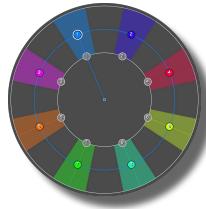
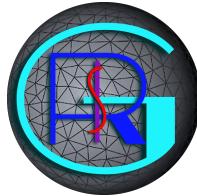


SpatGRIS



ServerGRIS



Sound spatialization tools in 2D and 3D

Developed by the **G.R.I.S.** at Université de Montréal
(Groupe de Recherche en Immersion Spatiale)

Director: Robert NORMANDEAU

Programmers: Olivier BÉLANGER

Vincent BERTHIAUME

Nicolas MASSON

Antoine MISSOUT

Assistants: David LEDOUX, Christophe LENGELE, Vincent MONASTESSE

Manual
Version 1.0
January 15, 2018

I. INTRODUCTION	4
1.1. Groupe de Recherche en Immersion Spatiale (GRIS)	4
1.2. SpatGRIS	4
1.2.1. History	4
1.2.2. Installation Notes	4
MacOS	4
Windows	5
1.2.3. System Requirements MacOS	5
1.2.4. AU or VST	5
1.2.5. System Requirements Windows	5
1.3. ServerGRIS	5
1.3.1. History	5
1.3.2. Installation notes	6
1.3.3. System requirements MacOS only	6
1.3.4. Warning about Jack	6
2. SPATGRIS: 2D AUDIO SPATIALIZATION	7
2.1. General Presentation	7
2.2. Interface	7
2.2.1. 2D Spatializer	8
2.2.2. Source parameters	8
2.2.3. Output parameters	8
2.2.4. Trajectories	9
2.2.5. Configuration panel	9
2.3. Settings	9
2.3.1. Param smoothing	10
2.3.2. Input/Output mode	10
2.3.3. Show grid lines, Process mode, Max span volume (dB)	10
2.4. Volume & Filters	10
2.4.1. Volume	10
2.4.2. Filters	10
2.5. Sources	11
2.6. Speakers	11
2.7. Controllers	12
2.7.1. OSC	12
2.7.2. Leap Motion™	12
2.7.3. Joystick and gaming device	12
2.8. How to use it	12
2.8.1. Loading the plugin on a track	12
2.8.2. Presets saving	13
2.8.3. Recording of the multichannel files	13
3. SPATGRIS: DESCRIPTION OF FUNCTIONS	14
3.1. Spatialization Modes	14
3.1.1. Free volume	14
3.1.2. Pan span	14
3.1.3. OSC Spatialization	15
3.2. Group Movements	15
3.2.1. Types of movements	15
3.3. Trajectories	17
3.3.1. General Settings	18
3.3.2. Speed	18
3.3.3. Specific parameters	18
Spiral	18

Pendulum.....	19
Random/Random Target.....	19
Random Target.....	19
3.3.4. Ready/Cancel.....	19
3.3.5. Trajectory recording in the DAW.....	19
3.3.6. Trajectory types.....	20
3.4. DAW configuration	21
4. SERVERGRIS: 2D AND 3D SPATIALIZATION	22
4.1. 2D or 3D?	22
4.2. Architecture	22
4.3. ServerGRIS zones	23
4.4. Speaker Setup.....	24
4.4.1. Speaker parameters.....	24
4.4.2. Direct outputs	24
4.4.3. Show and select/deselect a speaker.....	24
4.5. Inputs and Outputs	25
4.6. Parameters.....	25
4.6.1. Gain, Interpolation, Mode and Number of Inputs.....	25
4.6.2. Algorithms.....	25
VBAP.....	25
HRTF.....	26
STEREO.....	26
4.6.3. Input Colour.....	26
4.6.4. Mute and Solo	26
4.7. Client	27
4.8. File menu and Preferences	27
4.9. View menu.....	28
4.10. Naming and Saving.....	29
4.11. How to connect the Server and the DAW	29
4.11.1. Assign Core Audio to your interface	29
4.11.2. Open the Server.....	29
4.11.3. Adjust the output level	29
4.11.4. Assign your DAW to Jack.....	30
4.11.5. Audio On/Off.....	30
4.11.6. Multi-client.....	30
4.12. Recording.....	31
4.13. Representations	31
4.13.1. 3D Representation.....	31
4.13.2. 2D Representation.....	32
4.14. Performances	32
5. KNOWN ISSUES AND WARNINGS.....	33
5.1. Reaper: Device Preferences	33
5.2. Logic Pro X: Lack of Surround outputs	33
5.3. Digital Performer: Enable/Disable	33

I. INTRODUCTION

These instructions assume that you are familiar with these manuals (not included):

- Jack OSX
- Any DAW that can use AU or VST plugins.
- Your audio interface.

MacOS and software tested:

- MacOS Sierra™ (10.12.6)
- JackRouter 0.97
- Digital Performer™ 9
- Ableton Live™ 9
- Logic Pro X™
- Reaper™ 5

I.1. Groupe de Recherche en Immersion Spatiale (GRIS)

Director: Robert Normandeau

Main programmer: Olivier Bélanger

Former programmers: Vincent Berthiaume, Nicolas Masson, Antoine Missout

Assistants: David Ledoux, Christophe Lengelé, Vincent Monastesse

Logos: Simone D'Ambrosio (*SpatGRIS*), The team (*ServerGRIS*)

The GRIS received research grants from Hexagram, CRSH and FRQSC.

Thanks to Simone d'Ambrosio and Raphaël Néron-Baribeau who contributed to the writing of this manual.

I.2. SpatGRIS

SpatGRIS is a multichannel sound spatialization plugin available in Audio Unit (Mac) and VST formats (Mac and Windows). The free and open-source plugin allows movement of multichannel sound sources on a variable set of speakers. Modes of grouped movement and a trajectory system are provided for spatialization of mono, stereo and multichannel sources. The spatialization is made directly into the DAW with no need for external software.

I.2.1. History

The *SpatGRIS* started to be developed in 2016. It is a fusion of two previous plugins, *Octogris* (2010) and *ZirkOSC* (2012). The first version was released in May 2017.

I.2.2. Installation Notes

MacOS

- Download the latest version of *SpatGRIS* from SourceForge:
<https://sourceforge.net/projects/spatgris/>
- Decompress the downloaded file. A Mac or a Windows folder will be created containing the different versions of the plugin.
- To install the Audio Unit version, copy the files contained in the Components folder at the following location on your computer: ~/Library/Audio/Plug-Ins/Components
- To install the VST version, copy the files contained in the VST folder at the following location on your computer: ~/Library/Audio/Plug-Ins/VST

N.B.: SpatGRIS appears under the “UdeM” folder of your host application.

Windows

Chose the 64 bits (x64) or the 32 bits (x86) version to be placed in the VST folder of your system.

1.2.3. System Requirements MacOS

MacOS 10.10 and plus. Host software that supports Audio Unit and/or VST plugins, 64 bits.

Host software	SpatGRIS Compatibility	Number of outputs per track
Digital Performer 8/9	AU	8 (7.1)
Logic Pro X	AU	8 (7.1)
Reaper 5	VST	16
Ableton Live 9	AU*	2
Cubase / Nuendo	VST **	5.1/8
Pro Tools 10 +	AAX ***	2

* Ableton Live is a stereo DAW. But it is now possible to create multichannel outputs by using the ServerGRIS. See instructions below in the section 4. ServerGRIS: 2D and 3D spatialization.

** Not tested

*** ProTools HD is capable of multichannel outputs while the native version is stereo only. Both need the AAX version, which is not available yet.

1.2.4. AU or VST

SpatGRIS has been extensively tested on MacOS Sierra (10.12) and works apparently fine under Yosemite (10.10) and up. Here are some particularities:

- Use the AU version in DP. VST version does not work (like all VST multichannel plugins);
- The surround setup in Logic should be 7.1 (SDDS);
- Use the VST version in Reaper.

1.2.5. System Requirements Windows

The version 1.0 also exists in VST under Windows 10 format but it hasn't been intensively tested. It may be compatible with earlier version of Windows. Comments are welcome.

1.3. ServerGRIS

The ServerGRIS is an external multichannel sound spatializer for different configurations of speakers in 2D (plane mode: X and Y axis) or 3D (vertical mode: X, Y and Z axis). It is based on the *JackRouter* HAL plugin which is installed at the same time as the Server. The Server may include up to 128 inputs and outputs (see Section 4.14. Performances for more details about that). The movements are sent from the SpatGRIS in OSC mode to the Server. The audio spatialization itself is made by the ServerGRIS and sent to the audio interface.

The main difference between the SpatGRIS in audio mode and the ServerGRIS is that the former is limited by the DAW's maximum number of outputs per track, which usually varies from 2 to 8. This means that the user is limited to octophonic spatialization (hence the first name of the plugin: OctoGRIS). And SpatGRIS doesn't take into account the vertical dimension of the spatialization. On the other hand, the ServerGRIS has a practical limitation of up to 128 outputs (but theoretically to 256). And it is a 3D software.

1.3.1. History

The ServerGRIS started to be developed in 2017 as an alternative to the Zirkonium designed at the

ZKM in Germany. A beta version was produced in June and the first version was released at the beginning of 2018.

1.3.2. Installation notes

N.B.: We strongly recommend that you remove Jack if it was installed before, by using the Uninstall JackOSX command in the Jack folder and then restart your computer.

- Download the latest version of ServerGRIS from SourceForge:

<https://sourceforge.net/projects/servergris/>

- Decompress the downloaded file.

- The ServerGRIS has an installer that puts all the necessary components at the right place. That includes the Server itself and the Jack folder in the Applications folder and all the needed libraries at their precise locations.

N.B.: After the first installation, we recommend to restarted the computer. This procedure will make sure that all the preferences are set properly.

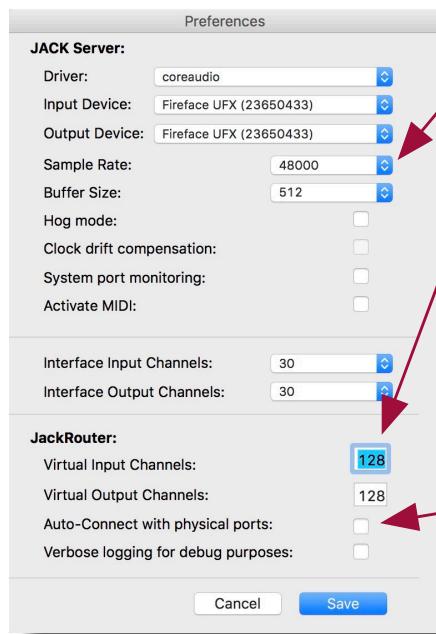
1.3.3. System requirements MacOS only

ServerGRIS is a Mac only software. It has been extensively tested on MacOS Sierra (10.12) and works apparently fine under Yosemite (10.10) and up.

