GRM Tools Spaces

User Manual
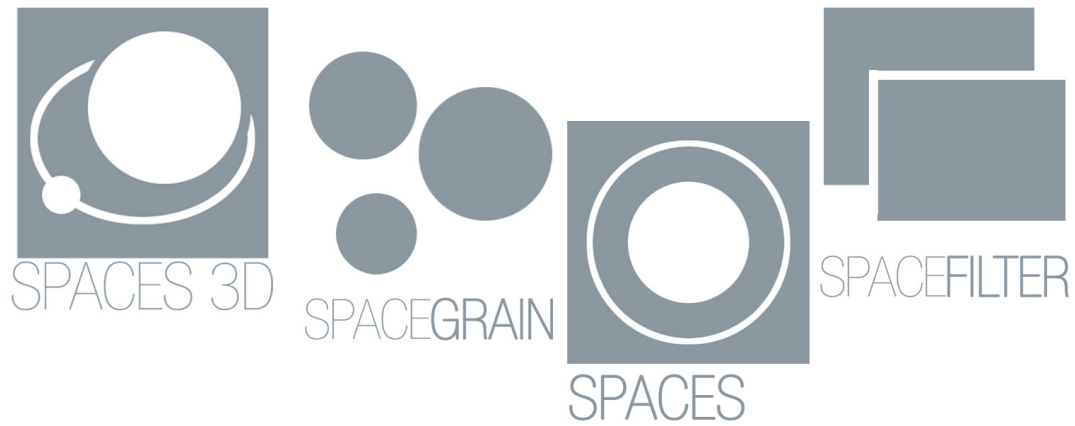
version 3.7

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Installation

Mac OS X

The installer puts the different files in the following folders :

- RTAS : Library\Application Support\Digidesign\Plug-Ins
- AAX : Library\Application Support\Avid\Audio\Plug-Ins
- VST : Library\Audio\Plug-Ins\VST\GRM
- Audio Units : Library\Audio\Plug-Ins\Components
- Stand Alone : Applications\GRM
- Documentation : GRM Tools Documentation

It installs also the iLok drivers necessary for authorization of the software.

To launch the installer, double-click on the **GRM_Tools_Spaces.pkg** icon and follow the instructions. If you do not want to install all available architectures, select the desired components in the **Installation Type**.

PC Windows

The installer puts the different files in the following folders :

- RTAS : Program Files\Common Files\Digidesign\DAE\Plug-Ins
- AAX : Program Files\Common Files\Avid\Audio\Plug-Ins
- VST : GRM folder in the default VST folder (usually : Program Files\Steinberg\Plug-Ins\ VST) or Program Files\VSTPlugins if the default folder is not defined.
- Stand Alone : Program Files\Ina-GRM\GRM Tools
- Documentation : My Documents\GRM Tools Documentation

It installs also the iLok drivers necessary for authorization of the software.

On 64 bits systems, 32 bits plugins and applications are installed in « Program Files (x86) » .

To launch the installer, double-click on the **GRM Tools Spaces Installer.exe** icon and follow the instructions.

Authorization

Buy GRM Tools Spaces

When you make your purchase, you will receive a serial number (also called **Activation Code**) and a link to the iLok.com website enabling you to authorize the plug-in. Take great care of the serial number, as it constitutes proof of your purchase. You will need it to authorize the plug-in and to contact the technical support unit.

Authorize GRM Tools Spaces

Authorization is carried out through the **iLok License Manager** application. ILok License Manager is an application for Mac and PC that allows you to more easily manage your licenses and iLok dongles.

The iLok dongle is no longer required. GRM Tools licenses can be either moved on the computer or on an iLok dongle.

- Create an account on iLok.com
- Download and install the latest iLok License Manager
- Launch iLok License Manager and sign in with your iLok.com ID
- Select « Redeem Activation Code » in « Licenses » menu
- Copy the activation code
- Drag the generated license on a location displayed on the left column (iLok dongle or computer).

Documentation and videos showing details of dongle and license management are available on the *iLok.com* website.

Universal Controls

Every plug-in contains a variety of interactive controls to vary, display, store, recall, and otherwise manipulate parameters. The controls are:

- **Sliders**
- **Elastic String**
- **Numerical Value Fields**
- **Buttons**
- **Presets**
- **Tempo**
- **SuperSlider**
- **Agitation**
- **Save/Load**
- **Window resizing**

Sliders and 2DControllers

To change the value continuously, drag the handle to the left or right.

To jump to a new value, click along the path of the handle.

To reset the default value, click on the handle while pressing the [Alt] key.

Only for 2DControllers, a click on the handle while pressing the [Shift] key limits movements to vertical or horizontal displacements.

Elastic String

To achieve smooth movement of Sliders, 2DControllers, or the SuperSlider, click on the object and move the mouse while holding down the [Command] key on Mac or [Ctrl] key on PC. Note: In general, the follow speed of the smoothing function depends upon the length of the Elastic String.

Numerical Value Fields
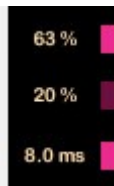
Note that a slider is often associated with a Numerical Value Field that shows the parameter value as a number or other alphanumeric character. You can change the value in a Numerical Value Field directly.

To change the value in a Numerical Value Field, click within the field and drag vertically upwards to increment a value or downwards to decrement a value. To modify the increment of change, drag while pressing the [Command] key on Mac or [Ctrl] key on PC.

Double clicking in a Numerical Value Field opens an editor enabling the direct modification of a parameter value. Clicking outside the field or the [Return] key ends value editing.

Caution: with some host applications, the [Return] key is interpreted as a host command and does not therefore end the editing of the value. In this case, click outside the editable field to end editing.
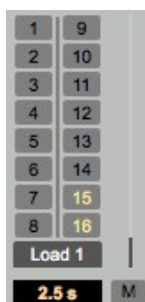
Buttons

Buttons are used to change a state or start a process.

To change the state of a Button, or to start a process, click on the Button.

Presets

Each plug-in has memorization capacities for all settings, and recall capacities for the memorizations.

Gradual transition from one preset to another is carried out by linear interpolation of parameter memories. The memorization zone is at the right of each window. It includes sixteen memorization boxes, an interpolation time control slider and a status field.

- To save your current configuration of parameter settings into any of the 16 Preset locations, click on a location number while holding down the [Command] key on Mac or [Ctrl] key on PC. Note that the Status Field, located under the Preset locations, gives the indication of the last performed operation.
- To call up a configuration of parameter settings from any of the 16 Presets, click on that Preset number. Note that the Status Field indicates 'Load'.
- To reload the factory configuration of parameter values, click while pressing down the [Alt] key. Note that the Status Field indicates 'Reset'.
- Note that the factory default settings for presets 15 and 16 are random values. Preset 15 applies a random variation of about 10% deviation from the current value as set by the user. Preset 16 generates a completely random set of parameter values.

The timing of the change from current values to the recalled Preset values is determined in one of two ways:

- It can be determined by the current position of the vertical Slider located to the right of the Preset numbers. To change the time of interpolation between current parameter values and Preset values, move the vertical Slider up or down to reflect your preferred timing.

- It can be recalled as one of the parameters saved in the Preset. To recall the time of interpolation from a Preset configuration along with other parameters, click on the Interpolation Button **M**, which is just underneath the vertical Slider, to activate it before you click on the Preset.

During interpolation, clicking on a slider or a value field, stops the interpolation of this parameter. The other parameters continue to be interpolated. To completely stop the interpolation, click the Status Field.

A preset content can be copied and pasted into another preset of the same kind. For instance, an Spaces VST preset can be pasted into another Spaces VST or even into an Spaces StandAlone.

A right-click on a preset opens a pop-up menu allowing to copy the preset into the clipboard. When a compatible preset is available, its number is shown and it can be pasted into the chosen preset. This new preset is now loaded.

Tempo

This feature is only available with certain applications such as Cubase, ProTools, etc..

Certain parameters, such as the time of interpolation between presets, can be synchronized with variations of tempo in the sequencer. To initiate synchronization, hold down the [Shift] key and click on the Numerical Value Field associated with the parameter you want to synchronize. The display will indicate in bold characters the figures that represent the possible tempos. The figures and the tempos they represent are:

T/64	64th-note triplets
1/64	64th-notes
T/32	32nd-note triplets
./64	dotted 64th-notes
1/32	32nd-notes
T/16	16th-note triplets
./32	dotted 32nd-notes
1/16	16th-notes
T/8	8th-note triplets
./16	dotted 16th-notes
1/8	8th-notes
T/4	quarter-note triplets
./8	dotted 8th-notes
1/4	quarter-notes
T/2	half-note triplets
./4	dotted quarter-notes
1/2	half-notes
T/1	whole-note triplets
./2	dotted half-notes
1/1	whole-notes
./1	dotted whole-notes
1 bar	measure

Larger numbers are indicated in numbers of measures, as in 3 bar for three measures.

The parameters of each plug-in that can be synchronized are itemized in the sections dealing with the individual plug-ins.

SuperSlider
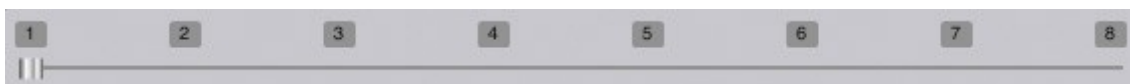
The horizontal SuperSlider and its associated Numerical Value Fields, located at the bottom of each window, provide a powerful control for interpolating between Presets. Use the SuperSlider to interpolate between any sequence of Presets to find new configurations and create new Presets.

- To select a Preset number in a Numerical Value Field, click in the field and drag vertically upwards or downwards.
- To change continuously from one Preset to another, drag the handle of the SuperSlider to the left or right.
- To disable a Numerical Value Field, click in the field and drag vertically downwards to an 'Off' position.
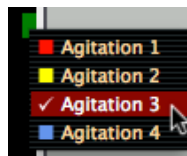
Agitation

This set of controllers enables the adding of random variations to the processing parameters. The left hand rotating potentiometer gives the amplitude (from 0% to 100%) of the random variation. The right hand rotating potentiometer gives the speed of the variations (from 0 to 60 s). The On/Off button under the two rotating potentiometers activates the variations.

Four agitation groups are available:

A left click on the coloured button to the right of each alphanumeric value validates agitation for each individual parameter. A right click on the button opens the agitation group selection menu.

When the button is bright, the parameter is subjected to the variation. When it is dark, the variation has no effect.

Caution: In the default configuration, agitation is deactivated for all parameters.

Save/Load
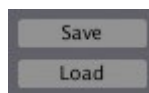
As an alternative to the save/load action in the host application, each plug-in contains Save/Load Buttons located in the bottom of the windows. These buttons allow you to save configurations of your plug-ins in a folder that you choose. They also allow you to exchange configurations of GRM Tools plug-ins in other environments in which GRM Tools is used.

- **Save** opens the file selector to save the complete configuration (current values of the parameters and the 16 presets).
- **Load** opens the file selector to recall a complete configuration (current values of the parameters and the 16 presets).

Window resizing

The plug-in window can be resized by clicking and dragging using the small triangle in the bottom right hand corner of the ina-grm logo.

Caution : Excessively large dimensions may slow down the display of data in the plug-in interface.

Midi management

All the processing parameters can be controlled by MIDI messages.
Important note: Some applications (for example Logic) do not send MIDI messages directly to the processings, but propose other solutions to bind the messages to the parameters.

MIDI messages

The MIDI messages recognized by the processings are the following channel messages:
  – Control Change
  – Note On
  – Pitch Wheel
  – Program Change
  –

The discrete controls (buttons, menus, Preset) behave differently depending on the messages:
  • **Control Change** : the message values (from 0 to 127) are mapped on the parameter variation range. For example, for a button, the values 0 to 63 trigger the "released" state, and the values 64 to 127 trigger the "pressed" state.
  • **Pitch Wheel** : similar to the previous control, but with a 14 bit message value range, that is from 0 to 16383.
  • **Program Change** : The program numbers correspond to the state of the parameter. For example, **Program Change** 1 and 2 correspond to the "released" and "pressed" state of a button. Alternatively, **Program Changes** from 1 to 16 correspond to the 16 processing presets.
  • **Note On** : A basic note is bound to the parameter.
    ○ For parameters with two states (buttons, or two-choice menus) each sending of the **Note On** message with the same basic note switches the state of the parameter. The other **Note On** messages have no effect, and can therefore be used to control other parameters.
    ○ For parameters with more than 2 states (Preset, menus, etc.), the basic note corresponds to the first state, and the following note to the second state, etc. For example, if the LA 440 (midi 69) is bound to the Preset parameter, the LA will load preset 1, LA# preset 2, SI preset 3, etc. **Note On** messages outside the parameter variation range (for example, notes below LA440 in the previous example) are not taken into account.

The **Note On** messages can be processed in a special way by certain types of processing (for example, for **Evolution** transposition parameters). Refer to the description of each type of processing for more information on these special cases.

Binding a Midi message to a parameter

Click on the MIDI button located next to the ina-grm logo, and underneath the **Save** and **Load** buttons. A panel opens to the left of the button. Manipulate the parameter you want to control on the plug-in interface. Its name is displayed on the **Parameter** line. Then send the corresponding Midi message, which is displayed on the **Message** line in the following format:

[channel number][controller name][optional parameter]

The binding between the Midi message and the parameter is carried out and memorized.

- **Unbind** : cancels the Midi binding of the parameter displayed
- **Close** : closes the panel
- **Reset All** : cancels the Midi binding of all parameters.
- **View** : opens the window shown below, which enables the viewing of all bindings, their modification and the addition of new ones.
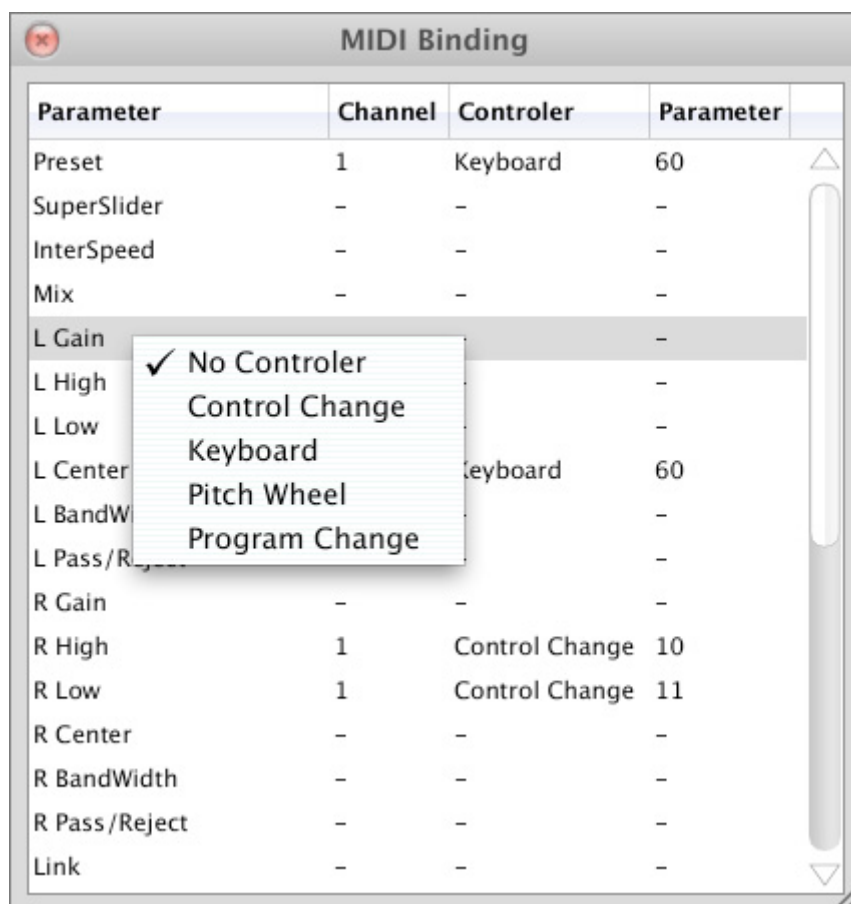
Multichannel

Spaces proposes outputs on several channels in AAX, RTAS, VST and Audio Units.

