will not be sent to this channel (for example, to avoid jamming a not <i>pitchbended</i> MIDI device). This setting is not applicable if the channel number chan. is > 32.
bank	From 0 to 9 : instrument variant related to <i>pgm</i> . This setting is not applicable if the channel number chan. is > 32.
aft	Aftertouch, from 0 to 127, -1 to disable.
octave menu	from -5 to +2 : global transposition, from -5 to +2 octaves, of the pitches generated by the the sequencer (see further). Default = 0.
pitchlock menu	from 0 to 127: constant pitch, overriding the sequencer computed pitch. Also useful to assign a percussive instrument number (according to the General MIDI standard, where the channel number 10 is reserved to drumkits).

Indicatively, the General MIDI instruments related to the **program**, **bank** and **pitchlock** settings are displayed next to the *Tracks* title, subject that the device linked to the **midi channel** is really standard compliant. If the *program* is 0, the *free use* indication is displayed.

Several tracks may be linked to the same MIDI channel. However this one can manage only a single MIDI program at a time. If a **chan.** or **pgm** setting change causes a conflict, the message *already_programmed chan.* flashes and the former setting is kept so that one track at a time may assign a program for this channel.

pan_spread slider	Common limiter for the stereo panoramic range. A double click resets to the central position.
Velocity range double slider	<i>Velocity</i> range specific to this track, from 0 to 127, corresponding to a 0 to 1 intensity range. The center of the range thus corresponds to a mean <i>intensity</i> of 0.5. A double click resets to the central position (value 64).
av. sustain slider (brown)	Average duration, from the <i>note-on</i> to the <i>note-off</i> , displayed in seconds. The grey slider above shows the remaining duration of the longest emitted note. Please note that the real duration also takes into account the <i>Xsustain</i> setting of every sequencer step.
K_up toggle (orange)	May be used with the sequencer in step mode (run toggle of the Play panel disabled), when the steps are triggered from the external keyboard (Kb toggle of the Play panel checked). When the K_up toggle of a track is checked, the note is sustained by the external keyboard and not by the duration programmed by the av. sustain slider. Several keys may be simultaneously pressed and released according to the desired sustain duration for each step.
polyphony menu	Channel polyphonic limitation through the maximum number of notes that can be simultaneously sustained. <ul style="list-style-type: none"> – Poly : no limitation – mono : monophonic (detached notes) – 2, 4 or 8v polyphonic voices Associated with av.sustain , this setting is important : <ul style="list-style-type: none"> – either, technically, to adapt Randolon to the capacity of the

	<p>destinatory synthesizer and so avoid potential MIDI channel overflows,</p> <ul style="list-style-type: none"> – or , musically, to clear the flow of notes by pruning the note lengths. <p>The « voice stealing » method : every new note overflowing the polyphonic limitation takes its place by cutting the older one by sending a preliminary <i>note-off</i> . However, synchronous notes (chords, canon) are here considered as a single note.</p>
stairs menu	Go to the next pitch through an up or down going arpege, according to the relative pitches, made of 2, 3, 4 or all intermediate intervals from the previous note, within the selected scale (see further : <i>scaling</i> and <i>mode</i>).
slide slider	Go to the next pitch though a 0 to half-tone, up or down going, slide, according to the relative pitches. A double click resets to the 0 position. This setting is disabled if the <i>pgm</i> number is -1 or if the channel number is > 32.
fluct. toggle (yellow)	To control if this track manages the fluctuating notes, related to th fluct. toggle of every sequencer step. See also the § 2.8 <i>Sequencer programming</i> . By default the first track is checked.
on toggle (green)	General track enabling / disabling .The right alphanumeric box displays the last note played by this track. By default the first track is enabled.
Track selector	Selection of the track for the <i>pitch motif</i> setting. Each track is symbolized by a triangle icon. When the track is not selected, the backgroud is yellow and the track triangle icon is green if the on toggle is checked, otherwise white. When the track is selected, the background is green and the icon purple.
Carousel toggle	Makes the sequencer to play tracks in round robin, one after the other, rather that all tracks in parallel.

2.6 Setting up the base note and the fluctuating note (Pitch_framework panel)

First, set the sequencer **off** : all the sequencer settings are disabled and are displayed with a white background. On the first sequencer step (step 0), check the desired **track** (green bottom bar). Or, more roughly, **reset** the sequencer.

scale and mode menus	<p>Define the scale and the mode.</p> <p>The scale map list of numbers shows the resulting half-tone scale.</p> <p>Leftside, the yellow/grey bar shows in white the classes used by the tonal scale according to the scale and mode settings. NB: all the squares of this bar are yellow when the chromatic scale is selected.</p> <p>The scale can also be defined by the user by checking the relevant squares at the right side of this bar, then selecting<i>user defined</i>....in the scale menu. Every scale begins by a « C » (the first square is checked by default).</p>
------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

base selector	Defines a register by the starting octave number (with possibly a transposition of -5 to +2 octaves according to each track octave setting, 0 by default). NB: C-1 corresponds to the <i>MIDI pitch</i> 0, C0 to 12, C1 to 24, and so on.
limit selector	Defines the random fluctuation ambitus by an octave number above or under the base .
transpo selector	Defines a final pitch shifting, in half-tones, from 0 to +11.
Kb toggle	Enables to set up the base register and the transpo shift from an external MIDI keyboard (see § 2.11).
fluid slider	Fluidity of pitch random fluctuations: <ul style="list-style-type: none"> when fluid is 0, the fluctuating pitch stay at the same pitch as the base, that is, a C, possibly shifted by the transposition, when fluid is maximum, the fluctuating pitches will be produced anywhere within the base – limit range, whatever the previous pitch, but in respect to the selected scale and mode, when fluid is between, the interval between a new fluctuating pitch and the previous is more or less restrained by the value displayed on the right of the slider, a double click resets fluid to 0.
1/n times selector	To change the fluctuating note every 1, 2, 3 or 4 cycles.
b grey slider	Indicative display of the base note pitch.
f grey slider	Indicative display of the fluctuating note pitch.
rt grey slider	Indicative display of note pitch played in real time by the sequencer current step, and its notation is displayed in the textual box at its right.