1.3.4. Warning about Jack

Some of the Jack's Preferences are not accessible in the ServerGRIS but they are set to proper values by default by the Server installer.

If for some reason, you need to access the Jack Preferences, then you'll have to open *JackPilot* (in the Jack folder) and its Preferences and adjust them like this:



Sample Rate and Buffer Size

These settings are available directly in the Server. The values by default are 48KHz and 1024.

Number of virtual inputs and outputs

This is the number that Jack will reserve for every software connected to it. So, you have to set up these numbers according to your project. Essentially the question you have to answer is: how many audio channels you need to make your project working. Or how many channels are going out of your sequencer and how many speakers do you have in your system. The value by default is 128 (Outputs not used don't take any CPU).

Auto-Connect with physical ports

Uncheck this option. If it is checked, the DAW will connect directly to the interface on top of the Server. The value by default is unchecked.

2. SpatGRIS: 2D audio spatialization

SpatGRIS is a spatialization plugin that has two audio modes:

- Free volume
- Pan span

It also offers an OSC Spatialization mode that will be described in the section 4. ServerGRIS: 2D and 3D spatialization.

2.1. General Presentation

SpatGRIS is a multichannel sound spatialization plugin (up to 8 channels / 16 speakers) in a two-dimensional plane. The plugin allows movements of multichannel sound sources on a variable set of speakers. Various grouped modes of movement and a trajectory system are provided to allow the spatialization of mono, stereo, quad, 5.1 and multichannel sources.

This document describes the operating instructions and functions specific to the SpatGRIS. This new plugin is a fusion of former plugins Octogris and ZirkOSC but its parameters are not compatible with them.

It is assumed that the user has sufficient knowledge of the host software used to perform certain basic functions in order to configure it.

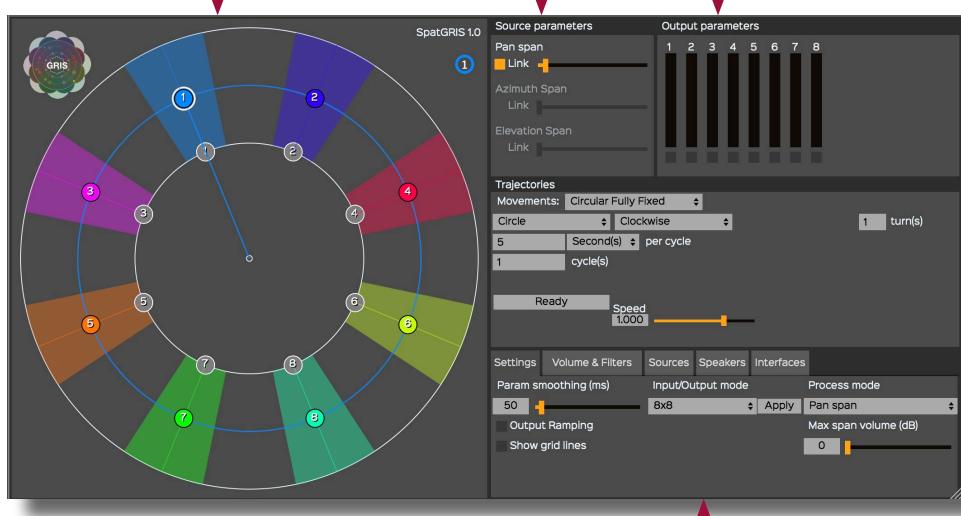
2.2. Interface

Both the VST and Audio Unit versions of SpatGRIS have a graphical interface consisting of five panels:

The 2D Spatializer is a graphical interface that allows the placement of speakers (in grey) as well as the positioning and movement of multichannel sound sources (in colours)

Source parameters: control panel of the emission area of the sources (Free Volume mode) or the Spans (in Pan Span mode)

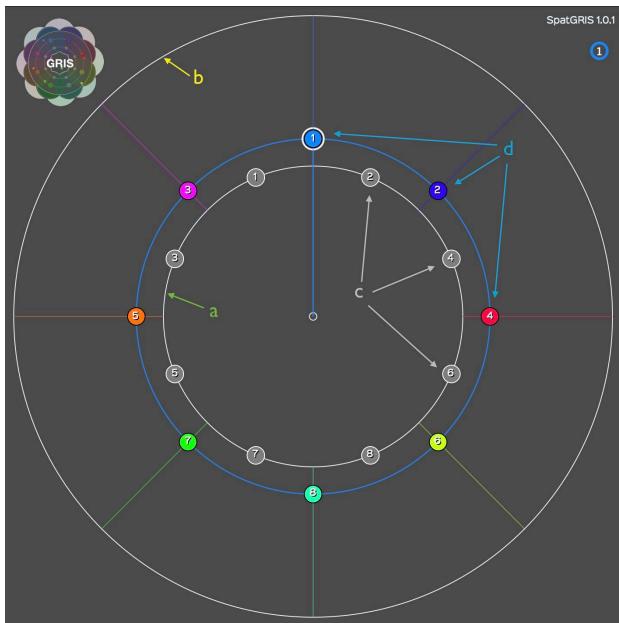
Output parameters: VU Meters of the outputs (disabled during automation recording)



Configuration panel of the plugin, subdivided in tabs: Settings, Volume & Filters, Sources, Speakers, Interfaces

Trajectories:
automated
trajectory
parameters

2.2.1. 2D Spatializer



When the alt-option key is pressed, the displaced source keeps a fixed radius, allowing the adjustment of the angle. When the Shift key is pressed, the displaced source keeps a fixed angle, allowing the adjustment of its radius.

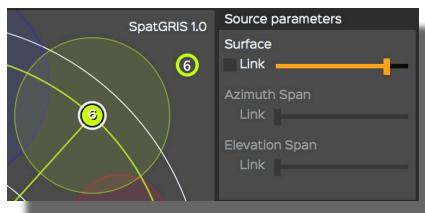
The 2D Spatializer is a two-dimensional representation of the sound sources distributed on a speaker system. Two concentric circles represent:

- the equidistant position of speakers (in *Pan Span* mode)
- and the far limit of the spatialization system.
- Gray dots represent each speaker. They are numbered according to the plugin outputs. These speakers can be either moved freely in the two-dimensional plane or along the equidistant circle of speakers based on the spatialization mode chosen.
- Coloured dots represent the sound sources. They are numbered according to the plugin inputs (audio channels). Sources can be moved freely in the plane with the mouse or with an external controller. Their movement can be achieved individually or in groups.

2.2.2. Source parameters

When *SpatGRIS* is used with the *Free Volume* spatialization mode, each source has an emission area surrounding it. The level of the signal sent to the speakers is then proportional to their distance to the centre of the source.

Within the Surface panel, it is possible to adjust the emission region for each of the sound sources.



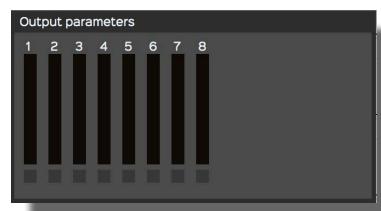
The *Surface* setting controls the diameter of the emission area represented by a translucent circle around the source. It allows a source to simultaneously reach multiple speakers. Also, clicking the control while having the alt/option key pressed resets its value.

When activated, the *Link* button pairs the control of the surface for all sources.

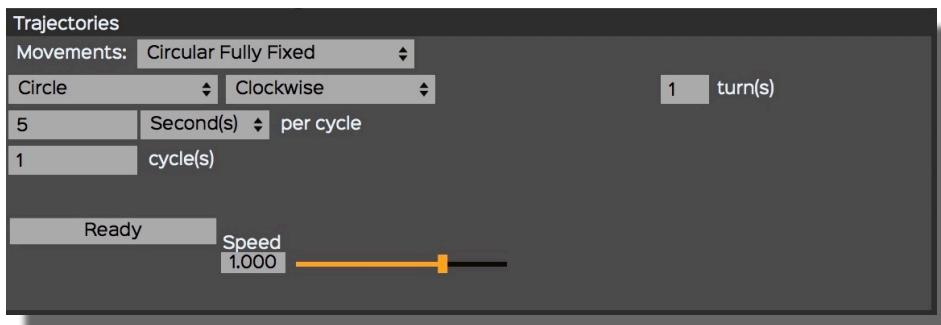
N.B.: In the *Pan Span* mode, the *Elevation Span* and *Azimuth Span* parameters are used instead of the *Surface* parameter.

2.2.3. Output parameters

These are the outputs VU Meters. They are disabled in automation recording mode to save CPU. Their numbers depend on the number of outputs of the track.

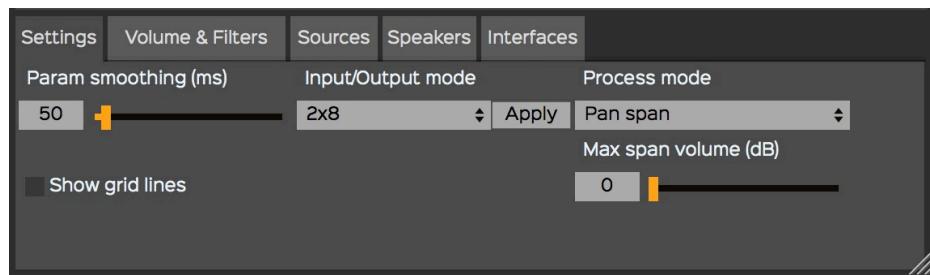


2.2.4. Trajectories



It is possible to automate the movement of the sources using predefined trajectories. Under the *Trajectories* control panel, you can set and adjust these movements to the musical context. See the chapter 3.6. *Trajectories* for detailed operations.