The channel allocations follow the standard configurations of each system:

Configuration	RTAS/AAX	Audio Units	VST
Quad	L R Ls Rs	L R Ls Rs	L R Ls Rs
5.0	L C R Ls Rs	L R Ls Rs C	L R C LS Rs
5.1	L C R Ls Rs LFE	L R C LFE Ls Rs	L R C LFE Ls Rs
7.1 (8.0)	L Lc C Rc R Ls Rs LFE	L R C LFE Ls Rs Lc Rc	L R C Ls Rs Cs Lc Rc

Configurations 7.1 & 8.0 are non-standard. It is a regular octophonic configuration without a central channel staging successive stereo couples.

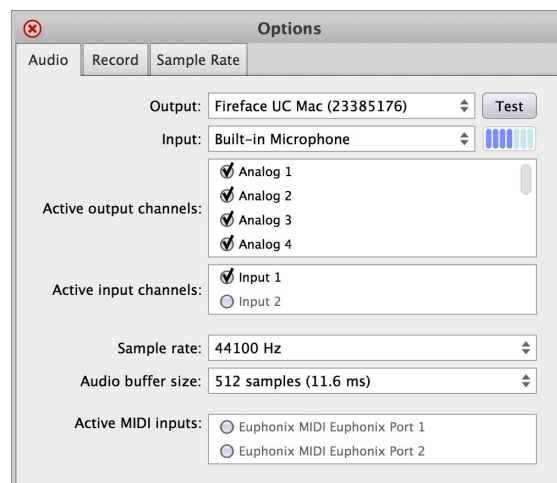RTAS/AAX (SDDS)   Audio Unit   VST
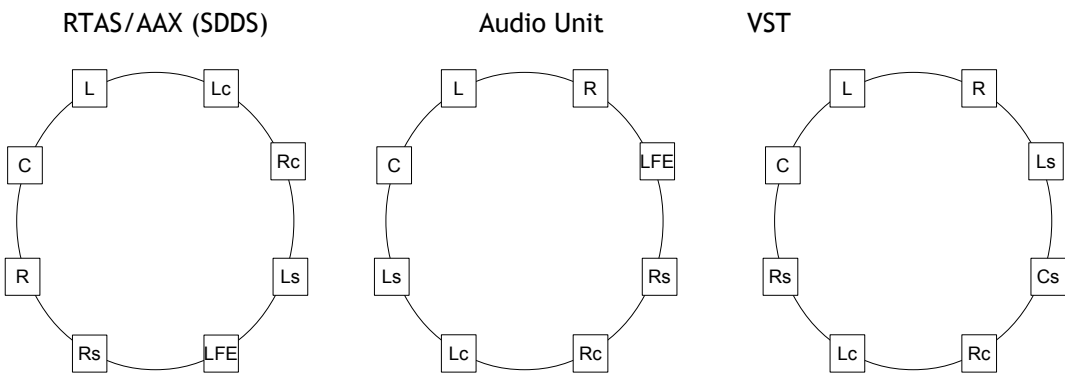
Stand Alone

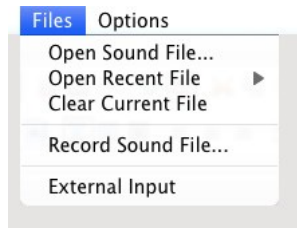The following descriptions only concern the stand-alone versions.
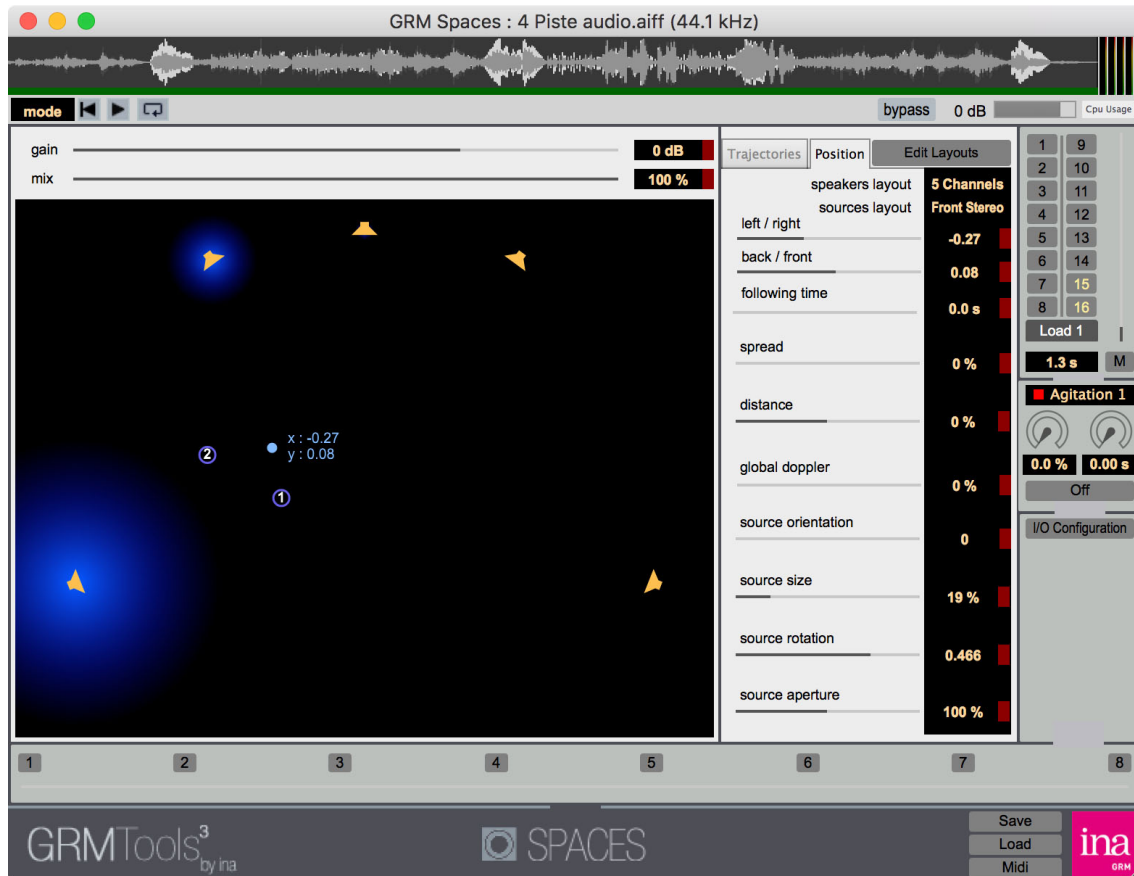
In this version, the processing window includes at the top a strip to control the reading and writing of sound files.

To select the number of output channels open the **Audio** tab in **Option**->**Audio & Midi Setting** menu :

To select a sound input:

Select **External Input** in the **Files** menu to process an external sound.

Drag an audio file from a file browser into the horizontal grey zone at the top of the window

**Select Open Sound File... or Open Recent Files in the Files menu.**

The file is loaded with a selection equal to its total time. To modify the start of the selection, click close to the start and slide the mouse. To modify the end, click close to the end and slide the mouse. Click&Drag inside the selection lets you simultaneously control the start and the end of the selection. A single click moves the cursor under the mouse.

The green bar under the waveform controls the zoom of the display.

The green zone corresponds to the displayed part, the red to the non-displayed. A click in the green zone followed by a vertical drag expands or narrows the zone. A horizontal drag moves the zone in time. A clic in the red zone moves the nearest bound.

A right clic on the waveform shows a contextual menu allowing to display the current time under the mouse and/or under the cursor.
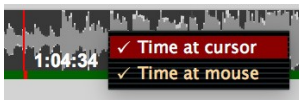
The buttons control the read cursor. The first button sends the cursor back to the start of the selection, the second starts the reading, or pauses it, and the third one loops reading on to the selection.

Two playing modes are available :

normal and variable. In variable mode, a slider and an alphanumeric field allow to change the playing speed from -2 (double speed backward) to +2 (double speed forward)

To record a sound file:

select **New Output Sound File...** in the **Files** menu.

The file will be created in the WAV format. We recommend adding the extension .wav to avoid any confusion at a later stage.

When an output file is open, the appearance of the advance button bar changes:

A new button can be used to start and stop recording. The name and the path of the file are indicated, and its time.

Option->**Audio & Midi Setting**, **Record** tab allows to choose the file resolution (16, 24 bits integer or 32 bits floating point) and the record mode:
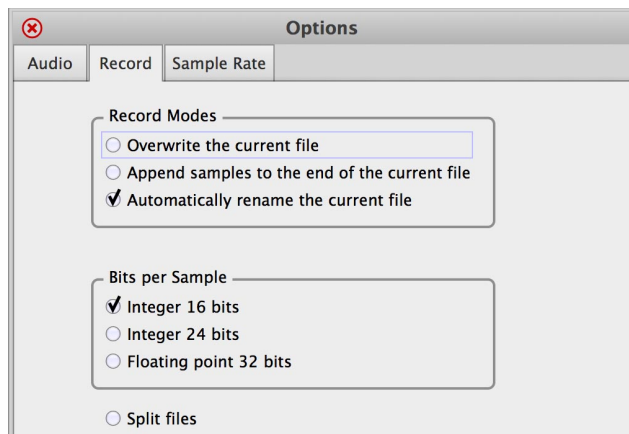
Split File option allows to split the output file in multiple mono files.
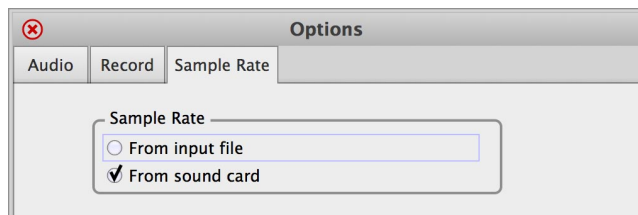
Sample Rate option allows to choose the sample rate when the file sample rate and the output sample rate are different:

From input file : the output sample rate is set to the file sample rate, if possible.

From sound card : the output sample rate is not modified, and the file is resample to this rate.

Spaces

Spaces enables the positioning and movement of a multichannel source (from 1 to 32 channels) in a multichannel space (from 2 to 32 channels).
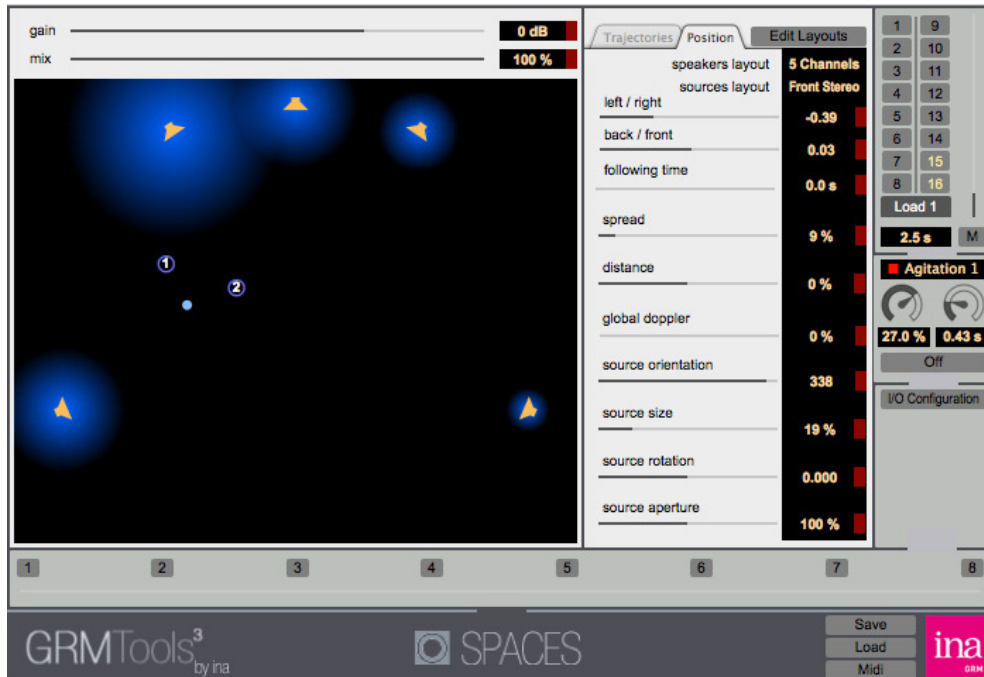
How does it work?

The source moves inside the speaker space in two modes:

Position

> places in static mode the source at coordinates specified by the **left/right** and **back/front** potentiometers. The layout of the channels of the source or of the speakers can be edited.

Trajectories

> the source follows trajectories that can be interpolated and drawn. The layout of the channels is fixed and can only be modified in the **Position** mode.

The controls are explained below, in the paragraph entitled **Reference** .

Getting started

It is assumed that the user is already familiar with the manipulation of the host applications, the import and recording of a sound on a mono, stereo or multichannel track, access to the various windows and the insertion of plugins. The following examples have been carried out using the Stand Alone version of Spaces (see the Stand Alone chapter, page 13, to find out more about this version). These examples can be transposed with no difficulty to the other versions (VST, AAX, RTAS and Audio Unit). It is assumed that the user is equipped with an audio interface with at least 5 outputs.

Launch Spaces StandAlone. Open **Audio & Midi settings** in the **Options** menu. Select 5 outputs in the **active output channels** list. Close the **Options** panel. The application is now configured for an output on 5 channels.
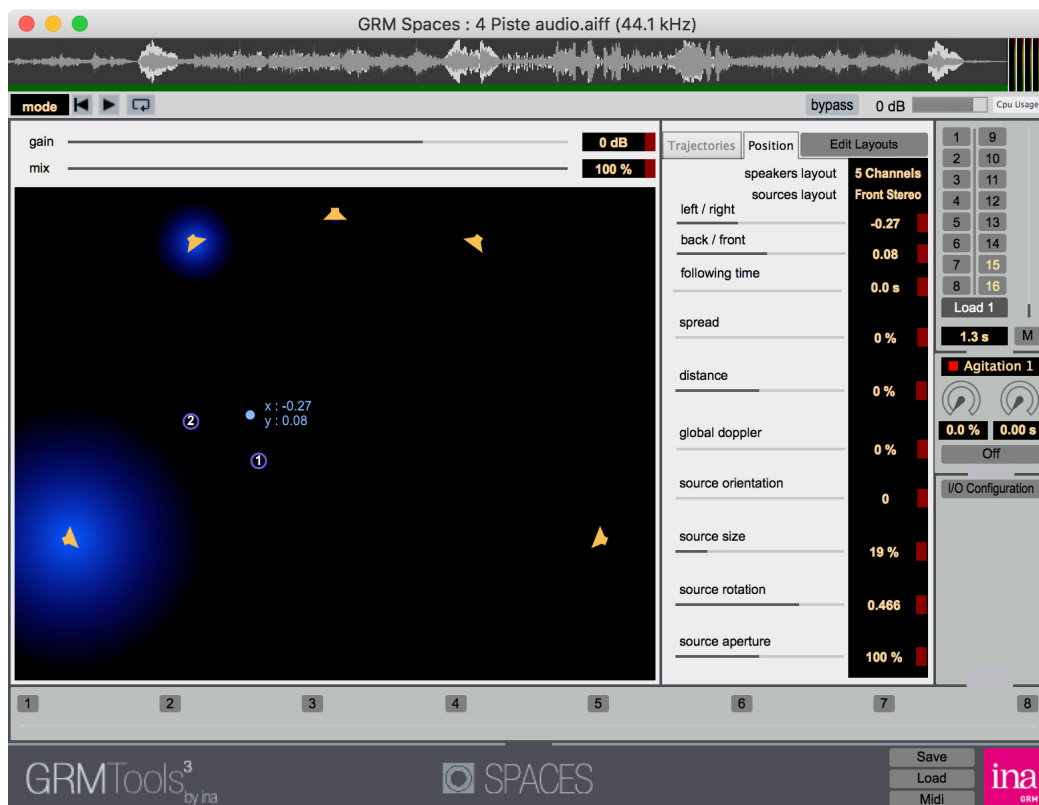
Click on the **Position** tab. Check that **speakers layout** does in fact indicate **5 Channels**. Open this menu: only compatible layouts with at least 5 channels can be selected (Stereo and Quadraphonic).

