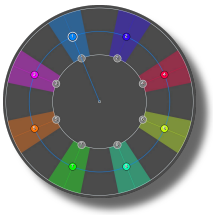
SpatGRIS



ServerGRIS

Tools for 2D and 3D sound spatialization

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

Director: Robert NORMANDEAU
Programmers: Olivier BÉLANGER
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Manual
SpatGRIS 1.01
ServerGRIS 1.04
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Université de Montréal

1. INTRODUCTION

These instructions assume that you are familiar with the following manuals (not included):
• Jack OSX
• Any DAW that can use AU or VST plugins
• Your audio interface

These instructions have been tested on the following MacOS and software:
• MacOS Sierra™ (10.12.6)
• JackRouter 0.97
• Digital Performer™ 9; Ableton Live™ 9; Logic Pro X™; Reaper™ 5

1.1. Groupe de Recherche en Immersion Spatiale (GRIS)

Director: Robert Normandeau
Main programmer: Olivier Bélanger
Former programmers: Vincent Berthiaume, Nicolas Masson, Antoine Missout
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Logos: Simone D'Ambrosio (*SpatGRIS*), the team (*ServerGRIS*)
The GRIS received research grants from Hexagram, SSHRC and FRQSC.
Thanks to Simone d'Ambrosio and Raphaël Néron-Baribeau, who contributed to the writing of this manual.
Proofreading and English translation: Terri Hron

1.2. SpatGRIS

SpatGRIS is a multichannel sound spatialization plugin available in Audio Unit (Mac) and VST formats (Mac and Windows). This free and open-source plugin allows movement of multiple sound sources on a variable set of speakers. Different modes of grouped movement and a trajectory system are provided for spatialization of mono, stereo and multichannel sources. The spatialization is made directly within the DAW without the need for external software.

1.2.1. History

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

1.2.2. 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 to the following location on your computer: ~/Library/Audio/Plug-Ins/Components
• To install the VST version, copy the files contained in the VST folder to 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 either the 64 bits (x64) or the 32 bits (x86) version and place it in the VST folder of your system.

1.2.3. System Requirements MacOS

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, up to version 9, 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: 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 yet available.

1.2.4. AU or VST

SpatGRIS has been extensively tested on MacOS Sierra (10.12) and appears to work fine on Yosemite (10.10) and higher. Here are some particularities:

- Use the AU version in DP, the 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

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 with the Server. The Server may include up to 128 inputs and outputs (see Section *4.16. Performances* for more details about that). The movements are sent from the *SpatGRIS* plugin 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* plugin in audio mode and the combination *SpatGRIS*/*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 original name of the plugin: *OctoGRIS*). *SpatGris* also doesn't take into account the vertical dimension of the spatialization (2D only). ServerGRIS does have a practical limitation of up to 128 outputs (but theoretically up to 256) and 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 recommend that you remove any prior version of Jack, by using the Uninstall JackOSX command in the Jack folder and then restarting your computer.

• Download the latest version of *ServerGRIS* from SourceForge:
https://sourceforge.net/projects/servergris/

• Decompress the downloaded file.

• The *ServerGRIS* installer puts all the necessary components at the right place including the Server itself and the Jack folder in the Applications folder and all the needed libraries in their correct locations.

N.B.: After the first installation, we recommend restarting the computer. This will ensure that all the preferences are properly set.

1.3.3. System requirements MacOS only

ServerGRIS is a Mac only software. It has been extensively tested on MacOS Sierra (10.12) and seems to work fine on Yosemite (10.10) and higher.

2. SpatGRIS: 2D audio spatialization

SpatGRIS is a spatialization plugin that offers two audio modes:

- Free volume
- Pan span

It also offers an *OSC Spatialization* mode that is described in the section *4. ServerGRIS: 3D spatialization*.