2.2.5. Configuration panel

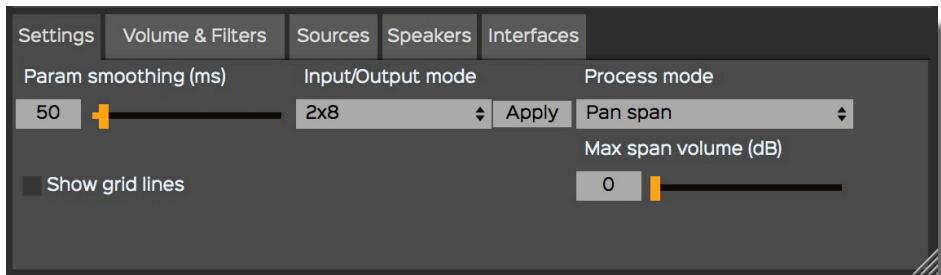


Configuration panel gives access to a set of the plugin parameters. These settings are grouped under tabs with explicit names:

- *Settings*
- *Volume & Filters*
- *Sources*
- *Speakers*
- *Interfaces*

N.B. The size of the interface can be adjusted from the handle at the bottom right corner.

2.3. Settings



SpatGRIS enables the spatialization of a variable-format source signal on a variable speaker system. The format of the plugin has to be adjusted when it is loaded on a track based on two parameters: the format of the track and the outputs assigned to this track. Due to the particularities of the host software, please refer to its manual. Here we have an example of a 2 inputs/8 outputs setting (a

stereo file to an octophonic speaker setup).

2.3.1. Param smoothing

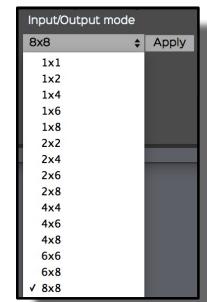
The movement of the sources is smoothed according to *Param smoothing (ms)* under the *Settings* tab. This function adjusts the duration of the fade when a source approaches or moves away from a speaker. The duration of this fade can be set between 1 ms and 1000 ms. This fade allows for a more or less fluid movement, damping instantaneous changes in the position of the sources. In most cases, the default value of 50 ms is suitable.

2.3.2. Input/Output mode

The configuration of *SpatGRIS* has to be adapted according to the number of input signals (sources) and output signals (speakers). Available formats depend on the host:

1X2, 1X4, 1X6, 1X8, 1X12, 1X16, 2X2, 2X4, 2X6, 2X8, 2X12, 2X16, 4X4, 4X6, 4X8, 4X12, 4X16, 6X6, 6X8, 6X12, 6X16, 8X8, 8X12, 8X16.

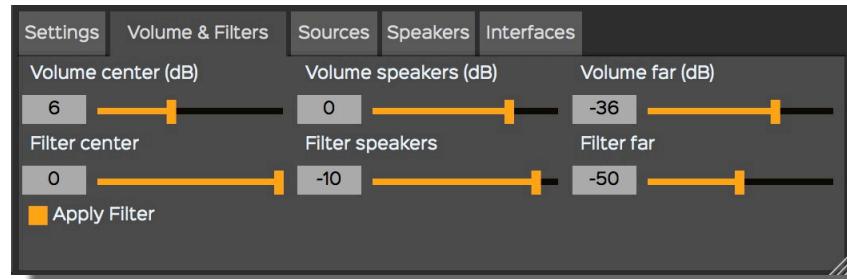
Select then press *Apply*.



2.3.3. Show grid lines, Process mode, Max span volume (dB)

- *Show grid lines*: shows a grid on the 2D spatializer.
- *Process mode* (see 3.1. *Spatialization modes*).
- *Max span volume (dB)* (see 3.1.2. *Pan span*).

2.4. Volume & Filters



In *Pan Span* mode, *SpatGRIS* distributes sources to a set of speakers in order to simulate their exact location in the 2D Spatializer. These settings allow volume attenuation and filter of the sources according to their position in the spatial plane. Sources share volume and filter values at three locations in the 2D spatializer: the centre, the circle of speakers and the far distance circle. The result of such an attenuation and filtering system is more convincing movements and trajectories in 2D space.

2.4.1. Volume

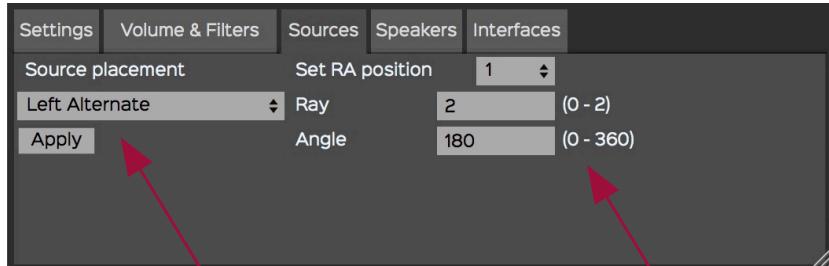
It is possible to adjust the attenuation of a source based on its position in the 2D spatial plane using the three sliders in the *Volume* section. Thus, a source located exactly on a predefined location will have a volume attenuated according to the control value (in dB). Also, *SpatGRIS* modulates these values according to a panning law when a source is located between two speakers.

2.4.2. Filters

The three sliders of the *Filter* section set the filtering of a source depending on its position in the 2D

spatial plane. The filter applied to the source is a low-pass filter. The control value is arbitrary between 0 and -100, 0 being a completely open low-pass filter and -100 being a completely closed low-pass filter. Also, the *Apply Filter* button enables or disables the filtering in order to save CPU if necessary.

2.5. Sources

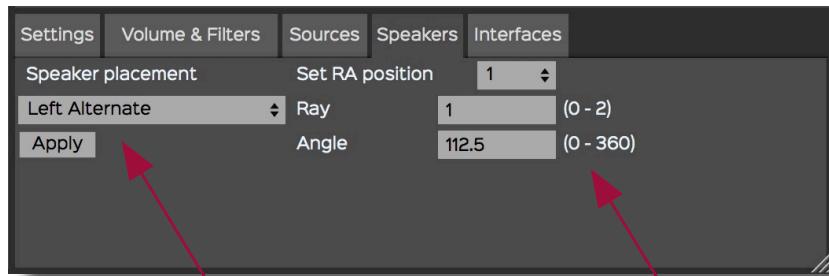


Under the Sources tab of the Control Panel, it is possible to accurately position sources on the 2D spatializer. Using *Source placement*, it is possible to equidistantly position sources following a clockwise or alternate order. To do so, simply select the desired layout from the drop-down menu and press *Apply*.

Moreover, it is possible to manually adjust the position of the sources by entering their polar coordinates. From the *Set RA position* drop-down menu, first select the number of the source to be moved. Then, enter the new coordinates of the source. The *Ray* and *Angle* correspond to current polar coordinates of the selected source.

N.B.: The speaker circle is set to a radius of 1 and the far distance circle is set to a radius of 2. The 0° position is set at right.

2.6. Speakers



Under the *Speakers* tab of the Control Panel, it is possible to accurately position the speakers on the 2D spatializer. Using *Speaker placement*, it is possible to equidistantly position speakers following a clockwise or alternate order. To do so, simply select the desired layout from the drop-down menu and press *Apply*.

Moreover, it is possible to manually adjust the position of the speakers by entering their polar coordinates. From the *Set RA position* drop-down menu, first select the number of the speaker to be moved, then enter its new coordinates. The *Ray* and *Angle* correspond to current polar coordinates of the selected source.

N.B.: The speaker position is constrained to the circle of speakers (*Ray* of 1) in *Pan Span* mode while it is completely free in *Free Volume* mode.

2.7. Controllers

2.7.1. OSC

It is possible to control *SpatGRIS* via an external Open Sound Control¹ (OSC) controller. A TouchOSC™ interface is under development and the first version is already available. Under the “Interfaces” tab, you can configure the connection between the OSC controller and the plugin. *SpatGRIS* responds to OSC messages in the manner below:

A source is selected by sending the following message :

/Octo/SourceN 0.3

where N is the source number and the value (0.3) < 0.5 confirms the selection.

The following message changes the position of the selected source:

/Octo/SourceXY 0.3 -0.5

where the two values are the Cartesian coordinates of the new position.

N.B.: OSC communication ports must have values greater than 1023.

2.7.2. Leap Motion™

It is possible to control *SpatGRIS* with a *Leap Motion*™ controller. For the moment, this control is limited to a single source at a time. Also note that the *Leap Motion* controller must be connected and set up prior to launching the host application.

2.7.3. Joystick and gaming device

It is possible to control *SpatGRIS* with a joystick or any USB gaming device.

2.8. How to use it

SpatGRIS is a plugin that must be inserted on any audio, auxiliary or master tracks that require spatialization. Source spatialization can be performed directly with the GUI plugin or with an external controller (see 2.7. *Interfaces*). A trajectory system is implemented in *SpatGRIS* in order to quickly and efficiently write predefined movements.

The recording and playback of the source's movements are achieved through the automation function of the host software. Therefore, it is essential to understand the various automation modes used in your preferred host.

2.8.1. Loading the plugin on a track

SpatGRIS is loaded similarly to any other AU or VST plugin. Before loading the plugin, make sure that the audio track has previously been configured to support the desired spatialization format. Please note that this process is largely dependent on the host software.

Normally, *SpatGRIS* is loaded at the end of the insert chain. Since the majority of plugins are limited to mono and stereo formats, it is more logical to first process the signal with these plugins before spatializing the sound using *SpatGRIS*.

¹ <http://opensoundcontrol.org/introduction-osc>

2.8.2. Presets saving

It is possible to save all of the *SpatGRIS* plugin parameters with the standardized AU and VST preset function of your host software. By creating such presets, you can save and recall all the parameters, including:

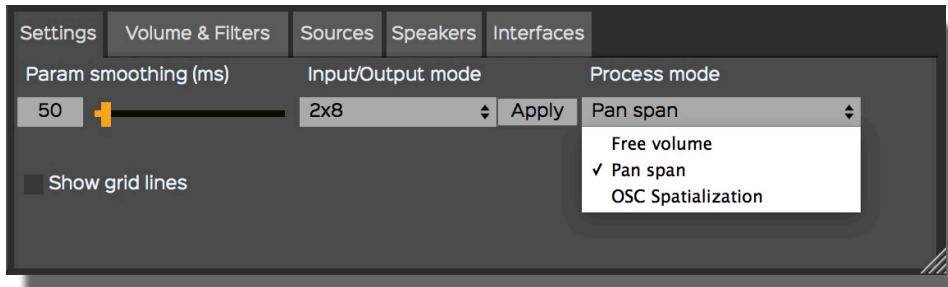
- The speaker positions. A system that has a peculiar positioning of the speakers can be quickly recalled at the initialization of *SpatGRIS*;
- The positions of the sources;
- The volume and filter configurations linked to the “Pan span” mode;
- The Trajectories settings.