Load a stereo sound and click the **Start** button. Click in the main window and move the mouse. Observe the variations of the blue haloes around the speakers. They represent the volumes applied at each output. These volume variations can be refined by using the **spread** and **distance** parameters. Adjust **source rotation** to about 0.5. The two channels rotate around the centre of the source in 2 seconds.

Click on the **Trajectories** tab. The centre of the source is moved along a circle and the two channels continue their rotation.

Click on the **Square** menu and select **Star**. Modify **interpolation** and observe the modification of the trajectory.

Click briefly inside the main window. The source is positioned on the point closest to the trajectory.

Click inside the main window and move the mouse to draw a new trajectory. This **User** trajectory takes the place of **Star**. Adjust **interpolation** and observe the modifications in the trajectory.
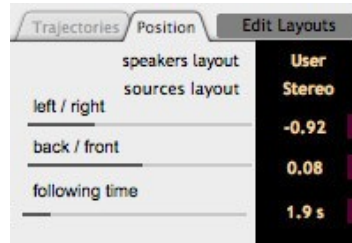
Reference

The Spaces interface has three zones:

1. a zone that is common to all the GRM Tools described in the **Common controls** chapter.
2. a zone that depends on the control mode, that is **Position** or **Trajectories**.
3. a zone with more general adjustments (gain, Doppler, etc.) that are common to the two control modes.

Position

This control mode is obtained by Clicking on the **Position** tab.

speakers layout

Menu enabling the choice of a layout amongst the 32 available, and its allocation to the layout of the speakers. Only layouts with a number of channels that is lower than the number of output channels actually available can be selected. The configurations can be edited by using the **Edit Layouts** button.

sources layout

Menu enabling the choice of a layout amongst the 32 available, and its allocation to the layout of the channels of the source. Only layouts with a number of channels that is lower than the number of input channels actually available can be selected. The configurations can be edited by using the **Edit Layouts** button.

left / right

Left/right coordinate of the position of the centre of the source. From -1 (left) to 1 (right).

Back / front

Back/front coordinate of the position of the centre of the source. From -1 (back) to 1 (front).
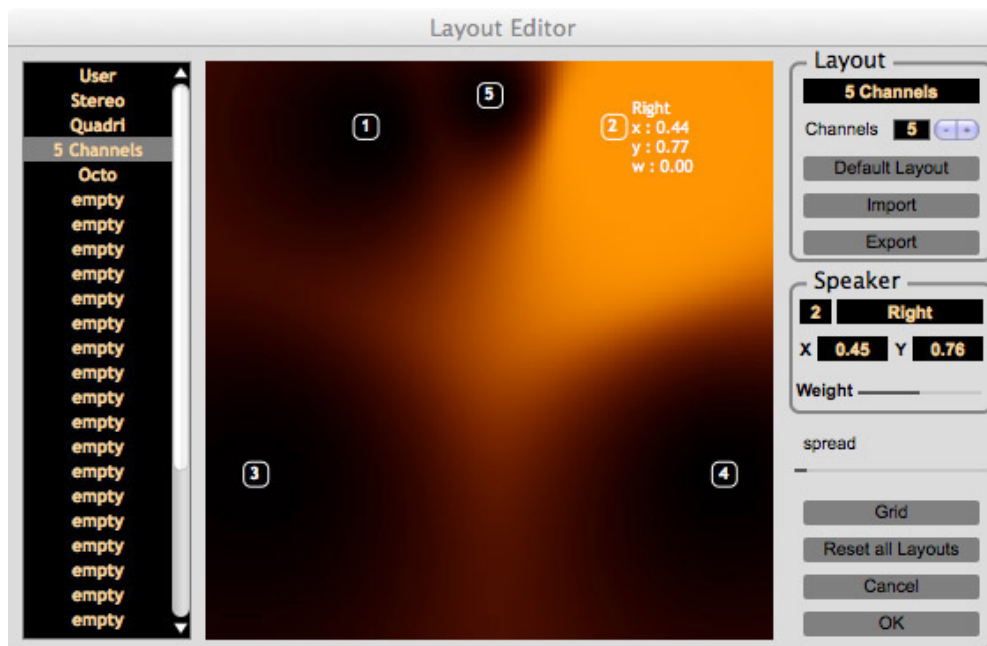
following time

Time taken by the source to reach the position defined by **left/right** and **back/front** or by a click in the main window.

Edit Layouts

Button that opens up the layout editor.

Layout editor

The left hand column lists the 32 possible layouts.
- Clicking on a name displays the layout in the central window, and its name and characteristics in the Layout frame in the top right hand corner.
- Click+drag is used to move an item in the list
- Shift+Click+drag copies the start item into the end item.

The central window displays the selected layout. The orange zone represents the influence zone of the selected output channel. A source located in this zone will be transmitted in the corresponding channel with an amplitude that is proportional to the intensity of the color. This zone has no significance when the layout is used for a source. The **spread** potentiometer controls the spread of the influence. At 0, there is very little overlap between the channels, at 1 the influence is almost constant throughout the space, and the overlap is maximum. The channels can be freely moved in the space displayed. When resizing the window, press the [Shift] key to maintain the proportions of the central window.

The **Layout** frame on the right is used to:
- **edit** the name of the layout
- **change** the number of channels. The direct edition of the numerical field initialises the position of the speakers in the default layout. Pressing the + or – button either adds a speaker in the centre or deletes the speaker without modifying the position of the other speakers.
- **apply** the default layout, depending on the number of channels
- **import** and **export** layouts in XML files. The file format is as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>

<Speakers name="Quadri">
  <S x="-0.625" y="-0.625"/>
  <S x="0.625"  y="-0.625"/>
  <S x="-0.625" y="0.625"/>
  <S x="0.625"  y="0.625"/>
</Speakers>
```

The **name** attribute indicates the name of the layout as it will appear in the list, and the attributes **x** and **y** are the coordinates of the speakers between 1 and 1. The number of channels is equal to the number of **S** items.

The **Speaker** frame on the right is used to:

- **select** a speaker by its number
- **edit** its name (Right in the example shown)
- **modify** its position
  - using Cartesian coordinates (X and Y) by default
  - using polar coordinates (Angle and Radius) if Grid polar is selected.
  (0° at top, 90° on right, 180° at bottom and 270° on left)
- **modify** its influence using the Weight parameter (in dB)

Grid
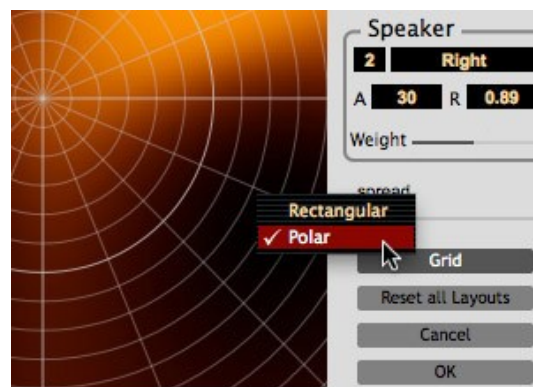
displays a magnetic grid which can be rectangular or polar.

Reset all Layouts

Resets the layout list:

1. Mono
2. Frontal stereo
3. Quadriphony
4. 5 channels
5. Symmetrical octophony
6. Centered octophony
7. Stereo

The following layouts (empty) are reset in frontal stereo

Main window
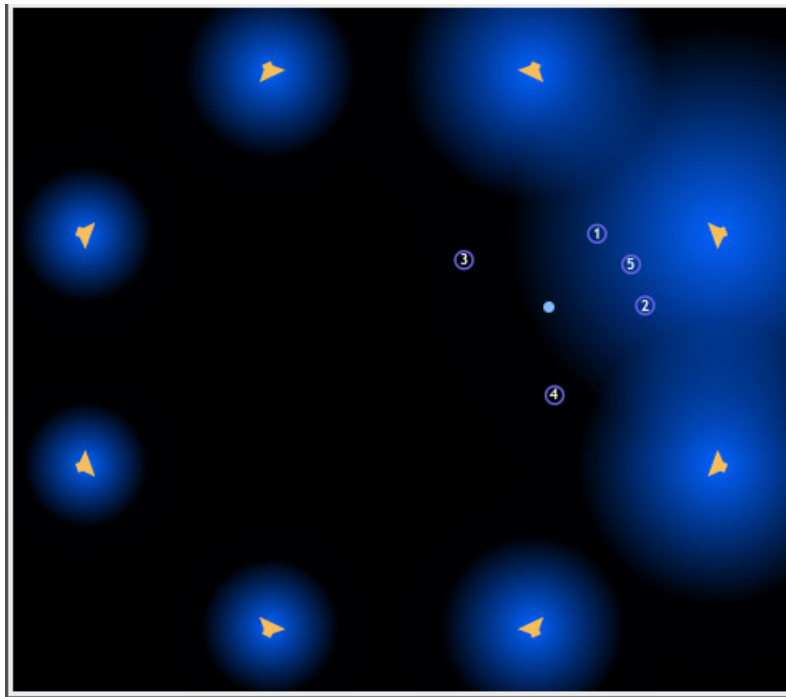
In this example, we have a source with 5 channels and an output device with 8 channels. The centre of the source is symbolized by a small blue disc, and the channels of the source by numbered circles. The blue haloes around the speakers indicate the amplitude of each output channel.

- Hovering (without clicking) over a speaker displays its influence zone and its number, name, output channel, coordinates (X and Y from -1 to 1) and its weight in dB.

-
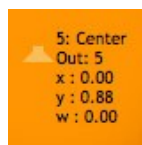
- A click moves the source.
- A right click causes the appearance of a context menu:

Display Gains the blue haloes represent the amplitude of each speaker.

Display Levels the blue haloes represent the actual level of the signals sent to each speaker, just as a VU meter would do.

Display Infos displays the numbers, names, output channels and amplitudes or dB levels of each speaker

Rectangular Grid displays a rectangular grid as the window background.

Polar Grid displays a polar grid as the window background.

Open Layout Editor opens the layout editor (see page 20)

When resizing the window, press the [Shift] key to maintain the proportions of the main window.

Trajectories

This control mode is obtained by Clicking on the **Trajectories** tab.

The two upper menus correspond to two trajectories, A and B, chosen from the 32 available. In the screen copy above: **A:Circle** and **B:Star**.

interpolation

controls interpolation between the two trajectories. Completely on the left the effective trajectory is trajectory A, completely on the right is trajectory B. For the intermediate values, the effective trajectory (red) is the result of interpolation between trajectory A (green) and trajectory B (blue). In the following example, the interpolation is 66% Star and 33% Circle:

Trajectories A and B are resampled on 1024 points to enable point-to-point interpolation. The first point of trajectory A will be interpolated with the first point of trajectory B. More generally, the nth point of A will be interpolated with the nth point of B.

speed

time taken by the source to travel the trajectory. The shortest times are at the limits of the travel of the potentiometer: to the left 0.2 s in the opposite direction to the trajectory definition, to the right 0.2 s in the direction of the trajectory definition. In the centre, the source stops, and the travel time is infinite.

position

position of the source along the trajectory. When the speed is not zero, this value is automatically updated.

absolute / relative

monitoring of the curvature of the trajectory by the source. When the button is pushed in (**relative**), the source maintains the same orientation relative to the trajectory. For example, if the trajectory is a circle, the various channels of the source will maintain the same position relative to the circle, and will therefore turn during their travel.

If the button is released (**absolute**), the position of the channels of the source remains the same relative to the work space.

Caution: This position can also be modified by **source orientation** and **source rotation**.

With **relative**:
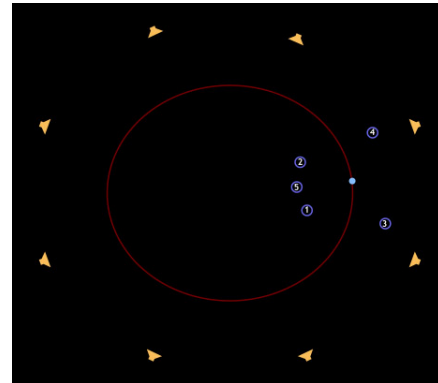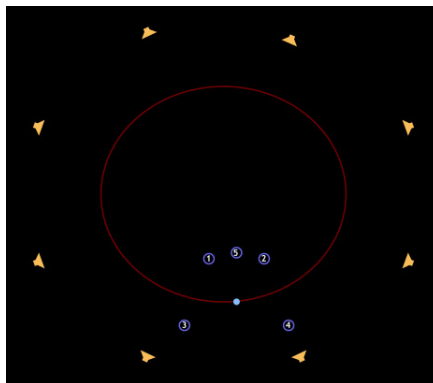
With **absolute:**

start

> restarts the trajectory travel in the **trajectory** and **segments** mode.

dyn

> opens the **Dynamics** window enabling the adding of a trajectory travel dynamic variation (accelerations, slow-motion, etc.)

> These variations are not active in **segment** mode (see **loop** parameter)

loop

> defines the trajectory travel modes.
>
> **loop** : the trajectory is travelled in a loop
>
> **bounce** : the trajectory is travelled alternately in one direction and then the other
>
> **trajectory** : the travel stops at the end of the trajectory. To begin travel again, the Start button must be pressed.
>
> **segment** : the travel stops at the end of each trajectory segment. The **Start** button must be pressed to start a segment travel. This mode only applies to multi-segment trajectories.

Edit Trajectories

> Button opening the trajectory editor, initialized with trajectory A.

Trajectories editor
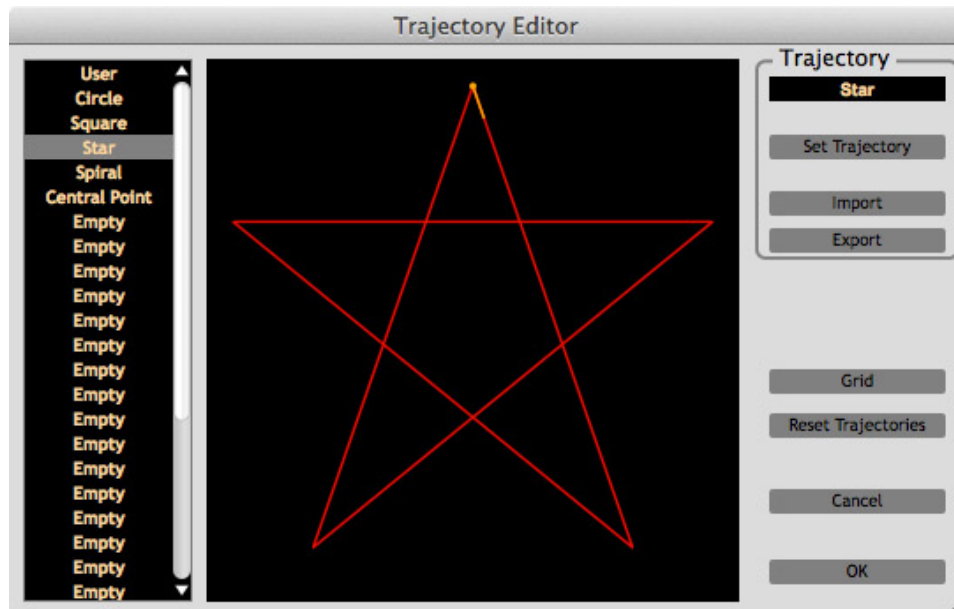
The left hand column lists the 32 possible trajectories.

- Clicking on a name displays the trajectory in the central window and its name in the Trajectory frame in the top right hand corner.
- Click+drag is used to move an item in the list
- Shift+Click+drag copies the start item into the end item.

The central window displays the selected trajectory. The first points of the trajectory are colored in orange.

A click in this window enables the modification of the trajectory:
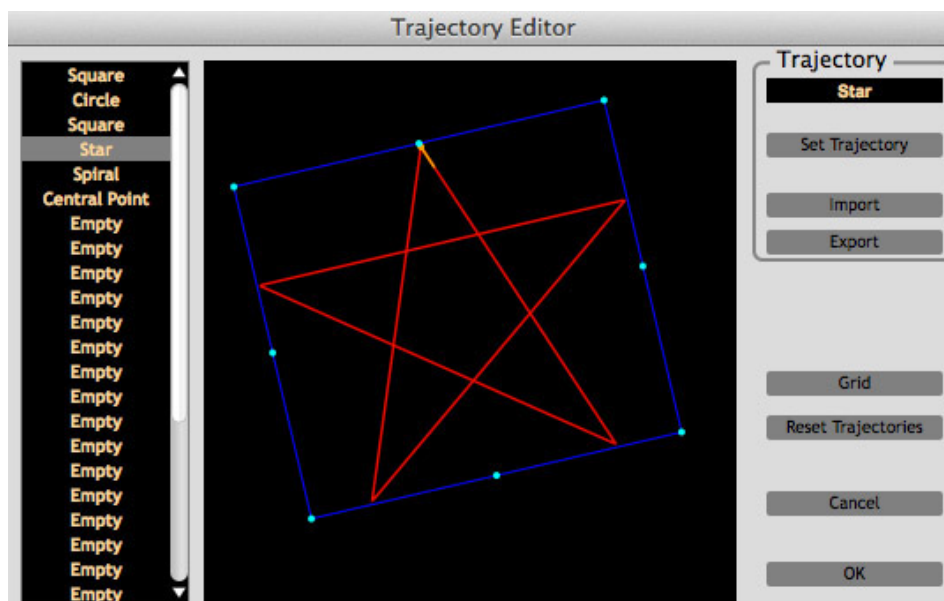
- Click in the frame: translation of trajectory

- click outside frame: rotation of trajectory
- Shift+click in angles: proportional setting to scale
- click on sides: non-proportional setting to scale
- double click: validation of modifications
- [esc]: cancellation of modifications

The **Trajectory** frame on the right enables:
- the editing of the trajectory name
- initializing the selected trajectory using predetermined trajectories (Circle, square, star, spiral, point) or by the interpolated trajectory of the main window
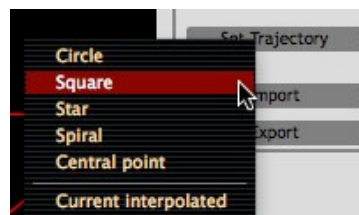
- importing and exporting trajectories into XML files. The file format is as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>

<Trajectory name="Spiral">
  <P x="0.5" y="0.0500000119" end="0"/>
  <P x="0.503637552" y="0.0505127199" end="0"/>
  <P x="0.507275164" y="0.0510254279" end="0"/>
  <P x="0.510912776" y="0.0515381359" end="0"/>
..........................................
  <P x="0.501509428" y="0.495491296" end="0"/>
  <P x="0.503901541" y="0.498148203" end="0"/>
  <P x="0.503500164" y="0.501678824" end="0"/>
  <P x="0.497459143" y="0.501612484" end="0"/>
</Trajectory>
```