To test the result, click on **step**.

NB: the pitch may be affected if the track *octave/pitchlock* setting is not 0: transposition of -5 to +2 octaves or fixed note, independant of the above settings if > 2.

2.7 Setting up the rhythm (Time_framework panel)

From up to down:

swing slider	Mean tempo of the swing, from 1 to 300 BPM . The numeric value may also be entered through the mouse in the box at the right. The grey backgrounded slider displays in real time the frequency derived from the <i>swing</i> tempo period.
%_alea slider	Random percentage, according to the distribution law defined by color : <ul style="list-style-type: none"> 0% : perfectly regular clock. 100% : randomized rhythm, the event probability distribution, being centered on the swing mean tempo, respects the probability law defined by the color menu. intermediate position : weighting of the random against the regular rhythm a double click resets to the 0 position.

fluid slider	<p>Rhythm variation fluidity, when %alea is different from 0:</p> <ul style="list-style-type: none"> • when the slider is moved to the right end (by default), the <i>swing</i> period may freely vary within the range resulting from the swing and %alea settings • when the slider is moved to the left end, the period is frozen at its last random value and cannot change anymore. • when the slider is between, the variations of the period are more or less restrained. • a double click resets to the maximum position.
Color menu	Distribution law for frequencies of the events, applying both to the <i>wave_depth</i> modulation and the %_alea randomization.
wave_depth and wave_period sliders	<p>Modulation of the rhythm by a slow periodic function . Its period is <i>wave_period</i> (from 1 to 60 s) and its amplitude is <i>wave_deph</i> from 0 to 1. The waveform selector determines the shape of the function:</p> <ul style="list-style-type: none"> • sine • square • up sweep • down sweep • saw: triangular sawtooth
pulse slider	<p>Mean tempo of the pulse, from 10 to 1200 BPM . The numeric value may also be entered through the mouse in the box at the right.</p> <p>The grey backgrounded slider displays in real time the frequency derived from the pulse tempo period.</p> <p>NB: it does not consider the intermediate notes triggered by the stairs or fraction settings.</p>
%_alea slider	<p>Random percentage, according to the distribution law defined by color :</p> <ul style="list-style-type: none"> • 0% : perfectly regular clock. • 100% : fully randomized rhythm, the mean density of the events being equal to the pulse mean tempo, respects the probability law defined by the color menu. . • intermediate position : weighting of the random against the regular rhythm • a double click resets to the 0 position.
fluid slider	<p>Rhythm variation fluidity, when %alea is different from 0:</p> <ul style="list-style-type: none"> • when the slider is moved to the right end (by default), the <i>pulse</i> period may freely vary within the range resulting from the pulse and %alea settings • when the slider is moved to the left end, the period is frozen at its last random value and cannot change anymore. • when the slider is between, the variations of the period are more or less restrained. • a double click resets to the maximum position.
synchro selector	<p>Rule for synchronizing sequences against the <i>swing</i> period :</p> <ul style="list-style-type: none"> • adj.puls (default) : the sequences are adjacent and <i>pulse</i>- timed; so the <i>swing</i> stems from them (swing , %_alea and fluid sliders are blanked) • adj.sw : the sequences are adjacent and <i>swing</i>- timed; so the <i>pulse</i> is automatically adapted to fit the <i>swing</i>. The pulse slider is blanked. In metric sequencer mode, %_alea and fluid sliders are also

	blanked <ul style="list-style-type: none"> the other positions apply to the general case where the <i>swing</i> has to trigger the sequencer cycle starts; the different options address the way to manage sequences longer than the <i>swing</i> period, poly : polyphonic sequence overlaying complete : no overlay, each sequence has priority and is completed before triggering the next one at the next <i>swing</i> beat truncate : no overlay, but the <i>swing</i> has priority and breaks uncompleted sequences.
--	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

To test the result, click **init**, then **run**, then **step**.

2.8 Programming the sequencer (Sequencer panel)

Sequencer mode, by the top left selector positions :

off	Disabled sequencer, without any effect on playing, except some step 0 settings that are effective in the <i>off</i> sequencer mode.
recitative:	The time intervals between steps are programmed through the rhythm parameters : <i>pulse</i> , <i>%_alea</i> , <i>fluid</i> and <i>color</i> .
metric	The time intervals between steps are programmed through the figures ($\frac{1}{4}$, $\frac{1}{8}$...) based upon a pulse common value resulting from the <i>adj.puls</i> or <i>adj.sw.synchro</i> setting.
MIDI-in settings	Used to program the sequencer steps by an external MIDI keyboard (see § 2.11).

The sequencer is made of 16 steps that are parametrized in an identical manner. The **reset** key sets the default values making the sequencer strictly neutral, that is, exactly like for the **sequencer off** position.

The sequencer must be considered as circular : the step following the last one is the first one, the step preceding the first one is the last one. This view is necessary to understand how the settings addressing the time work .