2.8.3. Recording of the multichannel files

We strongly recommend writing the multiphonic files on audio tracks in **real time** by sending the signal to buses rather than using the “Freeze” or “Bounce” functions in the sequencers.

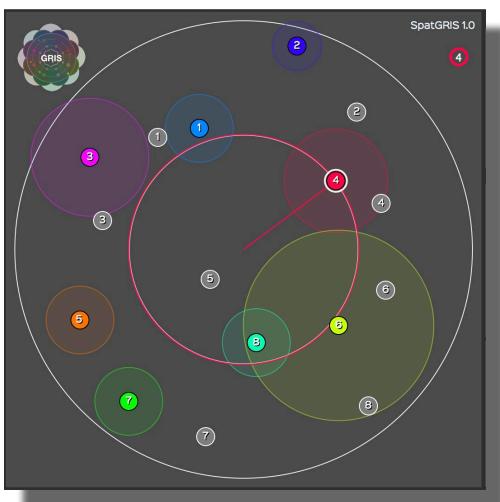
3. SpatGRIS: Description of functions

3.1. Spatialization Modes



3.1.1. Free volume

Free volume is a mode of spatialization inherited from the first version of Octogris. In this mode, a source has an emission area that can reach one or more speakers. A translucent circle around the source represents this emission area. Its size is set with the Surface settings. The level of the signal sent to the speakers is proportional to their distance from the centre of the source.



In this mode, it is possible to freely position the speakers on the entire 2D Spatializer. There is no pan law applied here, which means that if a source doesn't touch any speaker (like with sources no. 2, 5, 7 and 8 here), this source will not be heard. At the opposite, if there are many sources on one speaker, the sound could be very loud.

In this mode, it is possible to freely position the speakers on the entire 2D Spatializer. There is no pan law applied here, which means that if a source doesn't touch any speaker (like with sources no. 2, 5, 7 and 8 here), this source will not be heard. At the opposite, if there are many sources on one speaker, the sound could be very loud.

3.1.2. Pan span

In *Pan span*, each source is distributed over the speaker system through a pan law algorithm. *SpatGRIS* calculates the amount of signal sent to these speakers in order to simulate the exact location of the source. Thus, it is possible to simulate any position in the 2D Spatializer.



In this mode, *SpatGRIS* takes into account the concept of distance from the centre. The volume of a source changes depending on its distance from the centre of the interface. Also, a low-pass filter can affect the source depending on its distance from the centre. These distance parameters are adjustable in the *Volume & Filters* tab of the configuration panel.

This mode is inherited from another plugin developed by GRIS, the ZirkOSC. The *span* is an extended concept of the panning. In this mode, a source has an emission area

that can expand at will. With the span, a source can cover the entire surface of the 2D Spatializer or be reduced to a monaural source. This emission area is represented by a coloured distribution zone surrounding the source. Its width is set via the *Surface/Span* panel. The signal sent to the speakers touched by a source is proportional to the surface of the span.

The overall volume is set with the *Max span volume* parameter, ranging from 0 dB to +20 dB. Depending on the sounds used and the speaker environment, a value of +10 dB seems to correspond to an equal volume perception. The default value is 0 dB.

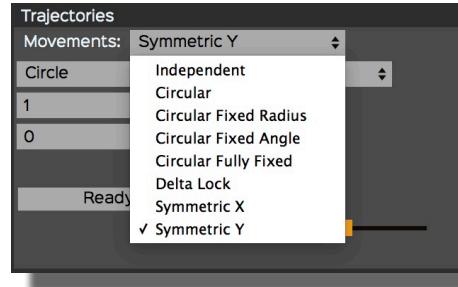
N.B.: In this mode, speakers remain exclusively positioned on the circle of speakers.

3.1.3. OSC Spatialization

This mode is covered in the section 4. ServerGRIS: 2D and 3D spatialization.

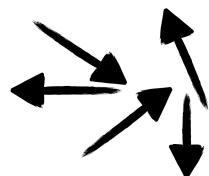
3.2. Group Movements

Under the *Movements* drop-down menu, in the *Trajectories* section, it is possible to choose different ways of linking all sources together.

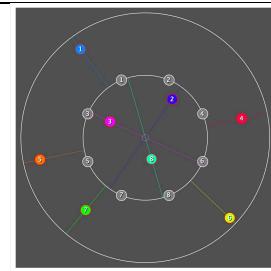


3.2.1. Types of movements

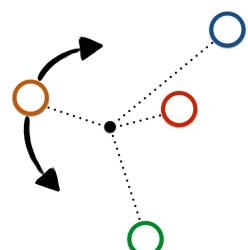
1) Independent STEREO + MULTIPHONIC



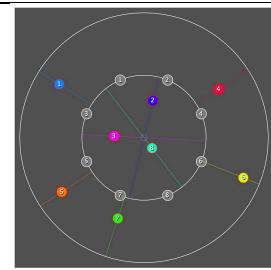
This mode is selected by default. The sources can be moved independently from each other.

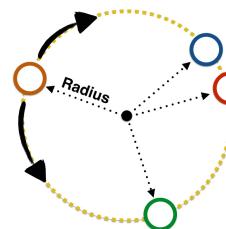


2) Circular STEREO + MULTIPHONIC

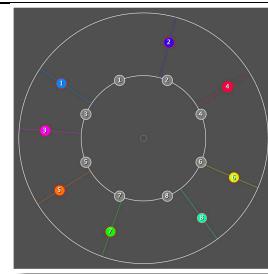
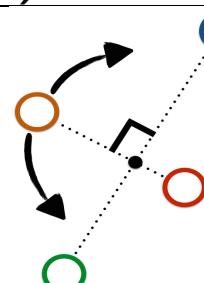


This mode enables the circular grouped movement. The angles between the sources remain constant while the radius adjusts proportionally.



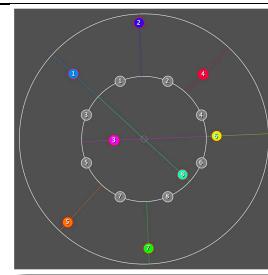
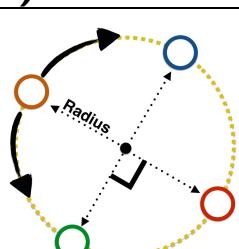
3) Circular Fixed Radius STEREO + MULTIPHONIC

The sources are linked in a circular motion by the RADIUS parameter, which remains fixed and equal. The relative distance between each source and the centre is the same for all sources.

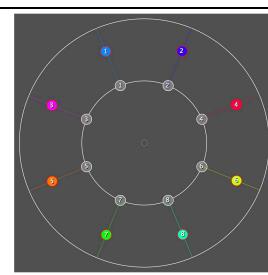
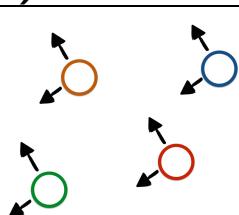
**4) Circular Fixed Angle STEREO + MULTIPHONIC**

The sources are linked in a circular motion with the ANGLE parameter, which remains fixed and equal.

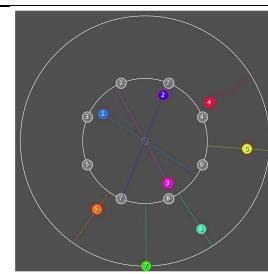
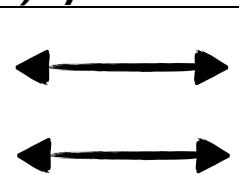
For example, in the 8x8 option (eight sources), the opening angle between each of the sources will be fixed to 45°.

**5) Circular Fully Fixed STEREO + MULTIPHONIC**

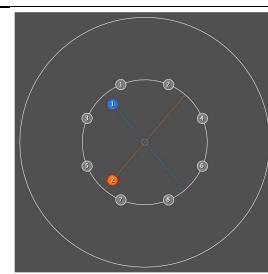
The sources are linked in a circular motion by both the RADIUS and ANGLE parameters, which remain fixed and equal. The opening between the sources and their radius thereof is always identical.

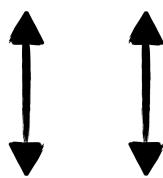
**6) Delta Lock STEREO + MULTIPHONIC**

This mode locks the position of the sources in relation to others along the X and Y axes, without the possibility of rotation.

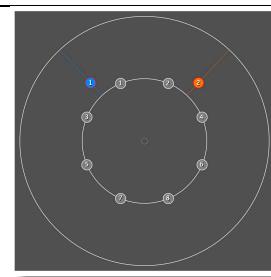
**7) Symmetric X STEREO**

This mode enables the symmetry between two sources following the X axis.



8) Symmetric Y STEREO

This mode enables the symmetry between two sources following the Y axis.



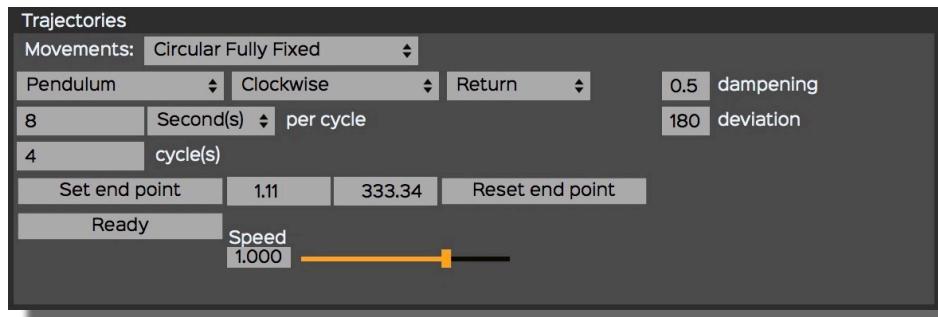
N.B.: A reminder of the concepts mentioned above:

- RADIUS (or Ray): Source's distance from the centre;
- ANGLE (or A) Separation between the sources.

The following shortcuts are available:

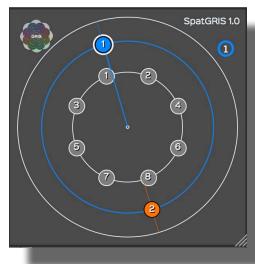
- Alt/option: fixed radius and adjustable angle;
- Cap: adjustable radius and fixed angle.