The **name** attribute indicates the trajectory name as it will appear in the list; the attributes **x** and **y** are the coordinates of the points between -1 and 1. The optional attribute **end** indicates the end of a segment. The number of points is equal to the number of **P** items and must be between 2 and 1024. Once loaded, the trajectory is always resampled at 1024 points. The order of the points determines the "normal" direction in which the trajectory is travelled, i.e. that obtained with a positive **speed** value.

The exported trajectories always have 1024 points.

When resizing the window, press the [Shift] key to maintain the proportions of the central window.

Main windows

When the interpolation potentiometer is manipulated, 3 trajectories are displayed:

- trajectory A in green
- trajectory B in grey-blue
- effective interpolated trajectory in red

After a few seconds trajectories A and B fade and disappear.

- Click in the window places the source on the closest point in the trajectory.
- Click+Drag in the window is used to draw new trajectories. Edition mode is stopped automatically after a few seconds of inactivity. The trajectory drawn is resampled on 1024 points, and then stored in first position in the list of trajectories and is allocated to trajectory B.
- If the [Command] key on the Mac or the [Ctrl] key on the PC is pressed, when the mouse is released, the drawing switches to point-to-point mode. A new point will be inserted each time the mouse is clicked. Pressing the [Shift] key forces the new point to vertical, horizontal or 45° diagonal. To exit point-to-point mode, release the [Command] key on the Mac or the [Ctrl] key on the PC before releasing the mouse.
- A right click displays the following context menu:

Display Gains the blue haloes represent the amplitude of each speaker.

Display Levels the blue haloes represent the real level of the signals sent to each speaker, in the same way as a VUmeter.

Display Infos displays the numbers, names, output channels and amplitudes or dB levels of each speaker.

Rectangular Grid displays a rectangular grid in the window background.

Polar Grid displays a polar grid in the window background.

Open Trajectory Editor opens the trajectory editor (see page 26)

When resizing the window, press the [Shift] key to maintain the proportions of the main window.

Global parameters

gain

This parameter controls the level of the output signal from –96 to +12 dB.

mix

This parameter controls the mix between the original sound and the processed sound. At 100% only the processed sound is heard, and at 0% only the original sound is heard.

spread

controls the spread of the influence of the output channels. At 0 there is very little overlap between channels, at 1 the influence is almost constant over the whole space and overlap is maximum.

distance

controls the variation in amplitude as a function of distance from the centre. At 0, amplitude does not depend on distance, and at 100% attenuation is maximum when moving away from the centre, while at -100 % attenuation is maximum at the centre.

doppler

controls the Doppler effect . At 0, no variation during movements, at 1, maximum frequency variation. A click on the word "doppler" opens a menu for definition of the effect application mode:

global doppler : The Doppler effect is applied globally to all channels of the source. The centre of the source is taken as the reference for the movement, and the same frequency variation is applied to all the channels.

independant doppler : The Doppler effect is applied independently to each channel of the source. A different frequency variation is applied to each channel as a function of its own movement.

source orientation

orientation in degrees of the channels of the source relative to the layout selected in **sources layout**.

source size

size of the configuration. At 0, all the channels are at the centre of the source; at 1, they are distributed over the whole space.

source rotation

Applies a circular movement to the source around its centre from -10 Hz (anti-clockwise rotation) to 10 Hz (clockwise rotation). This parameter takes priority over **source orientation**.
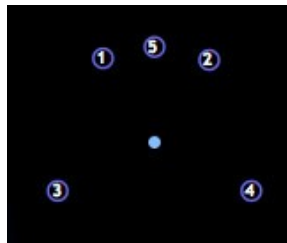
source aperture

Controls the angle of opening of the distribution of the channels of the source:

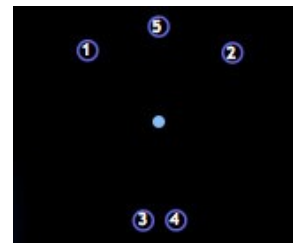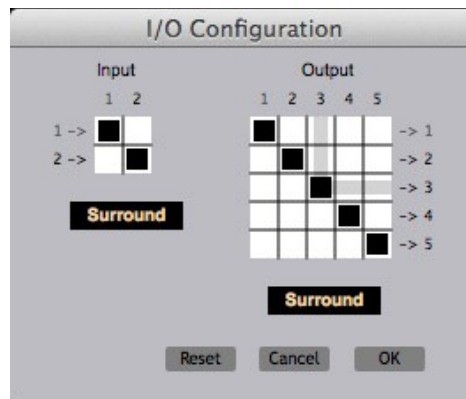30 %   100 %   150 %


At 100%, the channels are placed as defined in the layout editor.

I/O configuration

In most cases, the distribution of the input-output channels is carried out automatically (see the multi-channel chapter, page 12). To modify this distribution, click on the **I/O configuration** button:

In this example, **Spaces** is configured with a stereo input and a 5 channels output. The sequencer track channels (n-> or ->n) correspond to the matrix lines. The input and output channels of Spaces correspond to the matrix columns. To direct an output channel of **Spaces** towards an output track channel (or an input track channel towards an input channel of **Spaces**), click in the corresponding box of the matrix.
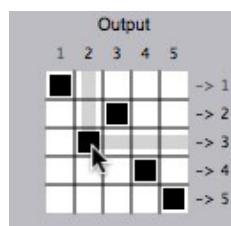
In this example, speaker 2 of **Spaces** is routed towards channel 3 of the output track. To help identify the channels, the surround menus placed under the two matrices propose the most standard configurations:
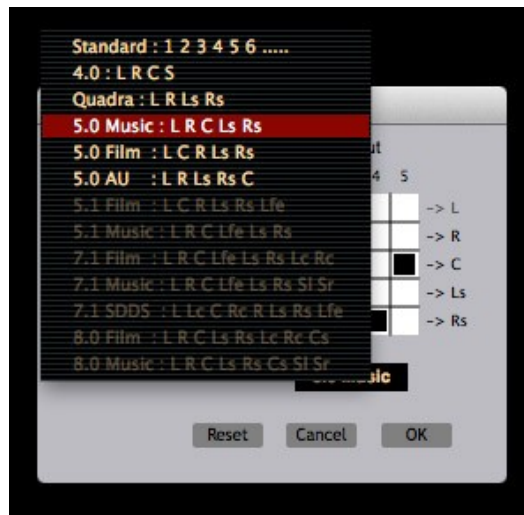
Only configurations compatible with the number of channels can be selected. The track channel numbers are then replaced by their standardized names (L, R, Ls, etc.) and the configuration of the matrix is performed automatically. Caution: the names of the channels and of the configuration are not memorized. This is only a matrix definition aid.

It is thus possible to manage up to 32 inputs and 32 outputs:
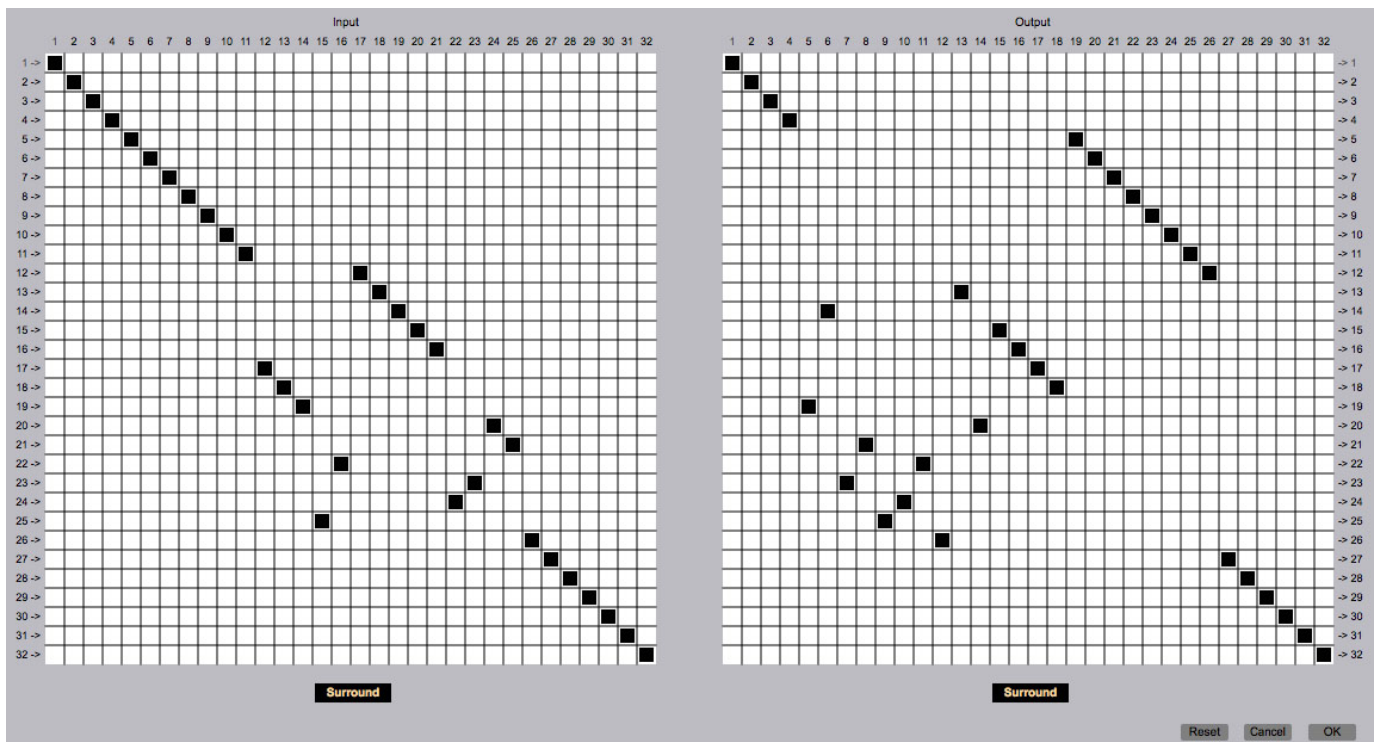
SpaceGrain

SpaceGrain enables the generation of up to 100 grains and their placing in a multi-channel sound space.
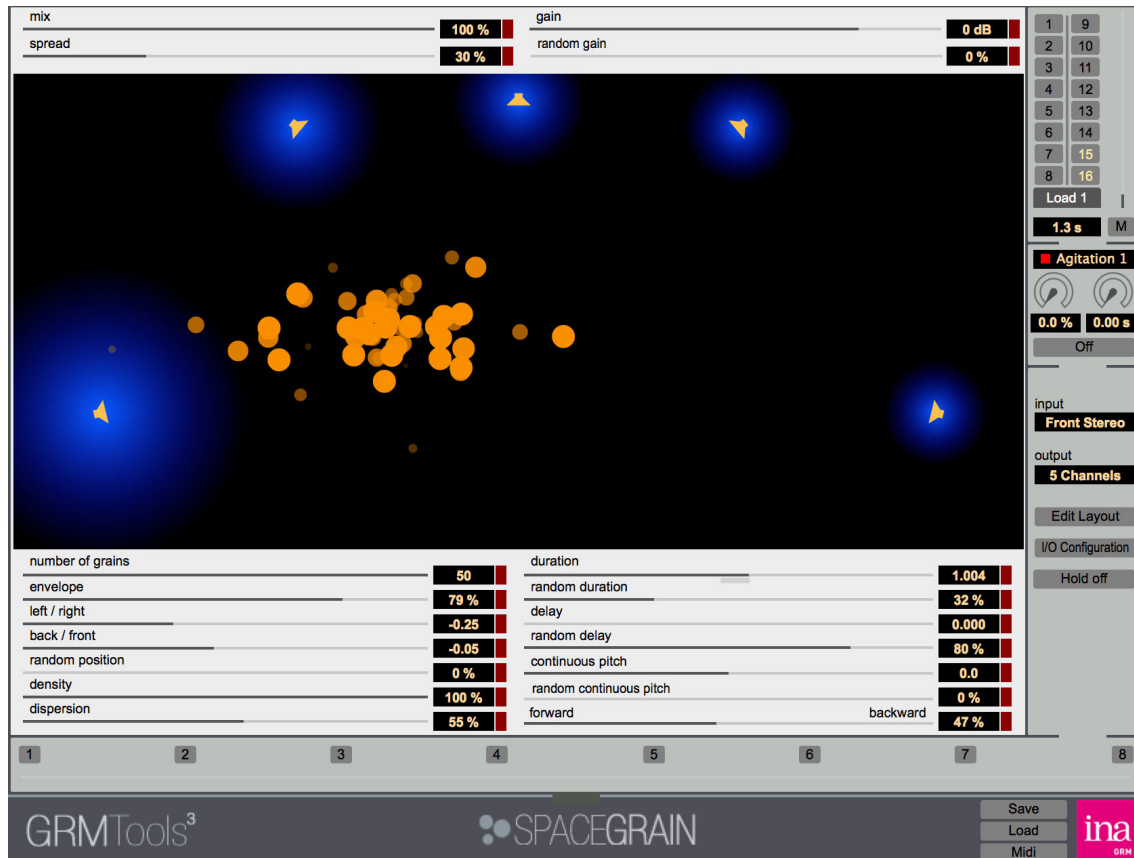
How does it work ?