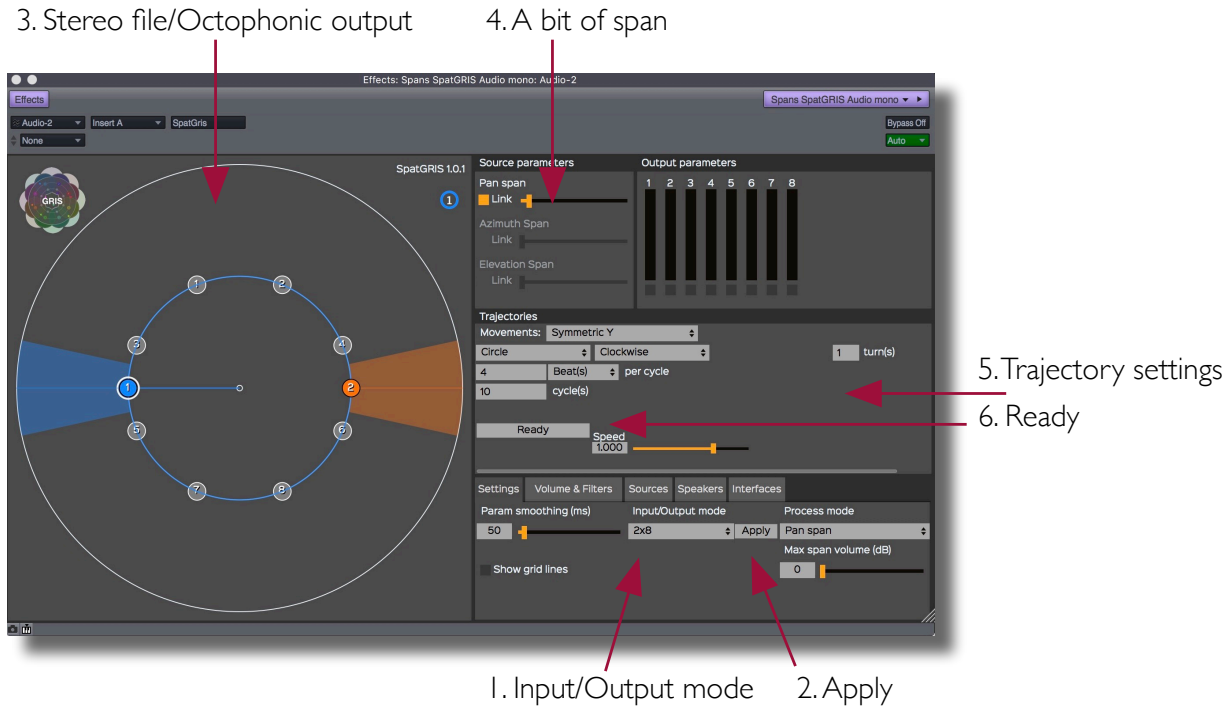
2.1. Quick Start

You don't need/want to read the manual? Here are the basic steps. Open the plugin in a track with a stereo file sent to an octophonic output.

1. Choose the input/output mode (2X8)
2. Apply
3. Graphic: stereo file (sources) in colour, octophonic output (speakers) in grey
4. Add a bit of span
5. Set the trajectory
6. Press Ready
7. Start the sequencer in write automation mode.

You are ready to explore the multiphonic world with *SpatGRIS*.

Questions? Details? Read the manual!



2.2. General Presentation

SpatGRIS is a multichannel sound spatialization plugin (up to 8 channels / 16 speakers) in a two-dimensional plane. This plugin allows movements of multichannel sound sources on a variable set of speakers. A number of 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 a working knowledge of the host software and can perform basic functions in order to configure it.

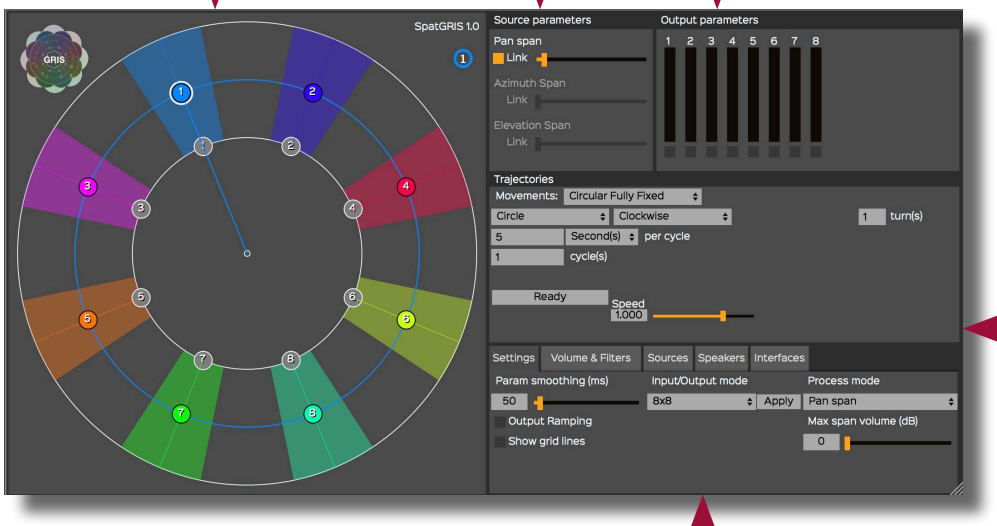
2.3. Interface

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 sliders of the emission area of the sources (*Free Volume* mode) or the *Spans* (in *Pan Span* mode)