3.3. Trajectories

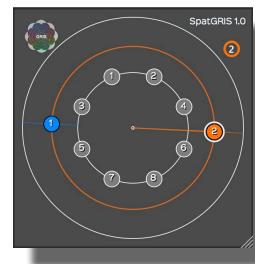


It is possible to automate the movement of the sources using predefined trajectories. Under the *Trajectories* control panel, you can set and adjust these movements to the musical context. The concept behind the movements is that there is a source master while the others are slaves. When you select a source, two visual indicators show you which source is the master:

- The source number is circled in white and there is a line from the centre to the source;
- The source number appears in a circle at the top right of the 2D spatializer with the same colour:



Master source is No. 1

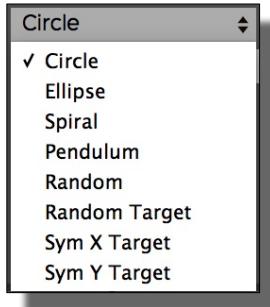


Master source is No. 2

3.3.1. General Settings

To automate the movement of a source is quite simple. You have to choose:

- The type that will be applied to one (or all) source(s), depending on the Movements chosen: *Circle*, *Ellipse*, *Spiral*, *Pendulum*, *Random*, *Random Target*, *Sym X Target*, *Sym Y Target*:



- The direction of rotation: *Clockwise/Counter Clockwise*;
- The shape of the trajectory: *turn(s)*: a value of 1 makes a complete trajectory, here a circle, for example. A setting of 0,5 corresponds to a half-circle, 0,25 to a quarter circle, etc.;
- The duration of the trajectory in *second(s)* or *beat(s)* (linked to the MIDI tempo of the host sequencer);
- The number of cycles (or repetitions) of the trajectory;

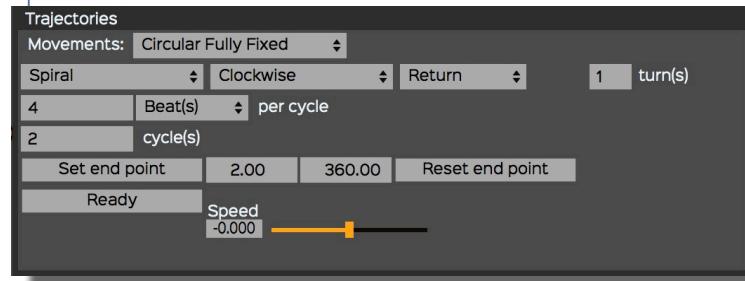
3.3.2. Speed

Speed is a multiplication factor, positive or negative of the resulting speed of a trajectory. The speed of a trajectory is the result of the multiplication of the number of seconds (or beats) per cycle by the number of cycles (for instance: a cycle of 4 seconds repeated 3 times equal a duration of 12 seconds). Speed multiplies this result by a factor of $\pm 2,5$. From 0 to -2,5, it will generate a counterclockwise acceleration and from 0 to 2,5, a clockwise acceleration. Results could be surprising. Experience with it. Speed is not automatable, but the affected parameters are.

3.3.3. Specific parameters

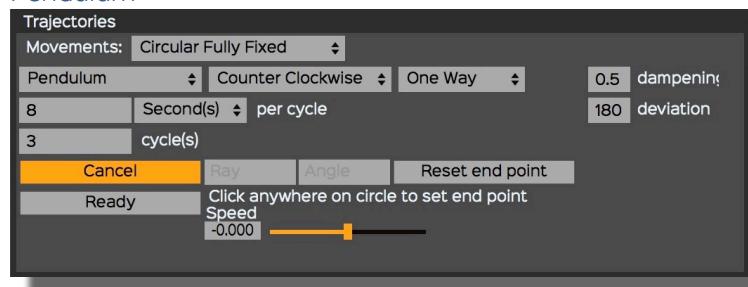
Specific parameters will show up according to different trajectories.

Spiral



- One Way/Return. One way: at the end of the trajectory, the cycle switches back at the beginning. Return: at the end, it goes back at the beginning in reverse motion.
- The Set end point/Reset end point. The default value for the end point is the opposite of the starting point. But any end point can be chosen by selecting Set end point and by clicking in the spatializer. The new coordinates will appear in the boxes. It is possible to Reset the end point or to start again.

Pendulum



- **Dampening.** The movement of the pendulum is damped over time, like in reality. The maximum amount of dampening is 1 where the pendulum will be completely damped at the end of the trajectory. A value of 0.5 corresponds to a value of half.
- **Deviation.** The pendulum deviates from its initial trajectory by an angle specified here. The maximum amount of deviation is 360°. A value of 180 will deviate the trajectory by 180°.

Random/Random Target



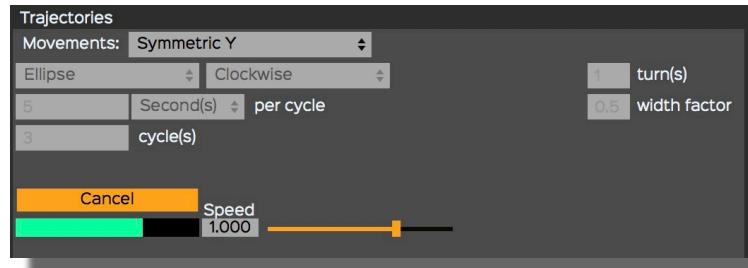
- Force separate automation. Even in a grouped mode, it allows independent trajectories for each source.

Random Target



- Trajectory can be *Continuous/Discontinuous*

3.3.4. Ready/Cancel



Pressing the *Ready* button arms *SpatGRIS*, that waits for the start of the sequencer. When the sequence is initiated, the plugin will start the trajectory according to the specified settings. The movement produced can be recorded — essentially X and Y coordinates of the Master source — like any other automation. In the course of a trajectory, the *Ready* button turns into a *Cancel* button which can stop the trajectory before its finalization. The green line indicates the progression of the trajectory.

3.3.5. Trajectory recording in the DAW

As explained previously, *SpatGRIS* waits for the host sequencer to start before starting a trajectory.

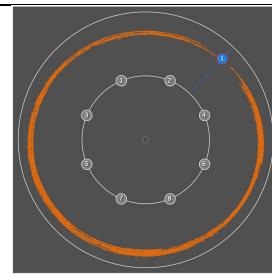
A progress bar is displayed by the plugin to inform on the progress of the trajectory. The audio tracks that contain *SpatGRIS* as an insert can be set in a write mode (Touch, Latch, or Write) in order to record those movements of the sources as automations. These automations are then available for playback or editing. It is always preferable to record the trajectories, because it frees up the CPU of the DAW.

N.B.: In grouped modes, only the source No. 1 should be recorded, the other sources being slaves. If different sources are recorded, then the plugin doesn't know who is the master and who are the slaves and therefore, very strange behaviours could occur.

3.3.6. Trajectory types

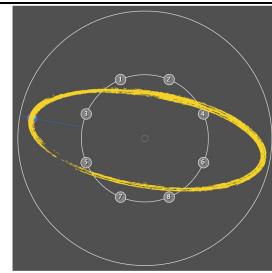
1) Circle

Circular motion around the centre of 2D Spatializer.
Options : CW/CCW.



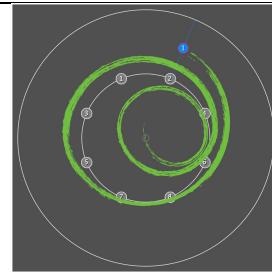
2) Ellipse

Elliptical motion around the centre of 2D Spatializer.
Options : CW/CCW; Width factor.



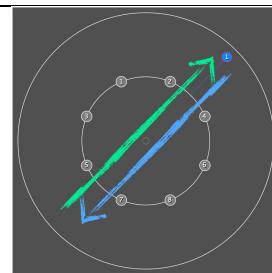
3) Spiral

Concentric motion around the centre of 2D Spatializer.
Options : Set end point; One Way/Return; CW/CCW.



4) Pendulum

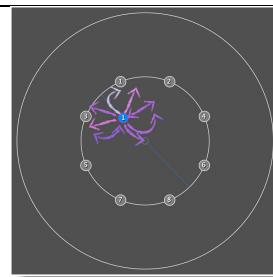
Back-and-forth motion passing through the centre of the 2D Spatializer.
Options : Set end point; One Way/Return; CW/CCW; Dampening; Deviation.



5) Random

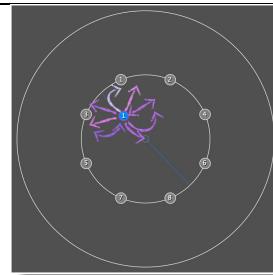
Random motion in the 2D plane.

Options : Slow/Mid/Fast: slow to fast jitter around original position; Force separate automation.

**6) Random Target**

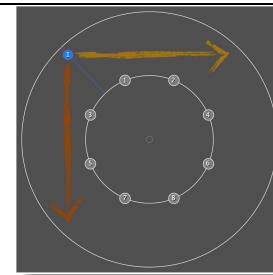
Chooses a random destination at every cycle.

Options: Continuous/Discontinuous.

**7) Sym X Target, Sym Y Target**

Straight line motion in accordance to the X or Y axes.

No Options



3.4. DAW configuration

For the *SpatGRIS* to work properly, it is important to correctly configure the host software in which it is used. The majority of the sequencers use standard cinema surround formats, which correspond to a specific configuration of audio channels and speaker layout. It is rarely necessary to reconfigure the routing outputs to match the virtual outputs of *SpatGRIS* and physical outputs on your audio interface. There are too many DAWs to describe the specificity of them all. Please consult the sequencers' manuals.

N.B.: We strongly recommend recording the multiphonic files on audio tracks in real time with sending the signal to buses rather than using the "Freeze" or "Bounce" functions in the sequencers.

4. ServerGRIS: 2D and 3D spatialization

SpatGRIS has a mode called *OSC Spatialization*. In this mode, the audio is not spatialized within SpatGRIS but externally with the ServerGRIS. SpatGRIS sends Open Sound Control (OSC) data to the Server to place the sounds in a set of speakers. The sound itself is sent from the DAW to the Server via JackRouter.

4.1. 2D or 3D?

ServerGRIS is capable of 2D and 3D spatialization. It could be useful to use the Server in 2D with DAWs that are stereo only like Ableton Live. You can turn these stereo DAWs into multichannel software even if it is only with an octophonic setup. But of course, the real power of the Server is in its 3D capabilities.