Variable duration, delay, amplitude and transposition grains are sampled in the incoming signal and distributed in a multi-channel space (up to 32 channels, depending on the environment). Each grains performs a mono read. The input channels (up to 8) are randomly allocated to the grains.

The controls are explained below in the paragraph entitled **Reference** (page 34).

Getting started

It is assumed that the user is familiar with the manipulation of the host applications, the importing and recording of a sound on a mono or stereo track, access to the various windows and the insertion of the plugins. The following examples have been carried out using the Stand Alone version of SpaceGrain (see the Stand Alone chapter, page 13, to find out more about this version). These examples are transposed without difficulty to the other versions (VST, AAX, RTAS and Audio Unit). It is assumed that the user has an audio interface with at least 5 outputs.
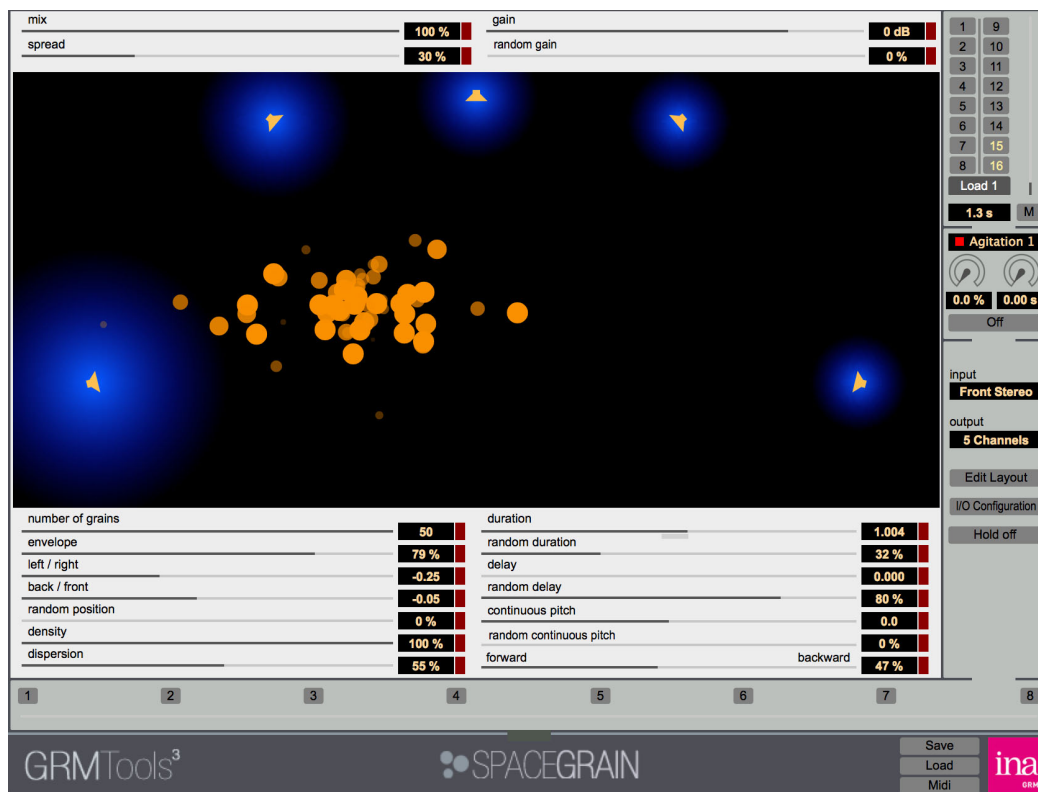
Start SpaceGrain StandAlone. Open **Audio & Midi settings** in the **Options** menu.
Select 5 outputs in the **active output channels** list. Close the **Options** panel.
The application has now been configured for an output on 5 channels.

Check that the menu above **Edit Layout** does indeed indicate **5 Channels**. Open this menu: only compatible layouts with fewer than 5 channels can be selected (Stereo and Quadraphonic).

Load a stereo sound file and start the reading. Observe the orange discs appearing in the main window. They symbolize the grains. Your can modify their quantity with **number of grains**, their duration with **duration** and their spatial distribution with **random position**.

Set **number of grains** to 10, **duration** to 2 and **random position** to 30%. Click in the window and move the mouse. The grains will follow the mouse with a delay that depends on their duration.

Reference

Spatial window
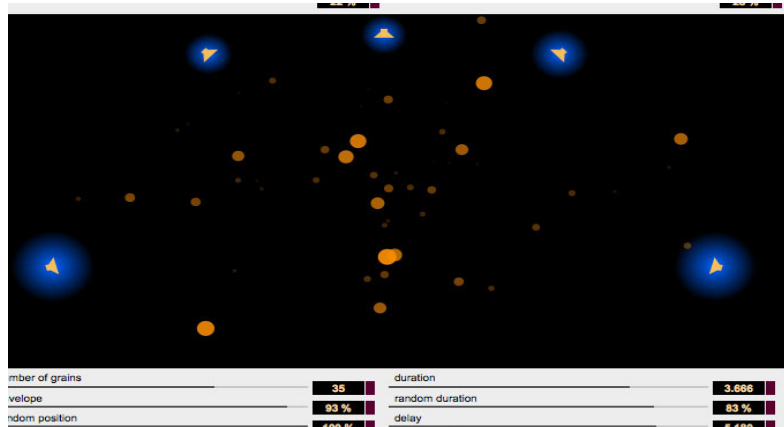
This window displays a multi-channel space symbolized by N speakers that correspond to N output channels. The grains are displayed as orange circles whose intensities depend on the envelope and amplitude of each grain.

clic + move

> moves the center of the grains distribution in the multi-channel space

right clic

> displays a context menu

> **Display Gains** the blue haloes represent the amplitude of each speaker.
>
> **Display Levels** the blue haloes represent the actual level of the signals sent to each speaker, just as with a VUmeter.
>
> **Display Infos** displays the numbers, names, output channels and amplitudes of dB levels of each speaker.
>
> **Rectangular Grid** displays a rectangular grid as the window background.
>
> **Polar Grid** displays a polar grid as the window background.
>
> **Open Layout Editor** opens the layout editor (see page 20)

mix

> This parameter controls the mix between the original sound and the processed sound. At 100% only the processed sound is heard, and at 0% only the original sound is heard.

spread

> controls the spread of the influence of the output channels. At 0, there is very little overlap between the channels, and at 1 the influence is almost constant over the whole space and the overlap is maximum.

gain

> This parameter controls the level of the output signal from –96 to +24 dB.

random gain

> Applies a random variation on the amplitude of each grain. At 0%, no attenuation is applied, and at 100% attenuation varies randomly between 0 dB and -40 dB.

number of grains

> The number of grains varies from 1 to 50. Depending on the **envelope** parameter, grains may overlap more or less. In the event of overlapping, the quantity of effective grains at a given moment can reach 100. Each grains performs a mono read. The input channels are randomly allocated to the grains.

envelope

> Amplitude envelope of each grain. At 0% the envelope is rectangular, and the transition from one grain to the next is sudden. At 100%, the envelope is triangular, and the grains are superimposed for half of their duration.

left / right

> Left/right coordinate of the position of the centre of the source. From -1 (left) to 1 (right).

back / front

> Back/front coordinate of the position of the centre of the source. From -1 (back) to 1 (front).

random position

> Random variation of the position of the grains. At 0%, all the grains are positioned at the last known position of the mouse. At 100%, the grains are distributed over the whole work space.

density

> Density of grains that are in fact active. At 0% no grain is active, and 100% all grains are active.

dispersion

> The grains move linearly outward from the cursor position in a random direction. 0 % no movement, 100 % maximum dispersion, about half of the main window.

duration

> Duration of grains from 1 ms to 10 s. This duration may be automatically modified as a function of the pitch parameters to avoid certain reading incoherencies.

random duration

> Random variation of duration of grains. At 0% duration is determined by the **duration** parameter. At 100%, duration varies randomly between 1 ms and the duration determined by the **duration** parameter.

delay

Delay of each grain relative to direct sound. The delay varies between 0 and 10 s. The delay may be automatically modified as a function of the pitch parameters to avoid certain reading incoherencies.

random delay

Random variation of delay. At 0% the duration is that determined by the **delay** parameter. At 100% the duration varies randomly between 0 s and that determined by the **delay** parameter.

continuous/chromatic pitch

Transposition of + or – one octave. The transposition is performed by reading at variable speed. Depending on the duration of the grains, the acceleration, or the slowdown, of the content of the grains will be perceptible or not. A click on the label opens a menu for selection of continuous or chromatic transposition.

random continuous/chromatic pitch

Random transposition of + or – one octave. The random variation is added to the previous **pitch** parameter. A click on the label opens a menu for selection of continuous or chromatic transposition.
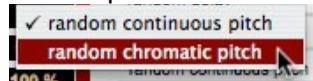
forward/backward

Proportion of grains that are played backward. At 0% all grains are read normally, 100% all grains are played in reverse.

input

Menu enabling the selection of the input layout. Only layouts with a number of channels lower than or equal to the number of channels of the track on which the processing is inserted can be selected. Only the number of channels is taken into account, and not the detailed layout of the channels. **Stereo** and **Front Stereo** are therefore equivalent.

With **I/O Configuration**, this menu enables the selection of the input channels that are actually used by the grains.
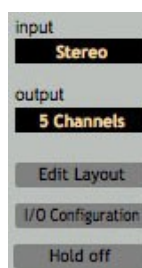
output

Menu enabling the selection of the output layout. Only layouts with a number of channels lower than or equal to the number of channels of the track on which the processing is inserted can be selected.

Edit Layout

Button that opens the layout editor. See the description of this editor above, on page 20.

I/O Configuration

Button that opens the input/output editor. See the description of this editor on page 30.

hold

Button enabling the suspension of the writing of the incoming signal (Hold on). The grains are then sampled in the last 40 seconds recorded.

SpaceFilter

SpaceFilter is used to spatialize the signal by independent frequency bands.
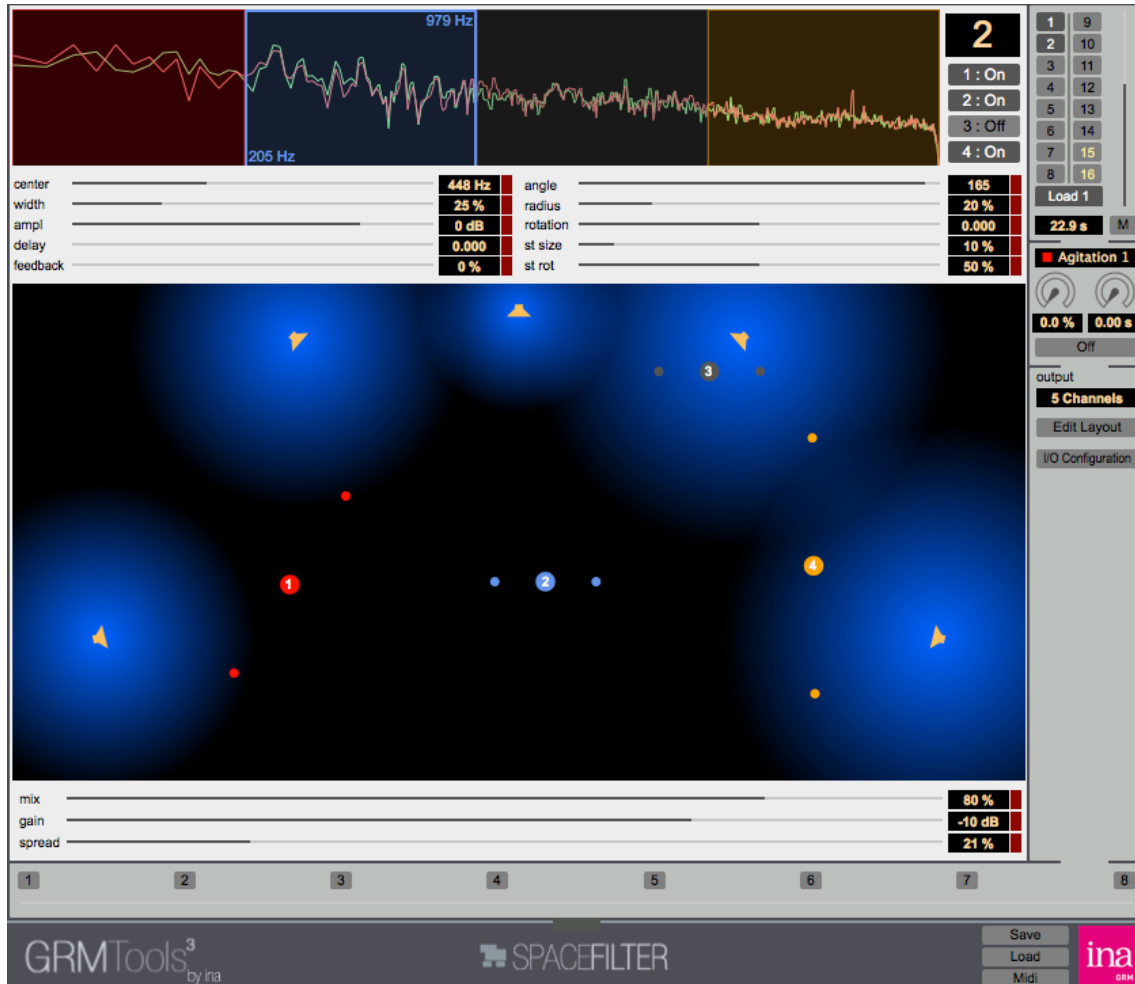
How does it work ?

The input signal spectrum is split into 4 independent bands to which are applied a delay and a feedback. The output of each filter is positioned in a multi-channel space (up to 32 channels).

The controls are explained below in the paragraph entitled **Reference** (page 39).

Getting started

It is assumed that the user is familiar with the manipulation of the host applications, the importing and recording of a sound on a mono or stereo track, access to the various windows and the insertion of plugins. The following examples have been carried out using the StandAlone version of SpaceFilter (see the Stand Alone chapter, page 13, to find out more about this version). These examples are transposed without difficulty to the other versions (VST, AAX, RTAS and Audio Unit). It is assumed that the user has an audio interface with at least 5 outputs.

Start SpaceFilter StandAlone. Open **Audio & Midi settings** in the **Options** menu. Select 5 outputs from the **active output channels** list. Close the **Options** panel. The application is now configured for an output on 5 channels.

Check that the menu above **Edit Layout** does indeed indicate **5 Channels**. Open this menu: only compatible layouts with at least 5 channels can be selected (Stereo and Quadraphonic).

Load a stereo sound file and start the reading. Observe the spectrum of the signal displayed in the spectral window at the top of the interface. Click on the buttons **1: On**, **3: On** and **4: On** to the right of this zone. They switch all 3 to Off and only the second band remains active.
Manipulate the **center**, **width** and **delay** potentiometers.

In the space window, only source 2 representing the second frequency band is colored. You can move it directly with the mouse, or using the **angle**, **radius** and **rotation** potentiometers that define its position in relation to the centre of the screen. You can also move each channel around the position previously defined using **st size** and **st rot**.

You can now activate the other bands and manipulate their parameters.

The choice of the band to be controlled is carried out by clicking directly on the band in the spectral window, or by clicking on the corresponding source in the space window, or by using the menu above the band validation buttons.