For every sequencer step, from bottom to top, with the title at the right :

Active green toggle	Bar for activating one or several steps in the sequence. The bottom right all toggle processes the 16 steps simultaneously. By default the sequence is empty and the steps to be used must be activated. The notes belonging to inactivated steps are displayed in white on the <i>pitch motif</i> .
Vertical bar of the pitch motif	To set up the pitch intervals for the different tracks. The word <i>note</i> is here used to mean a pitch interval. The below description assumes that the relevant sequencer step and track are both activated. Otherwise, the process is similar, but without effect while expecting the activation, and the note icons stay displayed in white. <ul style="list-style-type: none"> The middle horizontal orange line indicates the pitch corresponding to

	<p>the <i>base note</i> ; the notes of every step may so be set upper or lower than this one ;</p> <ul style="list-style-type: none"> • to set up a note, select the desired track through the <i>track selector</i>, click down a box of the bar and click up ; the note appears according to the selected track icon and displayed in black ; • to move a note, select the desired track, then click down the box of the note, vertically drag the mouse on the same bar and click up ; or click down and up, then click an other box of this bar ; • the last set or moved note (« hot » note) is displayed in black and can be moved by dragging or clicking down an other box of the same vertical bar : the other notes of the same selected track are red, and all the other notes are green, or yellow for fluctuating notes (see the fluct. toggle) ; clicking again the « hot » note releases it and displays it in red (or yellow) and enables to set up other notes on this step ; • to remove a note, select the desired track, click down on the note, then drag the mouse to the left or the right, outside of the bar ; • when a note is alone on a bar box, to click it makes its belonging track selected ; if is not alone in its box, the track must priorly be selected ; • up to 4 different notes can be set for one track on a bar (thus played in chord) ; • each box can contain only one note of the same track, but however several notes of different tracks ; • the <i>pitch motif</i> bottom orange raw is used to set up silences (rectangular icon) ; a silence makes the step silencious during its processing time, without removing the notes but displaying them white; to set up a silence, unselect all the tracks and click on the orange box of the bar ; click another time to remove the silence ; the bottom right silent toggle processes the 16 steps simultaneously. <p>Summary of the note display color code :</p> <ul style="list-style-type: none"> • black : currently edited « hot » note, • red : note belonging to the selected track, • green, note belonging to the other tracks, • yellow : fluctuating note, the track and step fluct. toggles of which are both checked • white : note belonging to an not activated or silencious step or to a not activated track. <p>For every note, the position on the bar defines a pitch interval against the <i>base note</i> or the <i>fluctuating note</i> (according to the fluct toggle), expressed in half-tones (from -14 to +14) if the tonal toggle is unchecked or expressed in the selected scale if it is checked. The orange horizontal lines display the octave positions according to number of degrees of the selected scale. See at § 2.10 how the tonal toggle can also work for the pitch transforming. See also how the play pitch toggle enables to listen to the notes when editing the <i>pitch motif</i>.</p>
fluct. toggle	Toggle to control if the pitches will refer to the <i>base note</i> (if not checked) or the <i>fluctuating note</i> (if checked and for the tracks having their own fluct. toggle checked). The all toggle proceeds on the 16 steps simultaneously. Fluctuating notes are displayed in black on the <i>pitch motif</i> .
microtones	Micro-tonal shift, from - 1/2 tone to + 1/2 tone, the scale being defined by the

slider	<p>left common selector: 1/4, 1/8, 1/16 tone or the <i>pitchbend</i> MIDI scaling (about 1/64 tone).</p> <p>A double click resets to the center position.</p> <p>The rand. key enables to produce in real time a random value within the range from 0 to the set shift. The fluidity is controlled by the turbulence_fluidity slider in the <i>Control</i> panel.</p> <p>Note 1: this setting does not consider tracks which have their <i>pgm</i> setting set on -1.</p> <p>Note 2: this setting is effective for the step 0 in the <i>off</i> sequencer mode.</p>
Xsustain slider	<p>Sound sustaining variation, from 1/8 to 8 times the <i>sustain</i> mean duration of the tracks addressed by the considered step. By default : 1.</p> <p>The rand. key enables to produce in real time a random value within the range from the average value to this setting . The fluidity is controlled by the turbulence_fluidity slider in the <i>Control</i> panel.</p> <p>Note: this setting is effective for the step 0 in the <i>off</i> sequencer mode.</p>
time shift slider	<p>Time shift within the pulse rhythm, in percentage of the time interval between this step and the previous one (negative shift) or the next one (positive shift). A - 100% setting plays the sound at the same time than the previous, and + 100% at the same time than the next one.</p> <p>The rand. key enables to produce in real time a random value within the range from 0 to this setting . The fluidity is controlled by the turbulence_fluidity slider in the <i>Control</i> panel.</p> <p>The time shift is effective only if the step sequencing mode is set on arpege (see below) and when the sequencer mode is metric. A double click resets to the 0 center position. Remark: although a 100% time shift produces a chord with the previous or next step, the result is rhythmically different from the chord , because the sequencer plays 3 steps in the <i>time shift</i> case against 2 steps in the <i>chord</i> case.</p>
intensity envelope slider	<p>Sound intensity variation, from 0 to 1, related to the min_velocity to max_velocity range of each addressed track. By default: 0,5. This feature enables to drawn an intensity curve by accentuating loud and low sequence times against the 0.5 average level.</p> <p>The setting is by hand when the shape selector is on <i>free</i>, otherwise it is programmed according to the checked functions. See below the § <i>intensity transformations</i>.</p> <p>Note: this setting is effective for the step 0 in the <i>off</i> sequencer mode.</p>
figure slider	<p>Figure is enabled only in the metric sequencer mode.</p> <p>Figure as a fraction of a semibrieve . The dotted toggle checks dotted notes. Warning: this value programs a time interval towards the next sound, and not the effective sustain time, which is set by the sustain setting.</p> <p>The fraction value for a step or successive steps may be inserted to divide a time interval into equal intervals. For example, two <i>fractions</i> make a triolet.</p>
Play key	<p>Flashes to show the current step and enables on a click to play its sound in solo when run is off. The just below row of alphanumeric boxes displays the real time notations or the played steps.</p>
1st toggle	<p>This step is selected as starting step of the sequencer cycle (see further : transformations of the sequencing).</p>

Each active step is played after the previous one according to the **metric** or **recitative** sequencer

mode, the **figure** value and the possible **time shift**.

To test the sequencer step by step, click on **step**, or, when **run** is off, on the individual **play** of each step. NB: of course, in step by step, the relative time intervals between sounds is not respected, however chord are played in simultaneity.