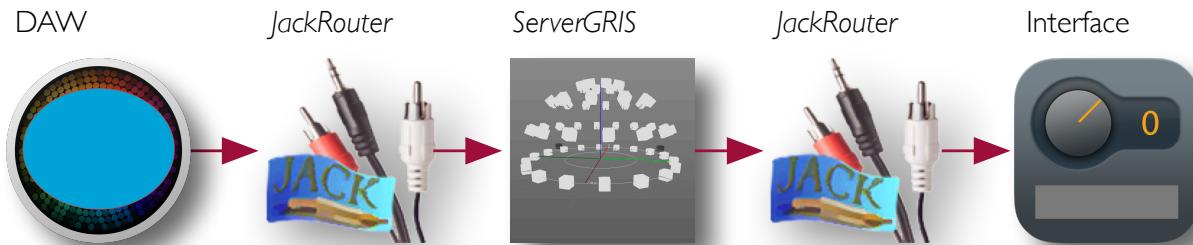
4.2. Architecture

The ServerGRIS setup is made of three elements:

- The ServerGRIS itself that is used to spatialize the sound
- The *Edit Speakers* page that is used to design the speakers' setup
- The SpatGRIS, to design and record the trajectories.

The whole architecture includes these elements (Audio and OSC are working in parallel):

Audio:



OSC:

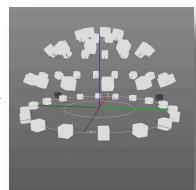
USB/OSC
Controller



SpatGRIS



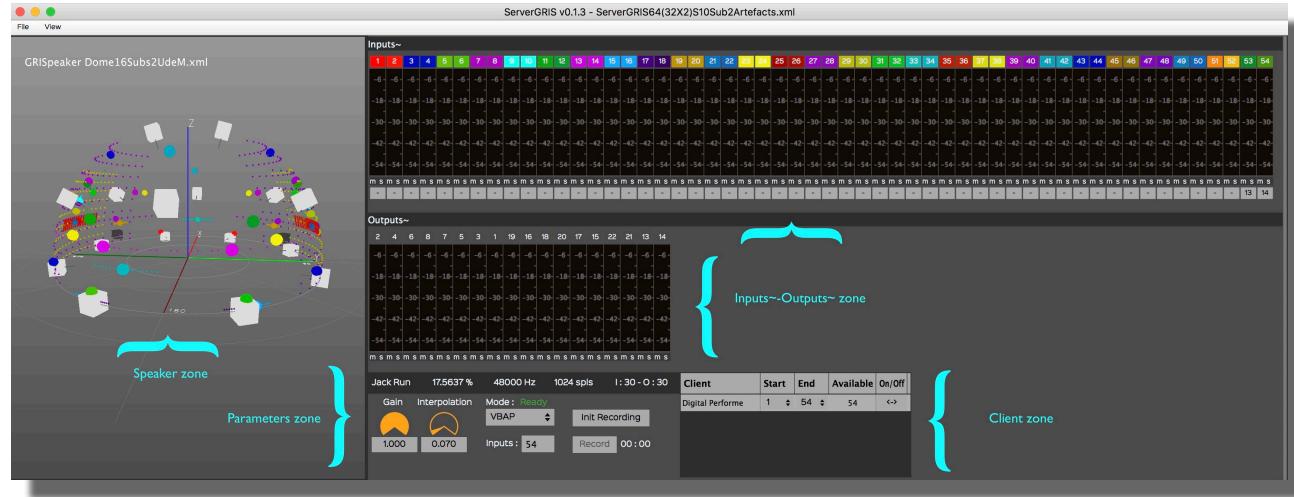
ServerGRIS



4.3. ServerGRIS zones

The ServerGRIS window is divided into 4 zones:

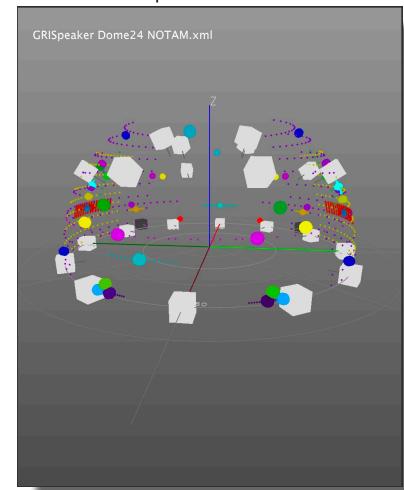
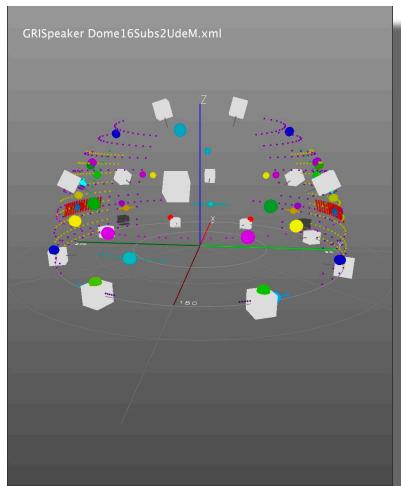
- Speakers
- Inputs/Outputs
- Parameters
- Client



One of the most interesting features in using ServerGRIS' VBAP algorithm is that the *Inputs* that come from your DAW, which represent the audio and space of your work, are independent of the *Outputs*, the speaker setup. So, if you have defined a very complex spatialization structure for a specific speaker arrangement at first, you can play it on any other speaker setup afterwards. You just have to change the speaker setup from one to the next.

Here we have an example of a piece designed for a 16-speaker setup, and then played on a 24-speaker system, different from the original, just by switching from one setup to the next.

As you can see, all the sources remain at the exact same coordinates. They will be played by different speakers, but at the same location in the concert hall.



4.4. Speaker Setup

Designing a speaker setup is the first step of the process. It is done in the Speaker Setup Edition Window (View menu, Alt-W).

4.4.1. Speaker parameters

A speaker configuration has to be created by determining the number of speakers in each ring and their location (Zenith, Radius and Offset Angle). An *Output Patch* connects the speakers to the output number of your audio interface (a 32-speaker dome plus 2 subs (direct outs) in this example).

ID	X	Y	Z	Azimuth	Zenith	Radius	Output	Gain (dB)	Highpass	Direct	delete
1	0.707107	0.707107	0	45	0	31	0	0	0	■	x
2	0.258819	0.965926	0	75	0	32	0	0	0	■	x
3	-0.258819	0.965926	0	105	0	33	0	0	0	■	x
4	-0.707107	0.707107	0	135	0	34	0	0	0	■	x
5	-0.965926	0.258819	0	165	0	35	0	0	0	■	x
6	-0.965926	-0.258819	0	195	0	36	0	0	0	■	x
7	-0.707107	-0.707107	0	225	0	37	0	0	0	■	x
8	-0.258819	-0.965926	0	255	0	38	0	0	0	■	x
9	0.258819	-0.965926	0	285	0	39	0	0	0	■	x
10	0.707107	-0.707107	0	315	0	40	0	0	0	■	x
11	0.965926	-0.258819	0	345	0	41	0	0	0	■	x
12	0.965926	0.258819	0	15	0	42	0	0	0	■	x
13	0.52208	0.78554	0.414166	54	5	0.98	43	0	0	■	x
14	0	0.888182	0.414166	90	25	0.98	44	0	0	■	x
15	-0.52208	0.78554	0.414166	126	25	0.98	45	0	0	■	x
16	-0.844711	0.274463	0.414166	162	25	0.98	46	0	0	■	x
17	-0.844711	-0.274463	0.414166	198	25	0.98	47	0	0	■	x
18	-0.52208	-0.78554	0.414166	234	25	0.98	48	0	0	■	x
19	0	-0.888182	0.414166	270	25	0.98	49	0	0	■	x
20	0.52208	-0.78554	0.414166	306	25	0.98	50	0	0	■	x
21	0.844711	-0.274463	0.414166	342	25	0.98	51	0	0	■	x
22	0.844711	0.274463	0.414166	18	25	0.98	52	0	0	■	x
23	0.570104	-0.236145	0.735403	337.5	50	0.96	55	0	0	■	x
24	0.570104	0.236145	0.735403	22.5	50	0.96	56	0	0	■	x
25	0.236145	0.570104	0.735403	67.5	50	0.96	57	0	0	■	x
26	-0.246984	0.939388	0.766044	112.5	50	0.96	58	0	0	■	x
27	-0.570104	0.236145	0.735403	157.5	50	0.96	59	0	0	■	x
28	-0.570104	-0.236145	0.735403	202.5	50	0.96	60	0	0	■	x
29	-0.236145	-0.570104	0.735403	247.5	50	0.96	61	0	0	■	x
30	0.236145	-0.570104	0.735403	292.5	50	0.96	62	0	0	■	x
31	0	-0.24329	0.90797	270	75	0.94	63	0	0	■	x
32	0	0.24329	0.90797	90	75	0.94	54	0	0	■	x
33	1	-1	0	315	0	1.41421	5	0	0	■	x
34	1	1	0	45	0	1.41421	6	0	0	■	x

You can adjust the output *Volume* and put a *Highpass* filter (0 is off, value in Hz) on each speaker to calibrate the setup. You have to *Compute* the setup before it becomes active (don't worry, you'll be asked if you forget).

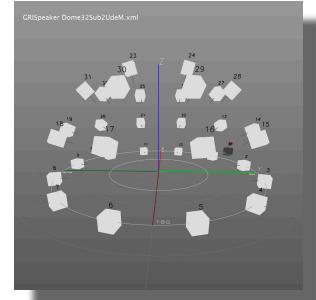
- *Azimuth* is the plane angle, from 0° to 360°. If you put a number greater than 360, it will be adjusted to a real value. For a 390°, the result will be 30° (390-360) after the *Compute* button will be pressed.
- *Zenith* is the elevation angle from 0° to 90° (or to -90, if you use a complete sphere). If you put a number greater than 90, it will be adjusted to a maximum of 90°.
- *Radius* is the distance from the speaker to centre of the sphere (with *Show Sphere*). An ideal dome, according to VBAP, would have all its speakers adjusted to a radius of 1.
- You can also enter the values with X, Y and Z coordinates if you prefer.

4.4.2. Direct outputs

It is possible to add speakers that are assigned to direct outputs, which means that they are not part of the spatialization algorithm, like the subwoofers. These speakers are identified with an orange rectangle in the setup. They can be put anywhere, but since they are independent of the spatialization, it is only for graphical purpose.

4.4.3. Show and select/deselect a speaker

- The location of the speakers and their numbers can be viewed in the 3D window by choosing the *Show Numbers* option (Opt-N). Direct outputs are showed in black.
- Click on a speaker or its number selects it; Right-click deselects it.