Reference

Spectral window
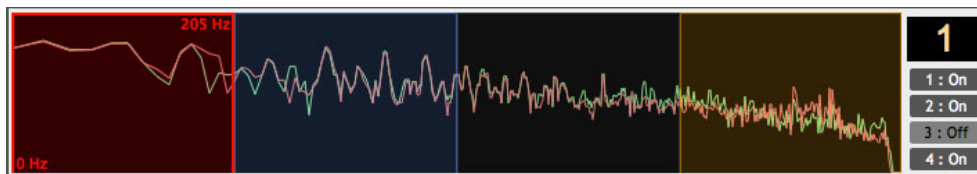
This window displays the logarithmic spectrum of the input signal and the four frequency bands (red, blue, green and orange). The bands can be activated and deactivated using the 4 buttons on the right. When a band is deactivated, it is displayed in grey in the spectral window.

clic + move

      selects the band under the mouse, and moves it while keeping its width fixed.

Cmd + clic + move (Mac)
Ctrl + clic + move (PC)

      as above, with modification of the band width by vertical movement.

Alt + clic

      reinitialization with four contiguous bands of the same width.

Band Parameters
The following parameters are applied to the selected band (by a click in the spectral window, or by the menu in the top right hand corner).

center

      central frequency in Hz

width

      band width as %. At 100% the band covers the whole spectrum, if **center** is at the centre.

ampl

      amplitude of the filtered signal. From -96 to +24 dB

delay

      delay applied at the output of the filter. From 0 to 10 seconds.

feedback

      percentage of feedback of the delay output towards its input.

angle

      angle in degrees of the source in relation to the centre of the spatial window. 0° is at the top of the window, and 90° to the right. If **rotation** is not zero, this parameter varies as a function of the current angle.

radius

      distance of the source in relation to the centre of the spatial window. At 100% the source is on a circle (or an ellipse) that is tangent to the four sides of the window.

rotation

      speed of rotation of the source in relation to the centre of the spatial window. From 0 to 10 seconds. The positive values correspond to rotation in the clockwise direction, and the negative values to rotation in a trigonometric direction.

st size

      distance of the satellites in relation to the source disc. For a source at the centre of the spatial window, 100% corresponds to a circle (or an ellipse) that is tangent

to the four sides of the window.

st rot

rotation speed of satellites in relation to centre of spatial window. From 0 to 10 seconds. The positive values correspond to rotation in the clockwise direction, and the negative values to rotation in a trigonometric direction.

These two parameters (**st size** and **st rot**) are only active if the processing input is stereo.

Spatial window
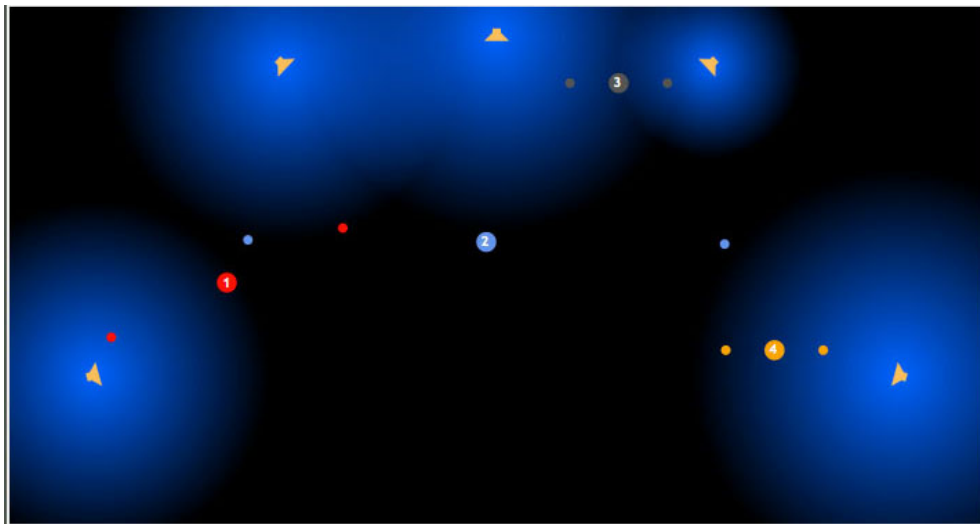
This window displays a multi-channel space symbolized by N speakers that correspond to N output channels. The 4 frequency bands are placed in this space and are represented by four colored discs numbered from 1 to 4 with the same colors as the corresponding bands in the spectral window. If the processing input is stereo, two small satellites of the same color symbolize the two channels. If a band is deactivated, the disc and any satellites are grey.

clic + move on a disc

selects the band corresponding to the disc and moves it in the multi-channel space

right clic

displays a context menu

Display Gains. The blue haloes represent the amplitude of each speaker.

Display Levels. The blue haloes represent the actual level of the signals sent to each speaker, just as with a VUmeter.

Display Infos. Displays the numbers, names, output channels and amplitudes of dB levels of each speaker.

Rectangular Grid. Displays a rectangular grid as the window background.

Polar Grid. Displays a polar grid as the window background.

Open Layout Editor. Opens the layout editor (see page 20)

Global Parameters

mix

This parameter controls the mix between the original sound and the processed sound. At 100% only the processed sound is heard, and at 0% only the original sound is heard.

gain

This parameter controls the output signal level from -96 to +24 dB.

spread

controls the spread of the influence of the output channels. At 0, there is very little overlap between the channels, and at 1 the influence is almost constant over the whole space and the overlap is maximum.
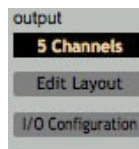
output

Menu enabling the choice of one configuration out of the 32 available, and its allocation to the speakers. Only layouts with a number of channels that is lower than the number of output channels actually available can be selected. The layouts can be edited by means of the **Edit Layouts** button.

Edit Layout

Button opening the layout editor. See the description of this editor above (page 20).
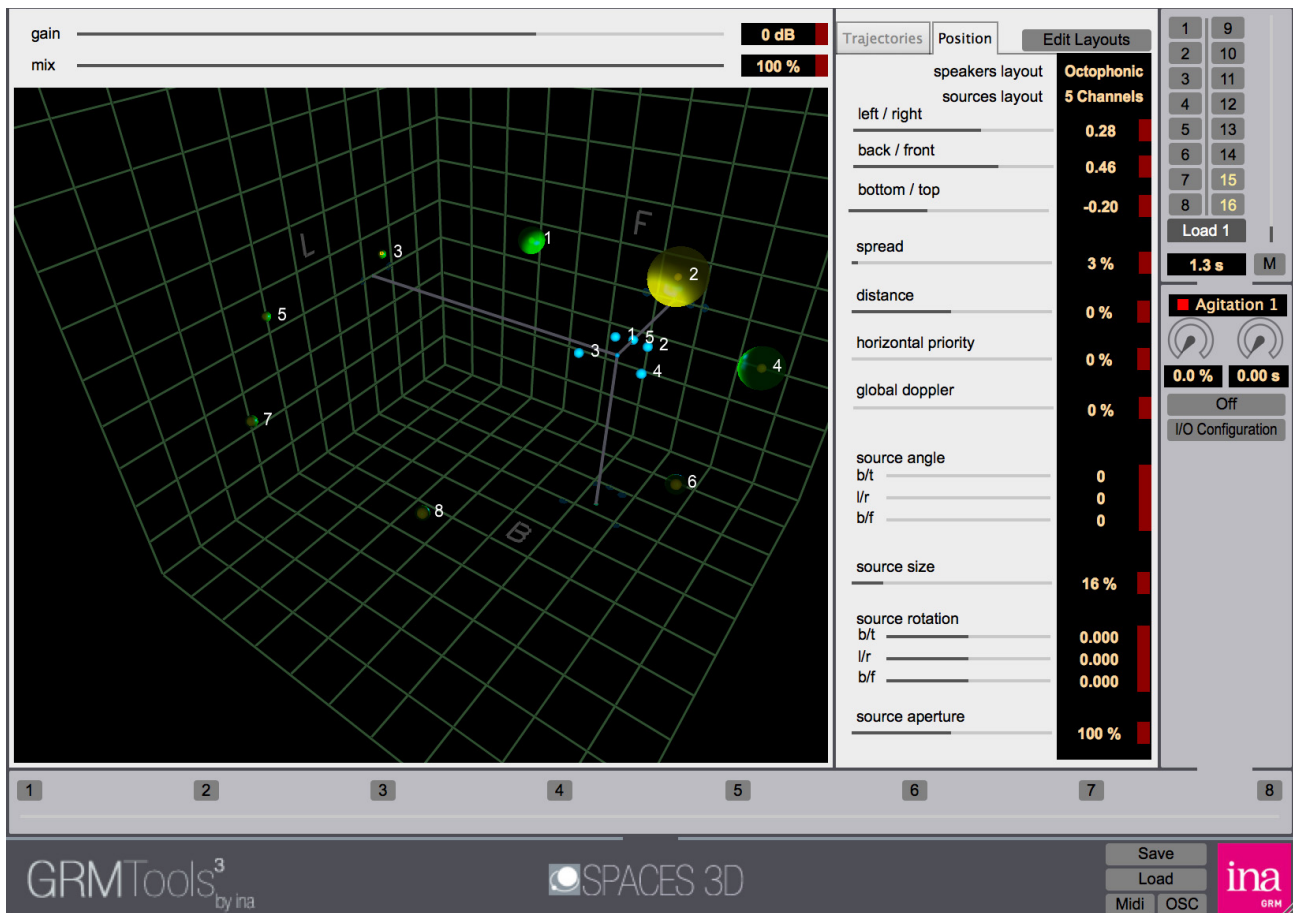
I/O Configuration

Button opening the input/output controller. See the description of this controller on page 30.

Spaces 3D

Spaces3D enables you to move around a source of multichannel sound (from 1 to 64 channels) in a multichannel space (from 1 to 64 channels) in three dimensions. The movement can be free, random, or can follow trajectories predetermined by the user.

How does it work ?

The source moves inside the speaker space in two modes:

Position

places in static mode the source at coordinates specified by the **left/right, back/front** and **bottom/top** potentiometers. The layout of the channels of the source or of the speakers can be edited.

Trajectories

the source follows trajectories that can be interpolated and drawn. The layout of the channels is fixed and can only be modified in the **Position** mode.

The controls are explained below, in the paragraph entitled **Reference** (page 45).

Getting started

We suppose that the user is familiarized with the manipulation of host applications, the import and recording of a sound on a mono or stereo track, the access to different windows and the insertion of plug-ins. The next examples are done with the StandAlone version of **Spaces3D** (check out the StandAlone chapter in the **Spaces** documentation to know more about this version). We suppose that the user has an audio interface with at least 5 outputs.

Open **Spaces3D** StandAlone. Go to **Audio & Midi settings** in the Options menu. Select 5 outputs in the **active output channels** list. The application is now configurated for an output on 5 channels.
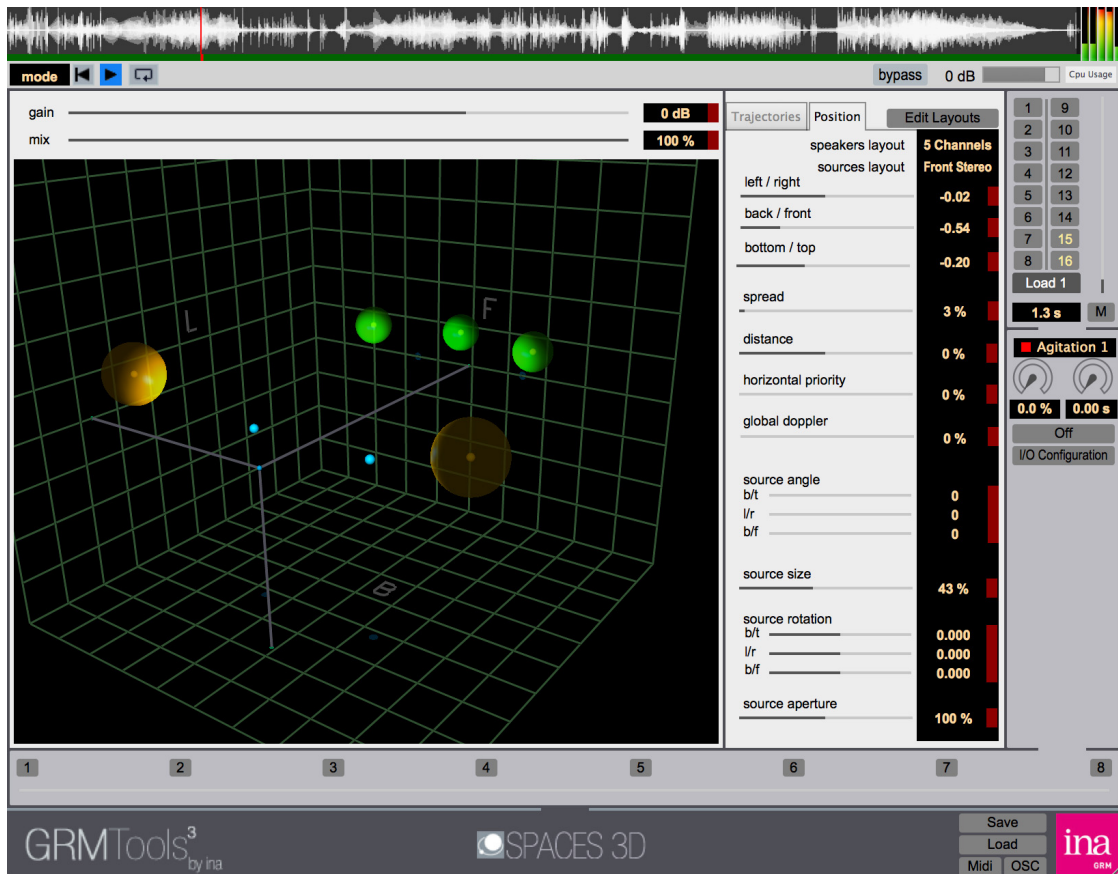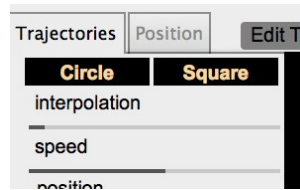

Click on the **Position** tab. Check that the speakers layout indicates **5 Channels**. Open this menu : only compatible configurations with less than 5 channels are selectable (Stereo and Quadriphonic).

Load a stereo sound and click the **Start** button. Click in the main window and move the mouse. The lateral movements of the mouse moves the source on the left-to-right axis, and the longitudinal movements move the source on the front-to-back axis. To obtain vertical movements, press simultaneously on the right bouton, or the [Shift] key, or use the mouse wheel. Observe the variations of the blue haloes around the speakers. They represent the volumes applied at each output. These volume variations can be refined by using the **spread** and **distance** parameters. Adjust **source rotation** to about 0.5. The two channels rotate around the centre of the source in 2 seconds.

Click on the **Trajectories** tab. The centre of the source is moved along a circle and

the two channels continue their rotation.

Click on the **Square** menu and select **Star.** Modify **interpolation a**nd observe the modification of the trajectory.