When a setting is changed during the sequencer operation, the new value is taken into account at the next cycle start.

2.9 Programming spacial trajectories (Spacial panel)

These settings enable to define and repeat at every sequence a trajectory for the sounds played by the sequencer.

Volume double slider	Range of the volume control value, related to the farthest and nearest positions.	
pan_spread slider	Left-right range, defined by the slider position and its symmetrical position against the center (by default : centered slider) The grey sliders display the <i>volume</i> and <i>pan</i> values in real time.	
Trajectory selector:	steady	constant position defined by the max and pan_spread .
	random	random position of every sound, limited by min , max and pan_spread .The fluidity is controlled by the turbulence_fluidity slider in the <i>Control</i> panel.
	near-far-near:	U trajectory, starting from the pan_spread position.
	far-near-far	inversed U trajectory, starting from the pan_spread position.
	clockwise-ellipse:	ellipse, starting from the position defined by pan_spread and the middle of min and max , and beginning by coming closer.
	c-clockwise-ellipse	ellipse, starting from the position defined by pan_spread and the middle of min and max , and beginning by going farther.
Note: if <i>min</i> = <i>max</i> , elliptic or U trajectories are reduced to a left-right path and if <i>pan_spread</i> is centered, itrajectories are reduced to a near-far path.		
xy	Toggle used to link the spacialization controls to the CEPbinaural plugin, through the ctrl8 and ctrl9 controls rather than the pan (ctrl10) and volume (ctrl7) MIDI controls; see the " <i>Couplage Randolon -LogicPro - CEPbinaural</i> " document.	
hold	When unchecked, each sound of a sequence moves along the trajectory. When checked, it stays at the same spacial position until the next sound occurs.	

2.10 Transformations of the sequencing

The sequencing can be transformed in time, in pitch and in intensity.

Time transformations:

Left to the **1st** toggles, the **Time transfo** first menu includes three positions :

rotation	by checking a sequence starting step different from the first
rand.	the starting step is random at each cycle (NB: <i>off</i> steps are not considered)
canon:	the starting step is 0, but several sequence in canon may be launched in parallel at times defined by checking two or more <i>cycle start</i> toggles; by unchecking these toggles, the relevant sequences are individually stopped.

The **Time transfo** second menu enables to play the sequencer steps in a different order, while considering their figures ($\frac{1}{4}$, $\frac{1}{8}$, etc....) :

basic:	no transformation
alea	random order
retrograd	inversed order
ping-pong:	altern normal and inverse
short ping-pong	ping-pong without repeating sounds at the beginning and the end.

Pitch transformations:

The Pitch_transfo settings process globally on the 16 steps of the *pitch motif*.

When experiencing **Pitch transfo**, sometimes initial settings need to be retrieved. For this purpose, they must be previously saved by clicking on **save**, in order they can be retrieved later by clicking on **restore**. Without **save**, the **default preset** or the loaded **preset** are retrieved by **restore**.

The *pitch motif* grid displays either the 12 half-tone chromatic scale or the selected tonal scale degrees if the **tonal** toggle is checked.

When switching from tonal scale to chromatic,

- the pitch motif intervals are re-computed to comply with the 12 degrees scale.
- the coloring of the rows of the grid shows the degrees of the tonal scale similarly to the **map** display of the **Pitch framework** panel.

When inversely switching from chromatic to *tonal*, the inverse operation is done, therefore by rounding down if the chromatic interval do not belong to the tonal scale.

The orange horizontal lines across the pitch motif shows the octave limits of the selected tonal or chromatic scale, above or under the middle orange line. If the upper or lower octaves are incomplete, they are not taken into account by the below described pitch transformings.

The **norm.** toggle indicates to make or not a normalization of the sequence after each transformation, against the chromatic scale or against the current scale (**tonal** toggle). In theory the *pitch*s should be shifted together inside the octave in such a way that the first note of the serie becomes a C. In practical terms, for Randolon, lowest note of the first track on the step checked by

the *cycle_start* toggle is used as a reference to shift the set of steps, in chromatic or tonal scale.

If a note is changed by hand, the normalization becomes disabled.

Click on ***invert*** to invert the sequence inside each octave, according to the chromatic or tonal scale. A new click set it back identically, excepted if ***norm*** is checked, because the pitch transformation types are not commutative. The ***button/altern./rand.*** menu enables to make inversions at each cycle start either by hand (by clicking the ***invert*** key), either everytime, or randomly.

To transpose the sequence, click a shifting height on the ***shift*** vertical selector. This action is not compatible with the normalization and thus eventually disables it. Notes shifted outside the octave are transposed back to the former octave. The ***rand.*** toggle enables to make different random shifts for each cycle start. ***Shift*** operations are reversible.

The ***selected_track_pitches*** area enables several transformations applied only to the track selected by the *track selector* :

<i>erase</i>	Remove all the notes
<i>copy</i>	Memorize all the note positions
<i>paste</i>	Pastes all note positions memorized by <i>copy</i> (possibly to an other track). This operation disables the possible normalization.
<i>shuffle</i>	Randomly sets up all existing notes (<i>all</i>), or only those with their <i>fluct.</i> toggle checked. The random serie is constrained by the <i>fluid</i> slider value on the <i>Pitch_framework</i> panel: if the fluidity is null, all the notes are aligned on the base note ; if the fluidity is maximum, the deviations between notes are unlimited across the <i>pitch motif</i> grid. Between, the maximum random deviation is displayed under the <i>shuffle</i> title.
<i>hide_others</i>	Visually hides the other tracks notes, without disabling them.
<i>play</i>	Toggle making steps played when modifying them, similarly to the <i>play</i> key.

Intensity transformations:

Intensity panel.