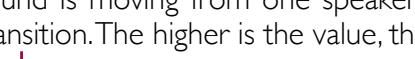
4.5. Inputs and Outputs

The ServerGRIS receives the signals from the DAW and sends them to the speakers. The two main sections are the *Inputs* (from the DAW through *JackRouter*) and the *Outputs* (to the speakers — via the audio interface—, also through *JackRouter*).

In this example, the inputs are made of 4X octophonic tracks (1-32) plus 4X stereo tracks (33-40) and 4X low frequency tracks (41-44, assigned to direct outs 5-6) for a total of 44 tracks identified by different groups of colours, distributed on the 32 speakers dome plus 2 subs (outputs 5-6). The VU meters are calibrated in RMS.

4.6. Parameters

4.6.1. Gain, Interpolation, Mode and Number of Inputs

- Gain: the default value is the unity gain of the outputs at 1.000. It can be adjusted here.
 - Interpolation: it is a smoothing factor. If you realize that there are some glitches when a sound is moving from one speaker to the next, you can adjust this value for smoother transition. The higher is the value, the higher is the CPU usage.

The screenshot shows the Spatialization panel with the following settings:

 - Gain:** A slider set to 1.000.
 - Interpolation:** A slider set to 0.070.
 - Mode:** Set to **Ready**. A dropdown menu is open, showing **VBAP** as the current selection, with other options like **DBAP**, **HRTF LOW**, **HRTF HIGH**, and **STEREO**.
 - Inputs:** Set to 64.

Red arrows point from the text descriptions to the corresponding UI elements: one arrow points to the Gain slider, another to the Interpolation slider, a third to the Mode dropdown, and a fourth to the Inputs slider.

 - Mode: this is where you chose the spatialization mode: VBAP (Vector Base Amplitude Panning); DBAP (Distance Base Amplitude Panning); HRTF LOW or HRTF HIGH (Head Related Transfer Function); STEREO (If a mode is greyed out, it is not yet implemented).
 - Inputs: this is where you specify the number of inputs according to the outputs of your DAW.

4.6.2. Algorithms

Different algorithms have been implemented in ServerGRIS and there will be more in the future.

VBAP

Vector Base Amplitude Panning (VBAP) is an algorithm created by Ville Pulkki in 2001. It allows the user to spatialize the sound under a dome of speakers by placing the sound according to the relative amplitude of three speakers (instead of two in 2D spatialization). Therefore, the dome is made out

of triangles of speakers. This way, the sound can travel smoothly through the dome, with no bumps or holes. VBAP is the first algorithm we have implemented in the ServerGRIS.

HRTF

Head Related Transfer Function (HRTF) is a function that reproduces the way we perceived the localization of sounds in the space. It is a set of phase and amplitude calculation that is designed to be listened on headphones. Primarily, it is designed for 5.1 reproduction or immersive listening on headphones, situations that one finds in the gaming and the VR industries.

We have put two HRTF modes in ServerGRIS to help to work at home on 3D spatialization when you are far from the real dome. It is possible then to experiment with some trajectories or strategies with a few tracks at a time. But *HRTF* is not intended to listen to a full and complex project, it is too CPU demanding. We have designed a *LOW* and a *HIGH* mode. This last one is more precise but more CPU intense, while the former is less precise, but allows you to listen to more tracks. The *LOW* mode allows around 50 inputs while the *HIGH* mode allows around 30 inputs (these numbers could vary depending on other parameters of your project).

HRTF modes use the outputs 1 and 2 of your system.

STEREO

We have put a simple stereo mode to listen to a complex project on a pair of speakers. All the sounds are sent to the corresponding speakers depending on their location (left to left, right to right). STEREO mode uses the outputs 1 and 2 of your system.

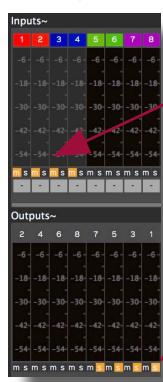
4.6.3. Input Colour



The colour of the inputs can be set to any value by double-clicking in the colour. It opens a window where you can set the parameters of the colour. Keep in mind that this is the colour you will see in the 2D or the 3D window. If you use a lot of sources, it is certainly a good idea to carefully design your colour set.

4.6.4. Mute and Solo

All inputs and outputs can be muted (m) or soloed (s).



4.7. Client

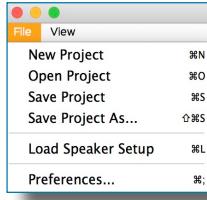
This zone informs you about the DAWs connected to the server and which OSC numbers they are using in your setup. In this example, DP is using channels 1 to 20 (total: 20) and Reaper is using 21 to 148 (total: 128). The default value is 128 channels per client, but some DAWs will use only the ones they need (like here with DP).

Client	Start	End	Available	On/Off
Digital Performer	1	20	20	<->
REAPER	21	148	128	<->

You can also change the default *Start* and *End* ordering values. The maximum number of channels is 256.

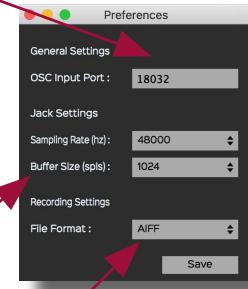
Client	id	Available	On/Off
Digital Performer	235	54	<->
	236		
	237		
	238		
	239		
	240		
	241		
	242		
	243		
	244		
	245		
	246		
	247		
	248		
	249		
	250		
	251		
	252		
	253		
	254		
	255		
	256		

4.8. File menu and Preferences

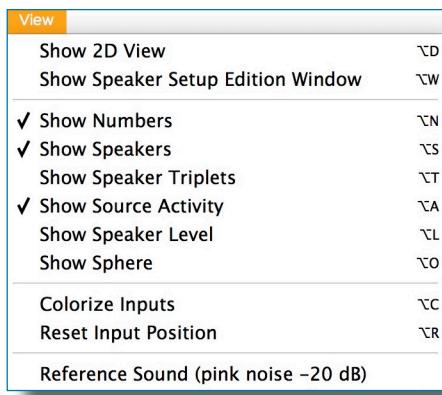


This is where you can create a *New Project* or *Open* an already existing one; *Save* or *Save As* — make a copy; *Load Speaker setup*; and set the *Preferences*.

- The value by default of the OSC port is 18032 which is the same as *SpatGRIS*. If you want to use another incoming OSC device, you have to change this number accordingly.
- Changes in *Sample Rate* and *Buffer Size* will lead to close *ServerGRIS* and to reopen it.
- The recorded file format, AIFF or WAV has to be selected here.

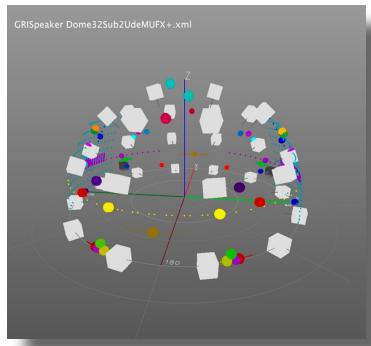


4.9. View menu

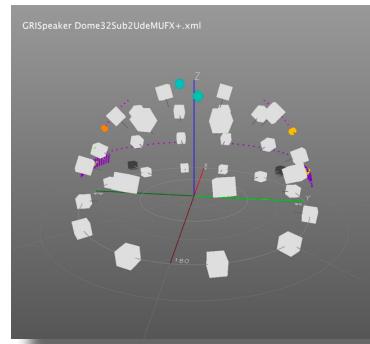


- Show 2D view: the 2D view from the top of the dome (only the sources).
- Show Speaker Setup Edition Window: this is where you built a speaker setup.
- Show numbers: show or hide the numbers of the sources and speakers.
- Show Speakers: show or hide the speakers in the 3D view.
- Show Speaker Triplets: show or hide the triplets in the 3D view. The triplets show how the speakers are connected one to each other; They are very useful for troubleshooting problems.

- Show Source Activity: when this option is selected, you'll see the energy of the sources (there is nothing when the DAW is stopped). The threshold is set at -70 dB. When not selected, all the sources are shown in the 3D view, even when the daw is stopped. Small dots around the big ones represent the spans.

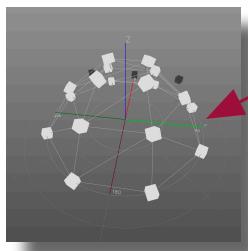


Show Source Activity Off: shows the static position of all the sources



Show Source Activity On: shows the activity of the sources that are really active

- Show Speaker Level: show how much energy each speaker delivers. From grey (nothing) to white (maximum).
- Show Sphere: if you have the chance to play in a full sphere!
- Colorize Inputs: this is an option that sets all inputs to a different colour within the visible spectra from red to red. Be careful, it erases all the individual colours already in place.
- Reset Input Position: when you change the project in your DAW, the sources may stay in place until you use this option to clear up the 3D view.
- Reference Sound: a pink noise at -20 dB, to test the outputs.



NB: If there is no line between two adjacent speakers or if a line is drawn from non-consecutive circles of speakers, then your speaker setup is not well designed. A message should warn you about this.

4.10. Naming and Saving

Speaker setups and server documents are saved under the .xml format. There is no distinction between them. The server document doesn't include the Speaker setup; therefore, they are independent. Consequently, we strongly recommend two things:

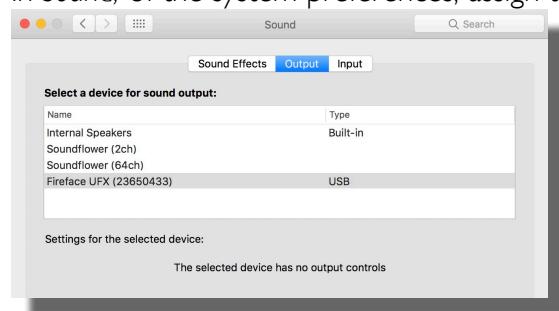
- Add the word «Speaker» to the name of your speaker setups and «Server» to the name of your server documents;
- Save them into two separate folders named Speaker and Server inside a folder named ServerGRIS, and save your files accordingly to their function.

ServerGRIS always remembers the last opened Speaker setup and Server document.

4.11. How to connect the Server and the DAW

4.11.1. Assign Core Audio to your interface

In Sound, of the system preferences, assign the input and the output to your interface:



This setting has two functions:

- To automatically connect Jack to your audio interface
- To synchronize your audio software over a long period of time.

4.11.2. Open the Server

If it is the first time, you'll have:

- To determine the numbers of inputs (up to 128). 64 would be enough in most cases (less inputs are less CPU);
- To design a Speaker Setup.

Save the speaker setup and save the server document.