Reference
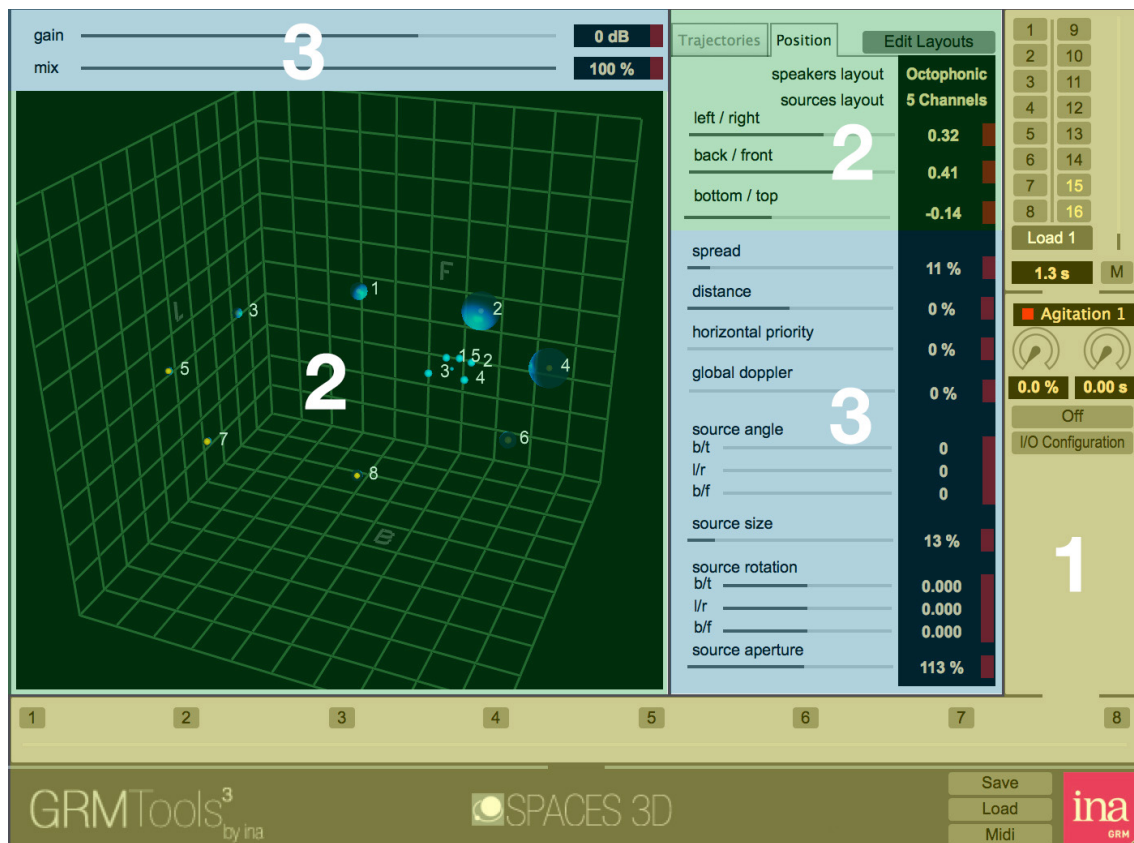
The **Spaces3D** interface has three zones:
1. a zone that is common to all the GRM Tools described in the **Common Controls** chapter.
2. a zone that depends on the control mode, that is **Position** or **Trajectories**.
3. a zone with more general adjustments (**gain, doppler**, etc.) that are common to the two control modes.

Position

This control mode is obtained by clicking on the **Position** tab.

speakers layout

> Menu enabling the choice of a layout amongst the 32 available, and its allocation to the layout of the speakers. Only layouts with a number of channels that is lower than the number of output channels actually available can be selected. The configurations can be edited by using the **Edit Layouts** button.

sources layout
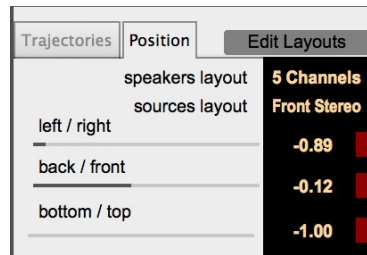
> Menu enabling the choice of a layout amongst the 32 available, and its allocation to the layout of the channels of the source. Only layouts with a number of channels that is lower than the number of input channels actually available can be selected. The configurations can be edited by using the **Edit Layouts** button.

left / right

> Left/right coordinate of the position of the centre of the source. From -1 (left) to 1 (right).

back / front

> Back/front coordinate of the position of the centre of the source. From -1 (back) to 1 (front).
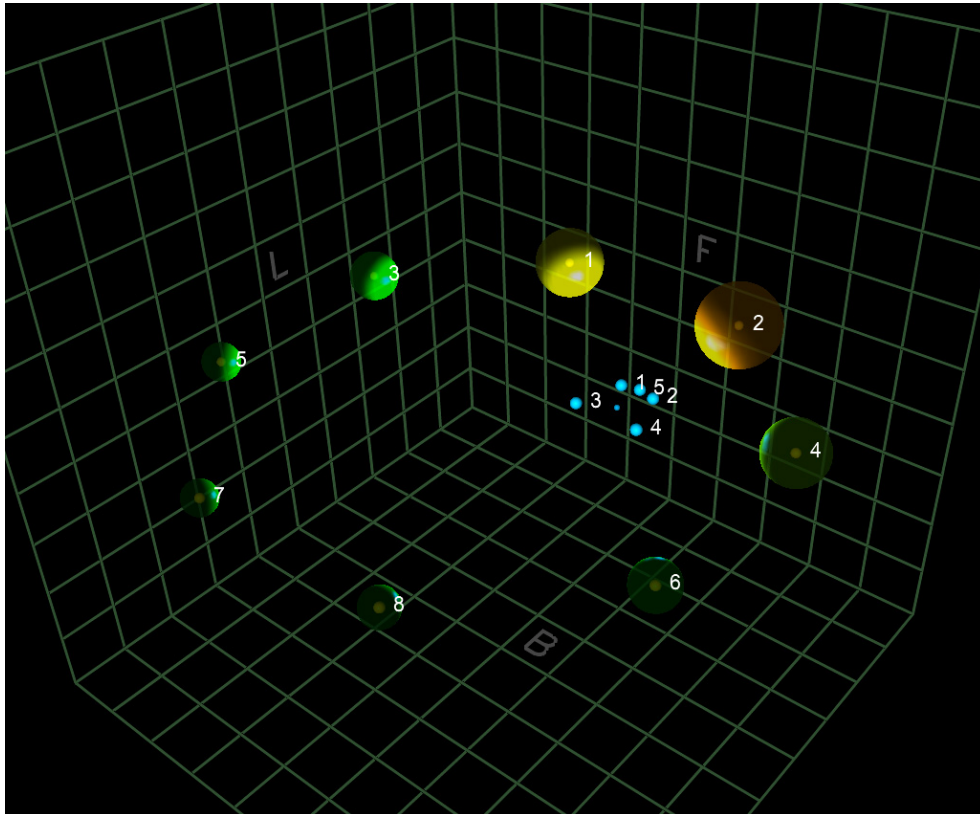
bottom / top

> Bottom/top coordinate of the position of the centre of the source. From -1 (bottom) to 1 (top).

Edit Layouts

> Button that opens up the layout editor.

Main window in position mode

In this example, we have a source with 5 channels and an output layout of 8 channels. The center of the source is symbolized by the little blue ball, the channels of the source by the numbered balls. The blue halos around the speakers indicate the amplitude of each output canal.

The 3D space area is represented by three plans defining a cubic box : the **F**ront plan, the **L**eft plan and the **B**ottom one. The speakers and the movement of the source is limited within the box.

View control

- [Alt]+mouse moves the view horizontally and vertically
- [Alt]+[Shift] approaches or moves the view further
- [Alt]+[mouse wheel] approaches or moves the view further
- [Ctrl]+mouse makes the cube turn around its center
- [Ctrl]+[Shift] gives an effect of dolly zoom
- [Ctrl]+[mouse wheel] gives an effect of dolly zoom

Source control

- click + lateral movement moves the source on the left-to-right axis.
- click + longitudinal movement moves the source on the back-to-front axis.
- click + right button and longitudinal movement moves the source on the bottom-to-top axis.
- click + [Shift] + longitudinal movement moves the source on the bottom-to-top axis
- [mouse wheel] moves the source on the bottom-to-top axis.

The « **M** » key slightly magnets the movement on the grid mesh.

Careful, depending on the rotation of the view, these axes don't necessarily correspond to the horizontal ad vertical axes of the screen. For the same reason, the mouse cursor doesn't correspond to the position of the source.

Contextual Menu

A right click displays the following context menu:

Display Gains the blue halos represent the amplitude of each speaker.

Display Levels the blue halos represent the real level of signal sent to each speaker as viewed on a Vu-meter.

Display Infos displays the number of each speaker.

Display All Infos displays the numbers, names, output channels, amplitudes or levels in dB, as well as the coordinates.

Display Box displays the box defining the 3D space area.

Projection on planes displays the perpendiculars of each plan **L**, **F** and **B** at the center of the source.

Fade out applies a gradual darkening of the view depending on the distance.

Starfield displays a starfield as background image.

Top view top view of the box.

Front view front view of the box.

3D view 3D view of the box.

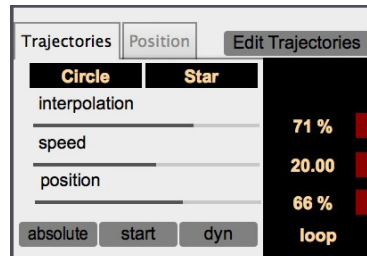**Open Layout Editor** opens the layout editor.

When resizing the window, press the [Shift] key to keep the proportions of the main window.
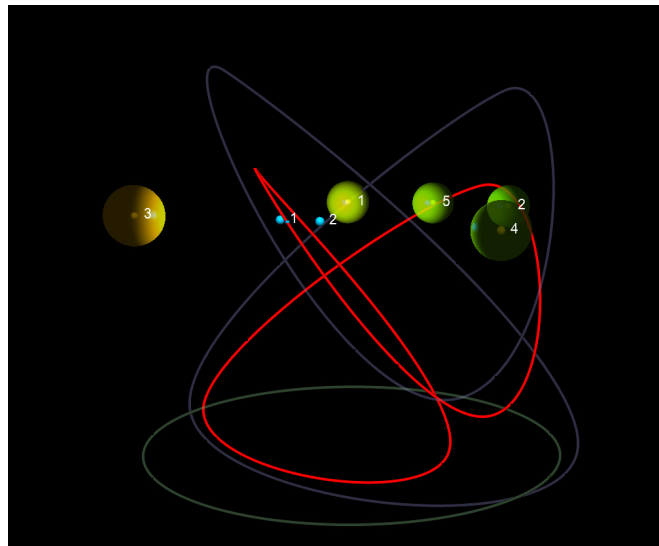
Trajectories

This control mode is obtained by clicking on the **Trajectories** tab.

The two upper menus correspond to two trajectories, A and B, chosen from the 32 available. In the screen copy above: **A:Circle** and **B:Star**.

interpolation

controls interpolation between the two trajectories. Completely on the left the effective trajectory is trajectory A, completely on the right is trajectory B. For the intermediate values, the effective trajectory (**red**) is the result of interpolation between trajectory A (**green**) and trajectory B (**blue**). In the following example, the interpolation is 30% Circle and 70% the second trajectory:

Trajectories A and B are resampled on 1024 points to enable point-to-point interpolation. The first point of trajectory A will be interpolated with the first point of trajectory B. More generally, the nth point of A will be interpolated with the nth point of B.

speed

time taken by the source to travel the trajectory. The shortest times are at the limits of the travel of the potentiometer: to the left 0.2 s in the opposite direction to the trajectory definition, to the right 0.2 s in the direction of the

trajectory definition. In the centre, the source stops, and the travel time is infinite.

position

position of the source along the trajectory. When the speed is not zero, this value is automatically updated.

absolute / relative

monitoring of the curvature of the trajectory by the source. When the button is pushed in (**relative**), the source maintains the same orientation relative to the trajectory. For example, if the trajectory is a circle, the various channels of the source will maintain the same position relative to the circle, and will therefore turn during their travel.

If the button is released (**absolute**), the position of the channels of the source remains the same relative to the work space.

Caution: This position can also be modified by **source orientation** and **source rotation**.

start

restarts the trajectory travel in the **trajectory** and **segments** mode.

dyn

opens the **Dynamics** window enabling the adding of a trajectory travel dynamic variation (accelerations, slow-motion, etc.)

These variations are not active in **segment** mode (see **loop** parameter)

loop

> defines the trajectory travel modes.
>
> **loop** : the trajectory is travelled in a loop
>
> **bounce** : the trajectory is travelled alternately in one direction and then the other
>
> **trajectory** : the travel stops at the end of the trajectory. To begin travel again, the **start** button must be pressed.
>
> **segment** : the travel stops at the end of each trajectory segment. The **start** button must be pressed to start a segment travel. This mode only applies to multi-segment trajectories.

Edit Trajectories

> button opening the trajectory editor, initialized with trajectory A.
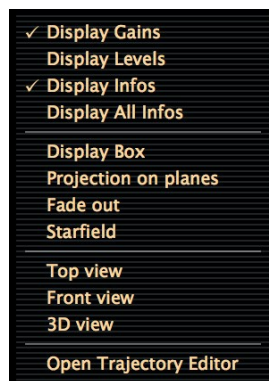
Main window in trajectories mode

When the interpolation potentiometer is manipulated, 3 trajectories are displayed :
- trajectory A in **green**
- trajectory B in **blue**
- effective interpolated trajectory in **red**

After a few seconds trajectories A and B fade and disappear.

The view control is the same as in **Position** mode.

- Click in the window places the source on the closest point in the trajectory.
- A right click displays the following context menu :

```
✓ Display Gains
  Display Levels
✓ Display Infos
  Display All Infos

  Display Box
  Projection on planes
  Fade out
  Starfield

  Top view
  Front view
  3D view

  Open Trajectory Editor
```

Display Gains the blue haloes represent the amplitude of each speaker.

Display Levels the blue haloes represent the real level of the signals sent to each speaker, in the same way as a VUmeter.

Display Infos displays the number of each speaker.

Display All Infos displays the numbers, names, output channels, amplitudes or levels in dB, as well as the coordinates.

Display Box displays the box defining the 3D space area.

Projection on planes displays the perpendiculars of each plan **L**, **F** and **B** at the center of the source.

Fade out applies a gradual darkening of the view depending on the distance.

Starfield displays a starfield as background image.

Top view top view of the box.

Front view front view of the box.

3D view 3D view of the box.

Open Trajectory Editor opens the layout editor.

When resizing the window, press the [Shift] key to keep the proportions of the main window.

Global parameters

gain

This parameter controls the level of the output signal from –96 to +12 dB.

mix

This parameter controls the mix between the original sound and the processed sound. At 100% only the processed sound is heard, and at 0% only the original sound is heard.

spread

Controls the spread of the influence of the output channels. At 0 there is very little overlap between channels, at 1 the influence is almost constant over the whole space and overlap is maximum.

distance

Controls the variation in amplitude as a function of distance from the centre. At 0, amplitude does not depend on distance, and at 100% attenuation is maximum when moving away from the centre, while at -100 % attenuation is maximum at the centre.

horizontal priority

Forces the sound distribution on the speakers in the same horizontal plane as the sources. At 100% the speakers located in the same plane will be favored, even if other speakers are closer, but in another plane.

doppler

Controls the Doppler effect. At 0, no variation during movements, at 1, maximum frequency variation. A click on the word "doppler" opens a menu for definition of the effect application mode:

global doppler the Doppler effect is applied globally to all channels of the source. The centre of the source is taken as the reference for the movement, and the same frequency variation is applied to all the channels.

independant doppler the Doppler effect is applied independently to each channel of the source. A different frequency variation is applied to each channel as a function of its own movement.

source angle

Orientation in degrees of the channels of the source relative to the layout selected in **sources layout**. Three axes are available :

- **b/t** : bottom/top axis
- **l/r** : left/right axis
- **b/f** : back/front axis

source size

> Size of the configuration. At 0, all the channels are at the centre of the source; at 1, they are distributed over the whole space.

source rotation

> Applies a circular movement to the source around its centre from -10 Hz (anti-clockwise rotation) to 10 Hz (clockwise rotation). This parameter takes priority over **source orientation**. Three axes of rotation are available :
>
> - **b/t** : bottom/top axis
> - **l/r** : left/right axis
> - **b/f** : back/front axis

source aperture

> Controls the angle of opening of the distribution of the channels of the source from 0% to 200%.
>
> At 100%, the canals are placed as defined in the layout editor.