Shape menu: choice to automatically draw the intensity envelope for the sequencer active steps:

<i>free</i>	manual setting of each slider
<i>flat</i>	reset all sliders to the center
<i>rand.</i>	random value limited by the <i>%i</i> slider ; the fluidity is controlled by the <i>randomization_fluidity</i> slider.
<i>downward</i>	downward ramp, the amplitude of which is defined by the <i>%i</i> slider

upward	upward ramp, the amplitude of which is defined by the %i slider
^	central peak, the amplitude of which is defined by the %i slider
v	central valley, the amplitude of which is defined by the %i slider

Intensity %time slider: to take into account, from 0 to 100%, the time between the events to compute the intensity : the intensity is as loud as the time interval of the events is long, as for the size of droplets of a constant average flow dripdrop. A negative value (towards -) takes into account the time since the previous event. A positive value takes into account the future time to the next event. A double click resets the slider to the central 0 position, where the intensity is only defined by the **intensity envelope** and **shape** settings.

2.11 Use of an external MIDI keyboard or of the alphanumeric keyboard

Sequencer programming

When the sequencer mode menu is set on **MIDI-in setting**, the notes played on the keyboard are automatically programmed on the successive sequencer steps. The stored **pitch** is the class of the note and does not take into account the register : it means the bias from the note played on the keyboard to the beginning of the octave, possibly shifted by the **transpo** setting.

Beyond the step 15, the programming restarts at the step 0. When several notes are played in chord (less than 200 ms of time gap), the related steps are programmed on the same step.

Transposition

The external keyboard MIDI pitch can also be used in real time to set up the base octave (register) and the transposition (**Kb** toggle under the **transpo** selector).

Manual sequencing

The **Kb** toggle of the **Play** panel enables to use the MIDI keyboard or the alphanumeric keyboard in a similar way as the step key, by any key down. If a track **K_up** toggle is checked, the sustain duration is the key-down duration instead of the duration set by the **sustain** slider.

Several steps can be simultaneously controlled through several simultaneous keys on the MIDI keyboard or the alphanumeric keyboard.

When run is not checked, cycles are processed step by step. When run is checked, the sequence automatically runs until completion, then stops, contrary to a start by the step key, which loops sequencer cycles without stopping.

See also at §2.14 how to manually control a MIDI file playback.

MID thru

In real time, all that is played on the keyboard can be directed towards one or several output tracks, thanks to the purple **thru** bar on the **Tracks** panel.

2.12 Sequencer in fractal mode

Although the resulting motifs complexity seems chaotic, in fractal mode the fluctuating pitch is generated by an arithmetical serie rather than a pseudo-random algorithm. The **fluid** slider is ineffective.

When the fractal mode is set on through the **fractal** selector, the 16 pitch values of the first track and the 16 **figure** values of the sequence are stacked during the sequencer operation. If a step contains several pitches of a chord, the lower is kept.

When the sequence restarts for the next cycle, the fluctuating note is overridden by the step 0 previously stacked note. Then, the next sequence use the note of the stacked step 1, and so on. Simultaneously the successive sequences are stacked and operated in their turns. The **depth** numeric box shows the number of stacked sequences.

The **fractal** selector position indicates if the fractalization is related to pitches (**pitch**), durations (**time**) or both (**pitch & time**). The time unit is the duration of a ¼ figure. When the base note is a ½ figure, the whole sequence rhythm is slowed down by 2. If it is 1/8, the rhythm is speeded up by 2, and so on.

The **init** key clears the sequence stack and resets **depth** to 0.

NB: the time fractalization is meaningful only in the **metric** sequencer mode.

The trends of the melodic motif to shift toward lower or higher registers depend both on the generic motif and on the number of steps having their **fluct.** toggle checked. However, the pitches are limited by the **pitch base** and **limit** selectors, acting as bouncing walls, enabling the fractal device to fold inside the desired range.

All the **time transfo** and **pitch transformation** settings can be used, including their **random** features.

The fractal building considers only pitches and rhythms. The other parameters are processed in real time in function of the settings of each step.

The motif notes can be changed during the operation : it will be taken into account to generate the fractal device continuation.

2.13 Master-slave operation

Several Randolon application windows may be simultaneously opened by the Control panel menu (**launch new instance**), which also enables to close the current window (**quit**).

The sequencer instances can operate separately or through a master-slave synchronization. Two types of master-slave synchronization may be implemented : slave sequencer and slave channel.

Slave sequencer:

An instance, declared as **master**, controls the **pulse** of the other instances, declared as slave sequencers (**slave seq**), which work as extensions of the master, enabling to add to it other simultaneous sequences.

A slave Randolon is fully controlled by the master rhythm parameters, so all its **Time_framework** panel settings are disabled.

When the master works, the slaves receive the **inits**, **runs** and cycle starts from the master. The slave **steps** flash at every received cycle start, with the following restrictions :

- a slave takes into account a master cycle start only if its own cycle is completed (no overlaying),
- the master does not send the *canon* cycle starts,
- if several instances are declared as *master*, the first sent master signal excludes all other masters by forcing them to the *solo* position

Slave channel:

In the **chan** numeric box of a track of the master sequencer, in the place of a MIDI instrument channel number (from 1 to 32), a Randolon number, from 33 to 48, may be declared. This one must be set as slave channel (*slave chan*), with the corresponding channel number.

The slave Randolon is timed by the master sequencer steps, and its *swing* settings are disabled.

When a master sequencer step is linked to this slave channel through one of the 8 tracks, the MIDI parameters are so translated:

- The *pitch* is used as fluctuating note of the slave sequencer . The base note is still defined at the slave level.
- The master velocity is transmitted to the slave as a base intensity.
- The master *sustain* defines a maximum duration for the slave sequence; thus, logically, the slave *pulse* rhythm should be set faster than this of the master, otherwise its sequences are broken at the end of the time defined by **sustain**.
- The successive sequences may overlay or not, according to the *synchro* options : *poly*, *complet* or *truncate*.
- The other MIDI parameters (*pitchbend*, *aftertouch*, *pgm* and *bank*) are not used by the slave channel.

A master **init** is also sent to the slave channels.