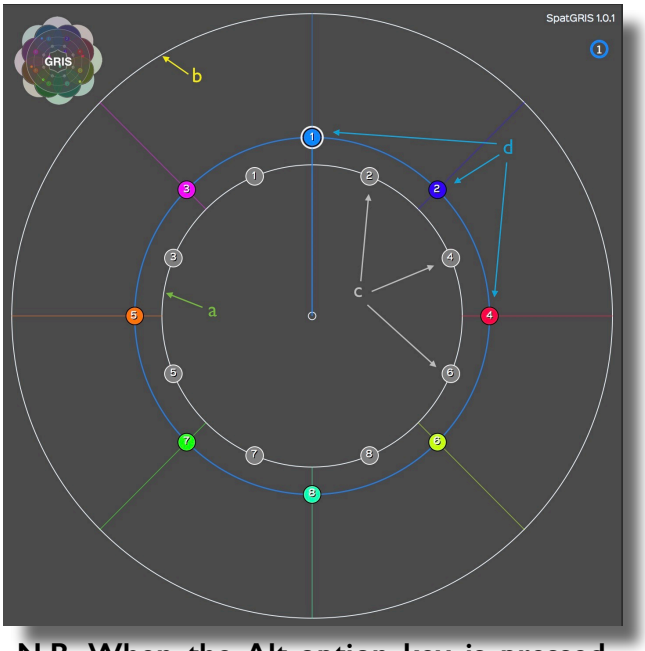
Output parameters: VU Meters of the outputs (disabled during automation recording)



Trajectories: automated trajectory parameters

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

2.3.1. 2D Spatializer



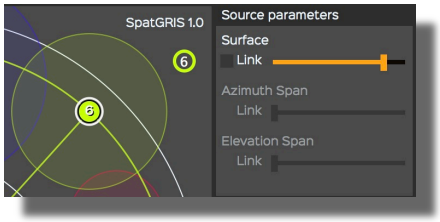
The 2D Spatializer is a two-dimensional representation of the sound sources distributed on a speaker system. The two concentric circles represent:

(a) the equidistant circle of speakers (in *Pan Span* mode)
(b) the far limit of the spatialization system.
(c) Gray dots each represent a speaker. These speakers can be moved either freely in the two-dimensional plane or along the equidistant circle of speakers based on the spatialization mode chosen.
(d) 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 controlled individually or in groups.

N.B. 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.

2.3.2. Source parameters

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

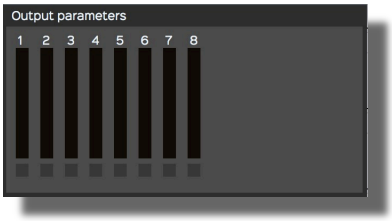


Within the Surface panel, it is possible to adjust the emission region for each of the sound sources. The *Surface* setting controls the diameter of the emission area represented by a translucent circle around the source. It allows a source to reach multiple speakers simultaneously. Also, clicking the 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.

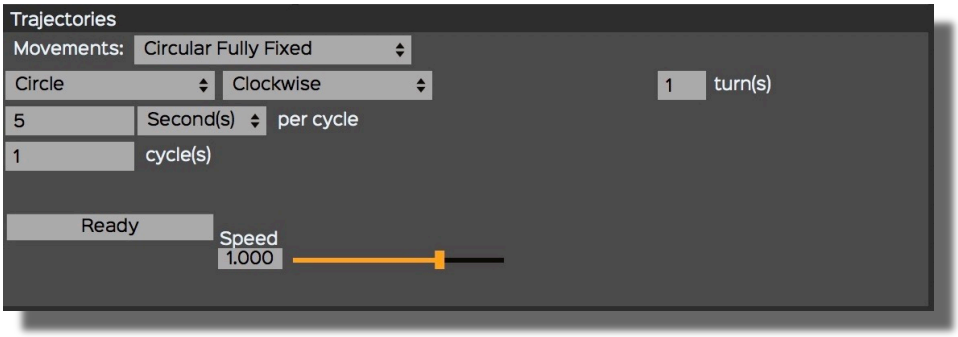
N.B.: In the Pan Span mode, the Elevation Span and Azimuth Span parameters replace the Surface parameter.