I/O configuration

> In most cases, the distribution of the input-output channels is carried out automatically (see the multi-channel chapter in the documentation of **Spaces**). To modify this distribution, click on the **I/O configuration** button:
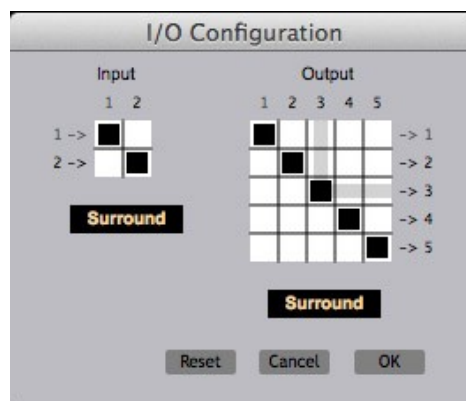

> In this example, **Spaces3D** is configured with a stereo input and a 5 channels output. The sequencer track channels (n-> or ->n) correspond to the matrix lines. The input and output channels of **Spaces3D** correspond to the matrix columns. To direct an output channel of **Spaces3D** towards an output track channel (or an input track channel towards an input channel of **Spaces3D**), click in the corresponding box of the matrix.
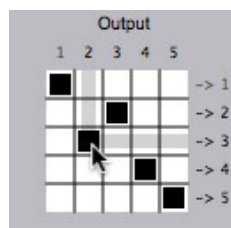
> In this example, speaker 2 of **Spaces3D** is routed towards channel 3 of the output track.

To help identify the channels, the surround menus placed under the two matrices propose the most standard configurations:
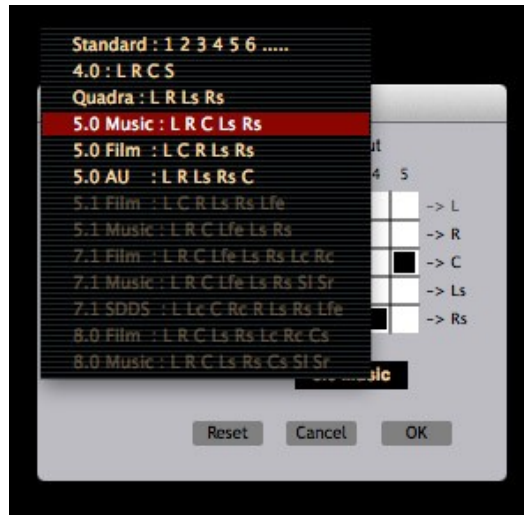

Only configurations compatible with the number of channels can be selected.
The track channel numbers are then replaced by their standardized names (L, R, Ls, etc.) and the configuration of the matrix is performed automatically.
Caution: the names of the channels and of the configuration are not memorized. This is only a matrix definition aid.

It is possible to manage up to 64 inputs and 64 outputs.

Layout Editor
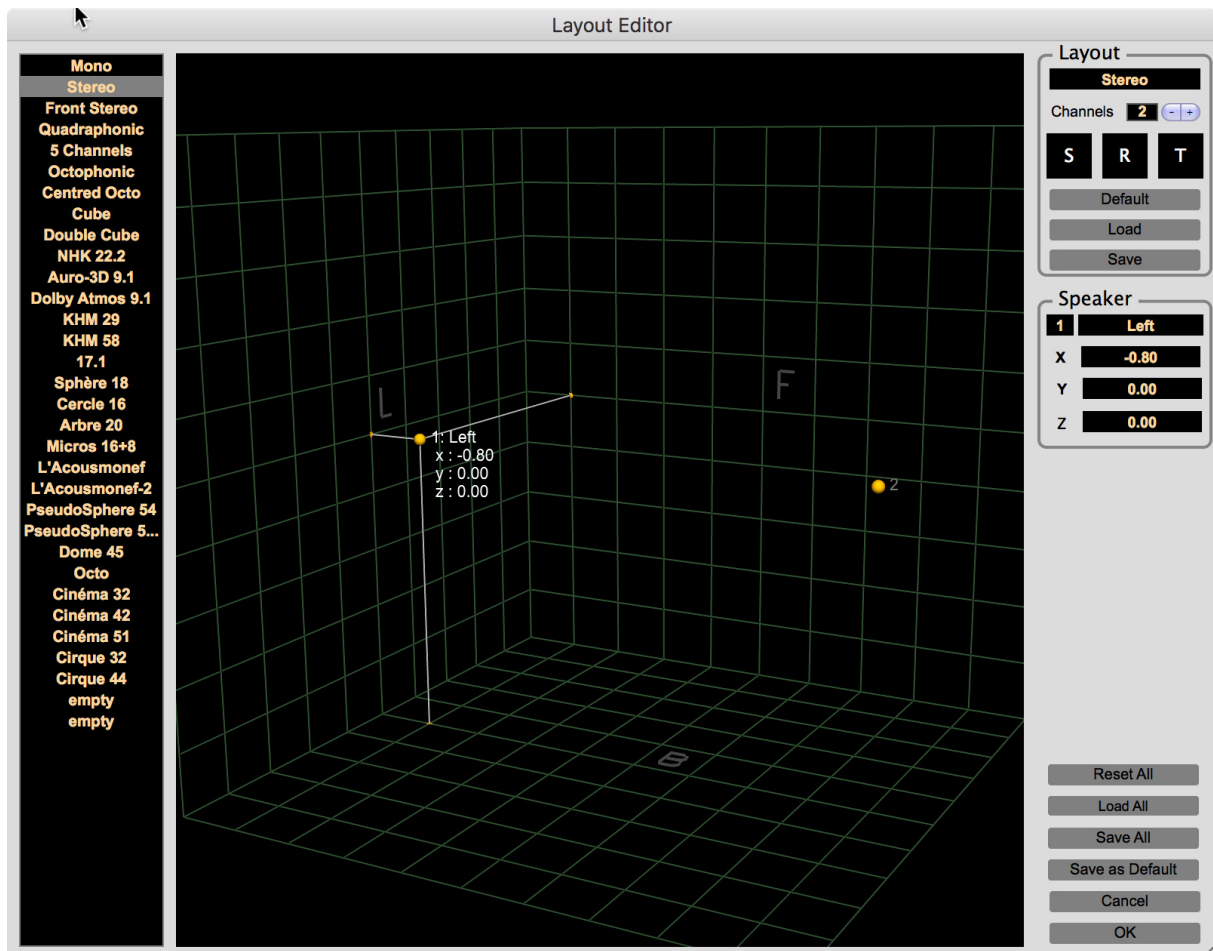
The left hand column lists the 32 possible layouts.

- Click on a name displays the layout in the central window, and its name and characteristics in the **Layout** frame in the top right hand corner.
- Click+drag is used to move an item in the list
- [Shift]+Clic+drag copies the start item into the end item.
- The copy/paste is available with a right click opening a contextual menu

The central window displays the selected layout.

A right click on this window displays a contextual menu, letting more or less information as well as the selection of 3 point of views getting displayed.

The movement of the point of view is done with [Alt]+mouse, and the rotations with [Ctrl]+mouse. [Alt]+[mouse wheel] or [Ctrl]+[Shift] controls the distance of the point of view, and [Ctrl]+[mouse wheel] or [Ctrl]+[Shift] the dolly zoom effect as in the main view.

A channel is selected when the mouse is close to the yellow ball representing it. Its number, name and coordinates are then displayed in the Speaker frame at the right of the window. A click in the central window will enable a modification of its coordinates :

- lateral movement :left-to-right axis.
- longitudinal movement : back-to-front axis.
- longitudinal movement + right button : bottom-to-top axis.
- longitudinal movement + [Shift] : bottom-to-top axis

The « **M** » key slightly magnets the movement on the grid mesh.

The **Layout** frame on the right allows you to :

- **edit** the name of the layout
- **change** the number of channels. The direct edition of the numerical field initializes the position of the speakers in the default layout. Pressing the + or – button either adds a speaker in the centre or deletes the speaker without modifying the position of the other speakers.
- **apply** the default layout, depending on the number of channels
- **import** and **export** layouts in XML files. The file format is as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>

<Speakers name="5 Channels">
  <S x="-0.5" y="0.77" z="-0.26" weight="0" name="Left"/>
  <S x="0.43" y="0.77" z="0"     weight="0" name="Right"/>
  <S x="-0.8" y="-0.4" z="0"     weight="0" name="Left Surround"/>
  <S x="-0.6" y="-0.3" z="0.21"  weight="0" name="Right Surround"/>
  <S x="0"    y="0.88" z="0"     weight="0" name="Center"/>
</Speakers>
```

The **name** attribute indicates the name of the layout as it will appear in the list, and the attributes **x**, **y** and **z** are the coordinates of the speakers between -1 and 1. The number of channels is equal to the number of **S** items.

The three keys **S**, **R** and **T** allow the application of global transformations to all the channels :

- **S** : scaling relative to the center of gravity of the channels. Scaling can be limited to one dimension by pressing a key: **W** for width, **H** for height, and **D** for depth.
- **R** : rotation around the center of gravity
- **T** : horizontal et vertical translations with [Shift]

For **R** et **T**,if the [Shift] key is pressed during the mouse click, the rotations and translations will be limited to only one axis.

The **Speaker** frame on the right is used to:

- **select** a speaker by its number
- **edit** its name (Left in the example shown)
- **modify** its position using Cartesian coordinates (X, Y, Z)

Reset All

Resets the layout list to default layouts.
The following "empty" are reset in frontal stereo.

Load All

Load a set of 32 layouts previously saved.

Save All

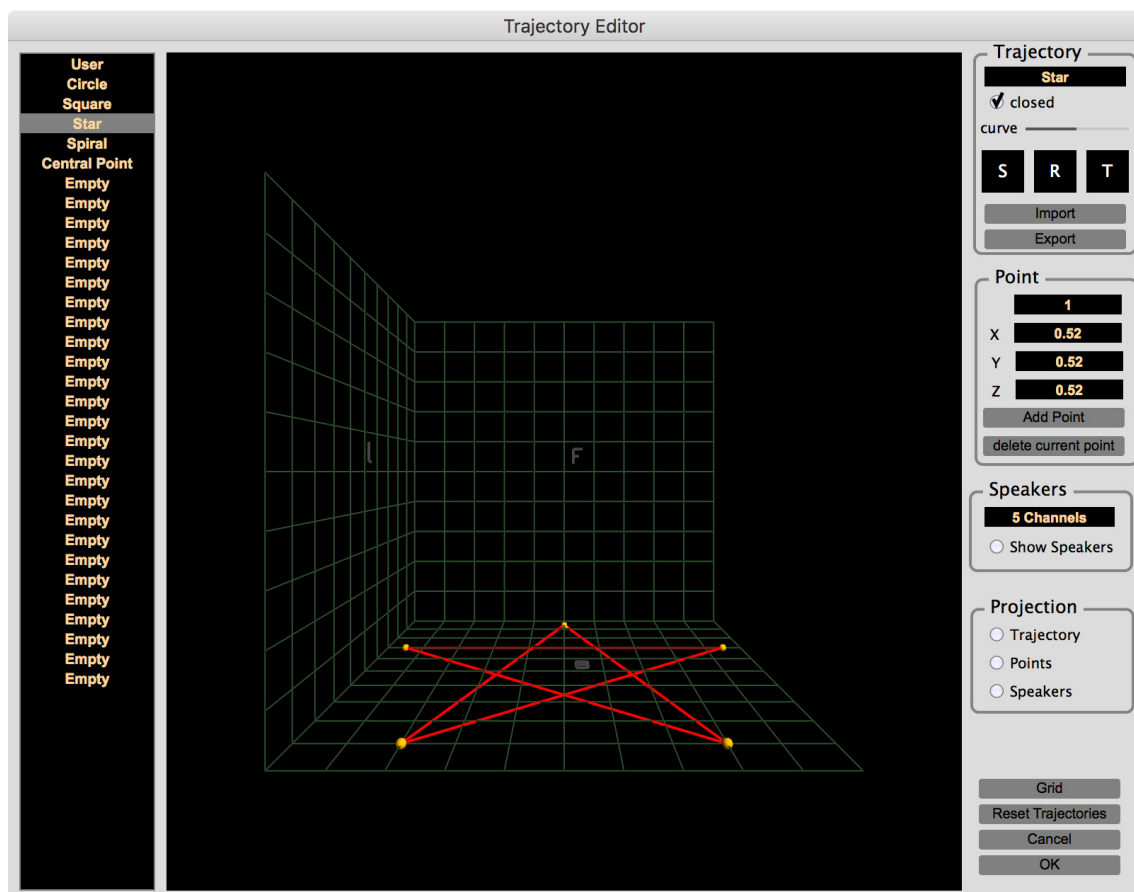Save a set of 32 layouts

Save as Default

Save the set of 32 currents layouts as new default layouts.

The default layouts **defaultLayout.ala** et **defaultUserLayout.ala** are stored in the following folders :

Mac : /Library/Application Support/GRM/SpacesData

PC : \Program Files\Common Files\GRM\SpacesData

Trajectories Editor

The left hand column lists the 32 possible trajectories.

- Click on a name displays the trajectory in the central window and its name in the **Trajectory** frame in the top right hand corner.
- Click+drag is used to move an item in the list
- [Shift]+click+drag copies the start item into the end item.
- The copy/paste is available with a right click opening a contextual menu

The central window displays the selected trajectory.

A right click in this window displays a context menu with the selection of 3 point of views.


The movement of the point of view is done with [Alt]+mouse, and the rotations with [Ctrl]+mouse. [Alt]+[mouse wheel] or [Ctrl]+[Shift] controls the distance of the point of view, and [Ctrl]+[mouse wheel] or [Ctrl]+[Shift] the dolly zoom effect as in the main view.

Trajectories with less than 32 points can be edited.
A point is selected when the mouse is close to the yellow ball representing it. Its number and coordinates will then be displayed in the **Point** frame at the right of the window. A click in the central window will allow to modify it's coordinates :

- lateral movement :left-to-right axis.
- longitudinal movement : back-to-front axis.
- longitudinal movement + right button: bottom-to-top axis.
- longitudinal movement + [Shift] : bottom-to-top axis
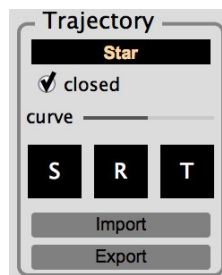
The **Trajectory** frame on the right allows you to :

- **edit** the name of the trajectory
- **define** whether it is open or closed
- **define** the curvature of the interpolation between the points. [Alt] + click resets to linear interpolation.
- **S** : scaling relative to the center of gravity of the trajectory. Scaling can be limited to one dimension by pressing a key: **W** for width, **H** for height, and **D** for depth.
- **R** : rotation around the center of gravity
- **T** : horizontal et vertical translations with [Shift]

  For **R** et **T**,if the [Shift] key is pressed during the mouse click, the rotations and translations will be limited to only one axis.

- **import** and **export** layouts in XML files. The file format is as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>

<Trajectory name="Star" closed="true" order="-0.4">
  <P x="-0.11" y="0.620" z="-0.98"  end="0"/>
  <P x="0.460" y="-0.95" z="-0.30"  end="0"/>
  <P x="-1.02" y="0.120" z="-0.98"  end="0"/>
  <P x="0.779" y="0.120" z="-0.98"  end="0"/>
  <P x="-0.51" y="-0.86" z="0.704"  end="0"/>
</Trajectory>
```

The **name** attribute indicates the name of the layout as it will appear in the list, **closed** indicates whether it's open or closed, **order** is the curvature of the interpolation (0 = linear interpolation). The attributes x, y, and z are the coordinates of the points between -1 and 1. The optional attribute **end** indicates the end of a segment.

The **Point** frame allows you to :

- **modify** the coordinates of the selected point
- **add** a point to the center of the 3D area
- **delete** the selected point if there are more than 2 points in the trajectory

The **Speakers** frame enables the display of a configuration of speakers among the 32 available. It is initialized with the current configuration.

The **Projection** frame allows to project the trajectories, the points of construction of the trajectory if there are less than 32, and the speakers if they're displayed, on the three plans **F**, **B** and **L**.

When resizing the window, press the [Shift] key to keep the aspect ratio of the center window.

Credits

Conception, development
   Emmanuel Favreau

Design interface
   Emmanuel Favreau

Documentation
   Emmanuel Favreau

Translation
   Peter Thomas
   Elvira Nataloni

Tests
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   Emmanuel Richier
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   Gustavo Adolfo Delgado

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