A slave channel Randolon cannot synchronise other subordinate slave channels. But a slave sequencer Randolon can do it.

Several slave channel Randolons can be synchronized by sharing the same slave channel number.

The green central menu positions :

solo	This Randolon operates individually (by default)
master	This Randolon is the master of one or several slave sequencers
slave seq	This Randolon is slaved to the master as a slave sequencer : all rhythm setting parameters are sent by the master and the Time framework area is disabled.
slave chan	This Randolon is slaved like an instrument channel of another Randolon, with a channel number from 33 to 48 set in the numeric box at the right. The fluid slider, limit pitch and fractal selectors and the settings related to the swing are disabled.
playback	This Randolon is playing back a MIDI file.
launch new instance	Open a new Randolon window.
quit	Close this Randolon window.

2.14 **MIDI recording and play back (Play-back panel)**

For this above control selector upper 4 positions, the MIDI controls generated by Randolon are recorded in waterfall into a play-back memory when the **run** toggle is on.

Everytime the **run** is set on, the play-back memory is erased and a new recording begins when the first MIDI control is sent, including from the external keyboard. When **run** is set off, the recording stops only when all the programmed notes are released (note-off).

The stop watch counter in the **Play-back** panel shows the recording time.

The **init** key immediatly breaks the recording in play-back memory, but, the content being possibly uncompleted, the play-back would end on pending MIDI notes.

To replay this recording, set the control selector on **playback**.

On playback :

- **run** : replay from the beginning to the end.
- **run** off : pause.
- **run** on again : continue.
- **init** : stop and go back to the beginning.

The play-back speed can be trimmed from 1/8 to 8 times the recording speed by the **speed** slider (neutral reset at the center by a double click).

At the play-back beginning, the **pgm** and **bank** track settings are sent again as they were set at recording time, and also the reset controls 121 and 123 towards every channel.

In the **Play-back** panel:

- **save_MIDI_file** : key to save the play-back memory into a MIDI file on the hard disk for a later re-use.
- **load_MIDI_file** : key to load the play-back memory with an existing MIDI file (thus with erasing the previous content).

These keys are disabled during the recording.

NOTE : this file recording to hard disk does not consider the data destined for the **out port 2** MIDI channel.

Manually controlled playback : each note or chord of the MIDI file can be played by a keydown press on the MIDI keyboard or the alphanumerical keyboard.

- Check the **Kb** toggle of the **Play** panel, then open the playback by **run** ; Randolon is waiting for the user press a key.
- Trigger each note or chord by one key press on the MIDI or the alphanumerical keyboard; when waiting for this keydown, the play back reading is hold.
- The sustain duration of each note is the keydown duration at the place of the duration programmed by the MIDI file. Several keys can be simultaneously operated to separately control several notes.

3. Terminology adapted to the context

(alphabetical)

NB: This terminology is not universal : it reflects how some musical and technical concepts are traduced here for the use of Randolon.

Aftertouch	A MIDI control related to the pressure applied to a down pressed key of a keyboard , being differently understood by not keyboard instruments.
Base value	Value computed from the global settings outside of the sequencer, and being a reference value used by the different steps of the sequencer cycle.
Chord	Production of several simultaneous sounds, independantly from the harmonious aspect of the result.
Color	<p>Characterizes here the random rhythm, that is, the frequency distribution law of the random events (and not that of the frequencies related to the pitches).</p> <p><i>white</i>: all the frequencies have the same density, thus, all inter event periods are equiprobable (law 1).</p> <p><i>pink</i> : the density is inverse-proportional to the frequency (law $1/F$), thus proportional to the period.</p> <p><i>brown or brownian</i>: the density is inverse-proportional to the square frequency (law $1/F^2$), thus proportional to the square period.</p> <p><i>blue</i> : the density is proportional to the frequency (law F), thus inverse-proportional to the period.</p> <p><i>purple</i> : the density is proportional to the square frequency (law F^2), thus inverse-proportional to the square period.</p>
Configuration	Set of the user interface settings, which can be saved through a <i>preset</i> .
Envelope	Serie of spots forming a continuous line (for instance : ascending or descending straight line, sinusoid, sawtooth).
Event (sound)	Occurrence of a sound, a packet of simultaneous sounds (chord) or a silence.
Figure	<p>It consists here in the relative time interval until the next sound, and not in the sound sustaining duration.</p> <p>1 : semibrieve 1/2: minim 1/4: crotchet 1/8 : quaver 1/16: double quaver 1/32: quadruple quaver</p>
Fluidity	Inverse of viscosity. A viscosity can be applied to a fuzzy parameter to restrain the deviations between its successive values, like if they were adherent together .
Fractal	Complex form resulting from a recursive breakdown of a simple form according to a repetitive process. Inversely, to recursively apply a simple form to the successive points of itself allows to generate a complex fractal