Next time, just to open the server will be enough. It will automatically open with your last saved speaker setup and document.

4.11.3. Adjust the output level

By default, the output level of the Server is set to unity gain: 1.000. It could be attenuated, specially the first time you try the system!

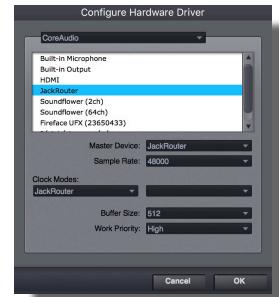
4.11.4. Assign your DAW to Jack

There are many differences from one DAW to the next. Please refer to their manual. *JackRouter* should be seen as any other audio interface.

In the audio setup of your DAW, assign the outputs to *JackRouter* (here's an example in DP):

The Server will automatically detect the presence of the audio software connected to Jack and the number of active channels. It will also automatically allocate the proper number of channels to each client in the opening order (in this example, 20 channels are allocated to DP and 128 to Reaper):

Client	Start	End	Available	On/Off
Digital Perfo...	1	20	20	<->
REAPER	21	148	128	<->



4.11.5. Audio On/Off

Before you can hear the sound, the audio On/Off <X> button has to be pressed. By default, the system is set to *Off* (X):

Client	Start	End	Available	On/Off
Digital Performe	1	8	8	<X>

N.B.: If you make changes in your setup, you might have to set the Server to Off and then to On again, in order to activate the new connections.

4.11.6. Multi-client

ServerGRIS is a multi-client software, which means that you can connect many different software to it. Keep in mind though that its first usage is to spatialize sounds that come from **one** DAW. The Server receives two types of information:

- Audio signals from Jack;
- OSC data from *SpatGRIS*.

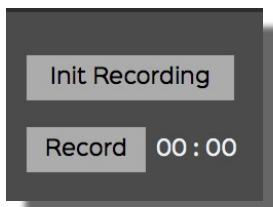
If you use only one DAW, no problem, we recommend that the audio channels and the OSC channels correspond and are labelled with the same numbers. Things become a little bit more complicated if you intend to use more than one software at a time.

- Audio signals from Jack will always start at number 1 in the DAWs. And most DAWs are limited to 64 outputs in total. But their real numbers in the Server will be organized accordingly to the *Start* and the *End* numbers allocated to each DAW. In the example shown in 4.11.4, DP will be assigned the inputs 1 to 20 and Reaper the inputs 21 to 148.
- OSC channel numbers on the other side, have to be absolute. Therefore, in this example, DP will have to use OSC numbers from 1 to 20 and Reaper from 21 to 148. Therefore, in Reaper, the audio channels (1 to 128) and the OSC channels (21 to 148) won't have the same numbering. Be careful with that.

4.12. Recording

When you're set with your spatialization, you have two options:

1. You play the piece «live» with your DAW and the ServerGRIS;
2. You record the spatialization in separate files that correspond to the number of speakers in the setup.



The ServerGRIS records mono files (AIFF or WAV according to your preferences). To record, you have to *Init Recording* to specify where the files will be recorded. And then to push the *Record* button once, to start the recording and the timer and a second time to *Stop* it. After the recording is made you can import the separate mono files into any DAW to play your piece in concert.

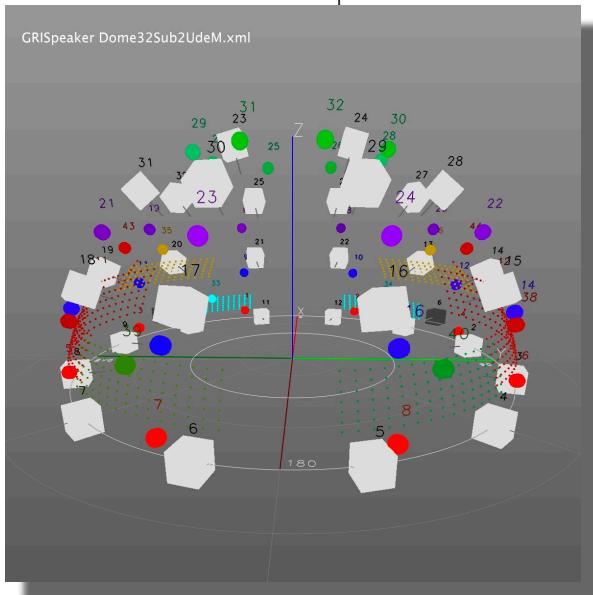
The difference between the two strategies is that you can adjust things in concert with the first one, while with the second one, the spatialization is fixed.



4.13. Representations

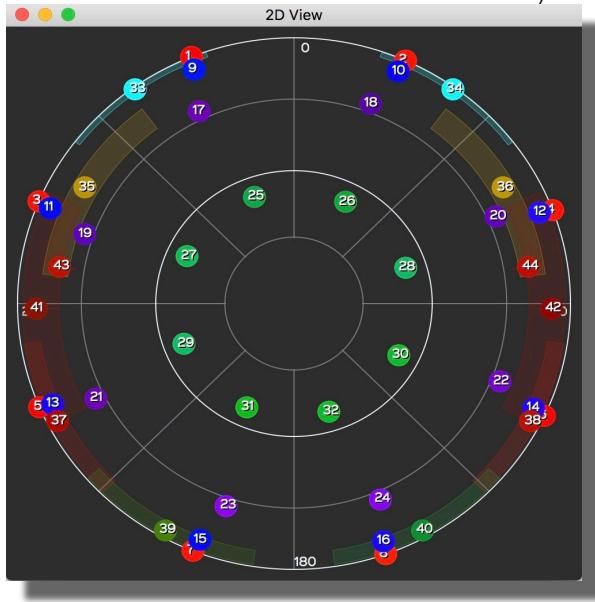
4.13.1. 3D Representation

This is what it looks like with four SpatGRIS, each with an octophonic track plus four stereo SpatGRIS viewed on a dome of 32 speakers as it can be seen in the 3D window:



4.13.2. 2D Representation

There is also a 2D view of the sources only:



4.14. Performances

The performance of *SpatGRIS* in audio mode or the *SpatGRIS/ServerGRIS* combination depends a lot on the different settings in your project. As a general statement, let say that a project with 64 audio channels sent to 64 speakers, on recent computers, will work perfectly well. That being said, we have tested projects with 92 audio channels (46 stereo tracks) or 96 audio channels (16 octophonic tracks) over a 128-speaker setup that was still working well (but it was close to the limit...).

The factors that will significantly reduce the number of channels that can be processed by our tools in order of importance are:

- The spans (Audio or OSC modes): the spans distribute the signal to more speakers than the normal settings, therefore, the activity increases very rapidly in the setup. The same setup with no spans can see its performance divided easily by two or three with spans at their maximum.
- The interpolation (OSC mode): the interpolation factor helps some sounds to get a better transient time when they move from one place to the next. Therefore, the higher this parameter is set to, the higher the number of speakers involved in the process because it takes more time to get into a speaker and to leave it (not to say that it also blurred the localisation).
- The number of speakers used in the Server: actually, the limit here is imposed by *JackRouter* which is single core. We measured comfortable performance with a 96-speaker setup, which is largely enough in most realistic situations!
- The number of tracks and their kind: it is actually the result of the multiplication of the number of tracks by the number of speakers that will determine the reliability of the setup. Few tracks over a big speaker setup will give the same result as a lot of tracks on a small speaker setup. Also, stereo tracks are more demanding per channel than octophonic tracks.
- Other factors: CPU speed, memory, computer age, etc.

What to expect then? Try and experience!

5. Known issues and warnings

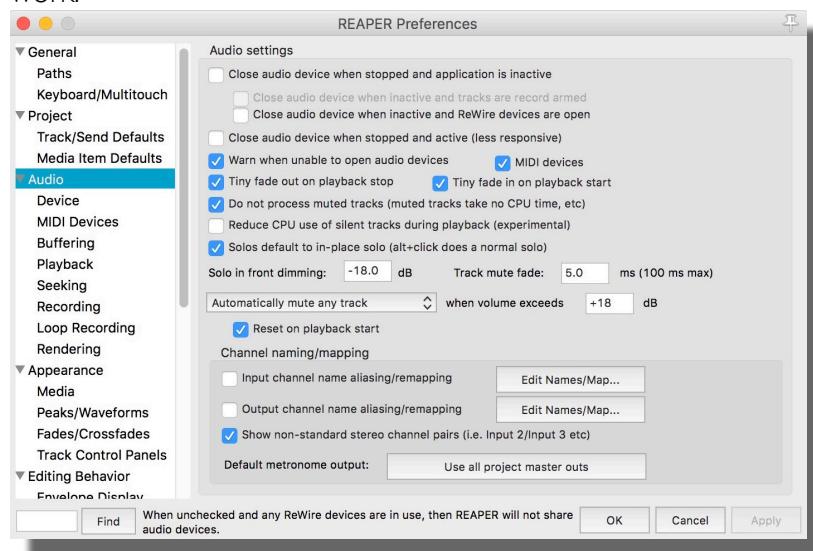
There are so many different situations and setups that is impossible for us to cover them all. So far, we haven't found any situation where the system is not working at all. But we have found situations where some parameters have to be adjusted properly before the system works. Here are a few of them.

5.1. Reaper: Device Preferences

In Reaper, in the Preferences, this option should be unchecked:

Audio-> Close audio device when stopped and application is inactive

Otherwise, JackRouter will lose contact with Reaper when it is inactive and the system will never work.



5.2. Logic Pro X: Lack of Surround outputs

In Logic, there is only one possible Surround instance in Logic. This means that it is not possible to have multiple multichannel tracks in Logic while using the ServerGRIS. To avoid this restriction, use only mono and stereo tracks in Logic.

5.3. Digital Performer: Enable/Disable

DP has a feature called *Enable/Disable* track. It is used to lower down the CPU usage, since it removes the track and all its plugins from the calculation. But it has a direct consequence with the ServerGRIS: the disabled tracks are not seen any more by JackRouter, and DP reallocates the following tracks to the number previously used by the disable tracks. Let say that you have 32 mono audio channels. Then you disable channels 9 to 16. The resulting channels will be named 1 to 24 and not 1 to 8 and 17 to 32. Therefore, since you spatialize the sound with OSC data, there will be a mismatch between the audio channels and the OSC channels, which are absolute, meaning they still will be named 1 to 8 and 17 to 32.

N.B.: We recommend that you don't use the disable function in DP with ServerGRIS.

Experience and have fun!