	form.
Frequency	Is here related to the rhythm of the events, and not to the frequencies of the acoustic vibrations which define the pitches. The inverse of the frequency is the period, i.e. the time between two events.
Fuzziness	Random component applied to a principally quantized parameter.
General MIDI	Standard for controlling synthesizers (source: page Wikipedia <i>General MIDI Level 2</i>), using the following parameters: - <i>channel</i> : selection of a channel number on a MIDI <i>port</i> (peripheral) - <i>program</i> ; selection of a melodic instrument or a drum kit on a polyphonic synthesizer - <i>bank</i> : selection of a melodic instrument variant.
Intensity	Sound loudness in to the velocity range defined for each instrument track.
Microtone	Pitch fraction smaller than a half-tone.
Note	Randolon uses the ABCDEFG American notation system. According to the MIDI standard, the octave number (register) range is from -1 to 7.
Phrasing	- staccato: the duration of each sound is shorter than the time interval between sounds - legato: each sound continues after the next sound is triggered - detached: each sound stops exactly when the next sound starts.
Pulse	Frequency of the steps in a sequence, in BPM (<i>beats per minute</i>).
Quantization	<ul style="list-style-type: none"> – of the pitch : pitch positions are set on an imposed scale – of the rhythm : time slicing into proportional figures ($\frac{1}{4}$, $\frac{1}{8}$ etc.). NB : Randolon does not refer to the concept of bar.
Random	Applies to a value made up of a part of chance, but whose statistic is ruled by pre-established constraints. NB1: the random algorithm use here for the pitch determination is known in literature as a « drunk random walk ». NB2: the pitch statistic distribution is horizontal between the lower and upper limits, but the MIDI pitch scale being by octave, thus logarithmic, to apply a constant distribution (of the white noise type) finally produces a pink sound spectrum ($1/F$).
Real time value	Value actually used to generate the MIDI controls, i.e. the value resulting from the specific settings of the sequencer current step.
Rhythm	Is made up of a <i>swing</i> and a <i>pulse</i> .
Scale	Subset of the tempered chromatic 12 half-tone scale. The steps of the scale are defined by a list of intervals defined in half-tones. The sum of the intervals must be 12. Each scale can be derived into as many modes as it may include classes from which the scale can start. NB : some [scale + mode] combinings may be redundant. The <i>quartertone</i> scale is a superset based on quarter-tones.
Sequence	Set of the steps that can be played by the sequencer.
Sequence transforming:	1. <u>time transformations</u> : <ul style="list-style-type: none"> • rand.: steps are played in chaos • retrograd: steps are played from the end to the beginning • two way: <i>ping-pong</i> , steps are played from the beginning to the

	<p>end, then from the end to the beginning, and so on</p> <ul style="list-style-type: none"> • short ping-pong, where the extreme steps are not repeated • rotation: the sequence is unchanged, but the rank of the starting step is not the first, and the last is followed by the first. The rotation may be combined with other transformations in time and pitch. <p>2. <u>pitch transformations</u>: these transformations are quantified against the chromatic scale or the selected tonal scale (<i>scaled</i>):</p> <ul style="list-style-type: none"> • <i>inversion</i>: each interval is replaced by its complementary in the octave, in respect to the steps of the scale. • <i>shift</i>: all notes are shifted of one or several steps of the scale (NB: not compatible with normalisation) • <i>normalisation</i>: the pitches are folded inside one octave and shifted so that the starting step, considering the rotation, must be a C. <p>3. <u>transformations of the intensity</u>:</p> <ul style="list-style-type: none"> • application of an intensity envelope to the sequence: ramp, triangle, random or free. <p>4. <u>spacial transformations</u> :</p> <ul style="list-style-type: none"> • application to the sequence of a left-right, near-far, elliptical or chaotic trajectory.
Serie	List of the pitches of the active (not checked <i>off</i>) steps of the sequencer.
Setting	Parameter entered by the user, thanks to the Randolon graphical interface.
Sound	The result of playing a note by sending MIDI controls to an instrument.
Sound object	According to the sense of hearing, it is an hearable and directly identifiable object, or an identifiable sequence of objects. Thus, when making sounds, it is a sound or a sequence of sounds.
Spatialization	Positioning of sounds from left to right and from near to far.
Start	Sequence or cycle start : time of triggering of the first step of a sequence.
Step	Grouping of the characteristics for the production of one sound, as pitch, duration, MIDI track etc.
Stereo	The effect of the panoramic (<i>pan</i>) MIDI control to balance the volume between the left and right audio channels.
Swing	Global rhythm determining the sequence start times.
Synthesizer	<p>Device producing sound when it receives MIDI controls through one or several channels :</p> <ul style="list-style-type: none"> - monophonic: it can play one sound at a time, whose characteristics are determined by the synthesizer local settings - polyphonic: it can play several simultaneous sounds from the controls received through one MIDI channel ; the sound characteristics are identified by an instrument timber (piano, trumpet..), either locally programmed on the synthesizer (<i>free_use</i> mode of Randolon), or programmed from Randolon; - multi-timbral: it can simultaneously play several MIDI channels, each one being programmed on a different instrument.

Track	A Randolon logical output towards a MIDI channel. Several tracks may use the same MIDI channel.
Velocity	The MIDI parameter related to the strength of a key strike, thus, by extension to other instruments, to the sound level. The scale from 0 to 127 is theoretically proportional in dB from -36dB (pppp) to 0dB (ffff), but may vary according to the design of each MIDI instrument.
Volume:	Global MIDI control of the sound level, simultaneously addressing all the sounds of the channel.

4. Randolon's musical principles

The principles rely on the duration/presence/color baseline described in the part 1 of the book « Imaginary Music » of Charles-Edouard Platel. Randolon operates on these three dimensions to generate sound objects that are embodied by MIDI sequences sent to instruments :

- the sound object color is defined by the pitch and the selection of an instrument or several synchronized instruments ;
- the sound object presence is defined by the intensity and the spacial position ;
- the duration dimension includes :
 1. at the basic level, the sustain time, i.e. the time of sustaining of the notes ;
 2. at the sequence level, the time intervals between the sequence steps ;
 3. at the global level, the sequence production rhythm.

Randolon assumes a recitative time progress, i.e. a sequence string (analog to verses) made of steps (analog to syllables). Two levels of rhythm result from this:

1. the swing, related to breathing, which rules the sequence cycle starts ;
2. the pulse, which rules the steps within a sequence.

The classical bar is not managed by Randolon, because it addresses only the specific case where, the sequences being contiguous, the pulse comes down to proportional fractions of the swing.

On the whole, the setting consists in defining a repeatable (but user changeable in real time) reference framework and modulation ranges for the parameters inside the framework.

The modulations are from four types and can be combined together :

- smooth progression, by a periodic continuous waveform,
- turbulent, by a random scattering under fluidity and limits constraints,
- fractal progression, by recursive repetition of a pattern,
- sequence variations derived from serial transformations.

Randolon may also be simply used without enabling any sequence cycle (or, samely, by enabling only a single step by sequence), thus, producing no repetitive forms in the music.

4.1 *Swing rhythm*

- the swing, which times the sequencer cycle starts, is defined in beats per minute (BPM);
- this rhythm may be modulated by a sine, square, ramp, or sawtooth waveform of a 1 to 60s period ;
- a random fuzziness percentage may be applied, according to a squatterring rule similar to coloured noise (white, pink, brownian, etc.) ;
- this random fuzziness may be restrained by a fluidity factor ;
- several modes to synchronize sequences to the swing are available :
 1. adjacent: sequences are looped : the swing so becomes the slave of the pulse ; it is the classical proportional metric configuration ;
 2. poly-recitative : if sequences are longer than the swing period, they can overlay together ;
 3. full mono-recitative : if a sequence is longer than the swing period, the cycle start is postponed to the next ;
 4. truncated mono-recitative: the cycle start breaks uncompleted sequences.

4.2 *Pulse rhythm*

- the internal pulse period is defined in beats per minute (BPM),
- a random fuzziness percentage may be applied, according to a squatterring rule similar to a coloured noise (white, pink, brownian, etc.) ;

- this random fuzziness may be restrained by a fluidity factor ;
- a fractal modulation of this period may be applied at every cycle start : the pattern is recursively provided by the internal sequence tempo scheme.

4.3 Internal sequence tempo

- to program the sequence tempo, the sequencer steps are programmed as arpege, chord, fraction or silence, with the available options to randomly switch between chord and fraction, or between arpege and silence (these kinds of switches do not alter the global duration)
- two modes are available to set the time intervals between steps :
 1. recitative : the intervals result from the constant or random duration of the successive pulses;
 2. metric: by defining figures (quarters, crotchets, triplets, etc.) upon a constant pulse stream, with availability to adjust a fixed or random corrective time shift toward the previous or the next step.

4.4 Sustain

- The note sustaining mean time is set for each instrument, independantly from the time intervals between the sequencer steps ;
- a detached phrasing may be defined at the instrument level, by eventually breaking each played note by the next one ;
- each sequencer step includes its own constant or fuzzy sustain correction, that applies to the sustain mean times of the controlled instruments.

4.5 Pitch

- pitches are quantized by defining a scale and a mode ;
- a base note is defined by the octave number of the C (register), possibly shifted by a global transposing of 1 to 12 half-tones ;
- this basis can be shifted by -2 à +2 octaves at each instrument track level ;
- before every sequence start, a fluctuating note can be computed, with a random pitch but with respect to the quantization required by the scale and mode ; it deviates from the base note according to a fluidity constraint ;
- for each sequencer step, an pitch interval is defined, either with the base or the fluctuating note ; this interval is either chromatic or tonal with respect to the scale and the mode and may be altered by a constant or fuzzy micro-interval ;
- the sequence pitch serie may be transformed (rotating, inversing, transposing, normalization), according to the chromatic or tonal scale, manually or randomly ;
- at each instrumental track level, the transition from a pitch to another may be slided, or by intermediate pitch increments, or both.
- the base note can also been changed at every cycle start, using a fractal algorithm based on the pattern of the sequencer string of pitches;

4.6 Instruments

Each sequence step controls 0, one or several simultaneous instrument tracks, whose settings are external to Randolon.

4.7 Intensity

- A velocity range can be defined for every instrument track :
 1. the minimum velocity is related to a null intensity,
 2. the maximum velocity is related to an intensity of 1,

- 3. the center of this range thus determines a base intensity of 0.5,
- relatively to this base intensity, an intensity modulation envelope can be defined along the string of the sequence steps, which applies to all controlled instruments. This envelope may be a continuous or random form ;
- the intensity can also be weighted by the rhythm : the intensity is stronger when the time interval between events is longer, like for the sizes of drops of a constant mean flow drip-drop . A negative value (toward the -) takes into account the passed time from the previous event. A positive value takes into account the future time to the next event.

4.8 Spacial position

The spacial position is defined in two dimensions by the *pan* and *volume* MIDI controls, or by controlling a spacialization plug-in like CEPbinaural.

- Left-right position: held by the panoramic control, whose range is defined symmetrically around the central position,
- Near-far position, held by the volume control, whose minimum and maximum are defined.

The positions may be programmed in trajectory figures that are launched at every new sequence.

5. Randolon technical data

AUDIO

No audio input or output.

MIDI

MIDI input : 1 channel (external keyboard)

MIDI outputs : 8 channels selected on 1 or 2 ports

MIDI file format: type 0 MIDI raw binary mixed on a single track, the port 2 is not considered.

Use of the MIDI controls:

- Note (pitch/velocity)
- Pitchbend
- Aftertouch
- Volume (control 7 by default, or control 9)
- Pan (control 10 by default, or control 8)
- Program change
- Bank MSB (control 32)
- Bank LSB (control 0)
- Reset controls (control 121)
- All notes off (control 123)

SEQUENCER

16 steps

RHYTHM

main swing : 1 - 300 BPM

sequencer pulse : 10 - 1200 BPM

SUSTAIN (duration between note on and note off) : 0.04 - 80 secondes, or manual via the MIDI keyboard.

RANDOM ALGORITHM

Random law: pseudo-random numbers within a range, the maximum deviation between consecutive draws is controlled through a fluidity parameter. The initial seed is reset to a constant value at the application launch.

Colors, for the rhythm :

- *white*: all the frequencies have the same density, thus, all inter-event periods are equiprobable (law 1).
- *pink*: the density is inverse proportional to the frequency (law $1/F$), thus proportional to the period.
- *brown, or brownian* : the density is inverse proportional to the square frequency (law $1/F^2$), thus proportional to the square period..
- *blue* : the density is proportional to the frequency (law F), thus inverse proportional to the period.
- *purple* : the density is proportional to the square frequency (law F^2), thus inverse proportional to the square period.