2.3.3. Output parameters

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

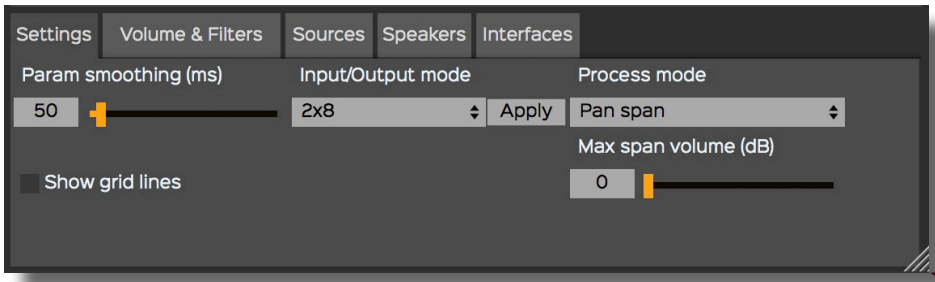


2.3.4. Trajectories



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 section *3.3. Trajectories* for details.

2.3.5. Configuration panel

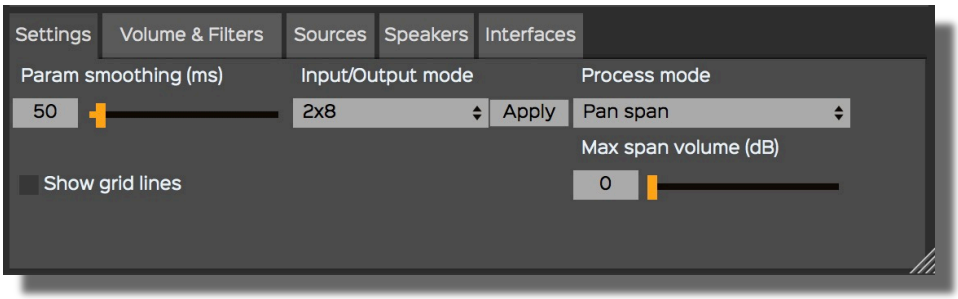


The configuration panel gives access to a set of plugin parameters. These settings are grouped under tabs with explicit names:

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

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

2.4. Settings

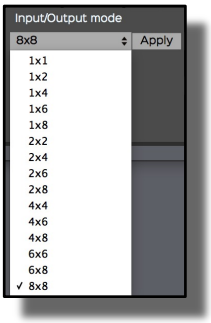


SpatGRIS enables the spatialization of a variable-format source signal on a variable speaker system. Two parameters determine the format of the plugin: the format of the track and its assigned outputs. Due to the particularities of each host software, please refer to its manual. Here we have an example of a 2 inputs/8 outputs setting (a stereo file played on an octophonic speaker setup).

2.4.1. 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 works well.

2.4.2. Input/Output mode

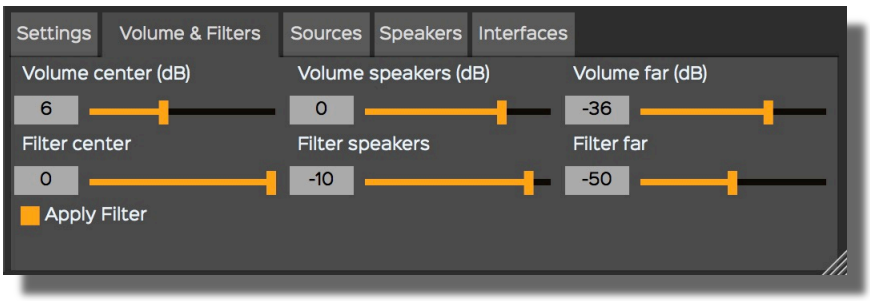


The configuration of *SpatGRIS* has to be adapted to the number of input signals (sources) and output signals (speakers). Available formats depend on the host:
1X2, 1X4, 1X6, 1X8, 1X12, 1X16, 2X2, 2X4, 2X6, 2X8, 2X12, 2X16, 4X4, 4X6, 4X8, 4X12, 4X16, 6X6, 6X8, 6X12, 6X16, 8X8, 8X12, 8X16.
Select the right one and then press *Apply*.

2.4.3. 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*).

2.5. 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 for the volume attenuation and the filtering 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. This r attenuation and filtering system results in more convincing movements and trajectories in 2D space.

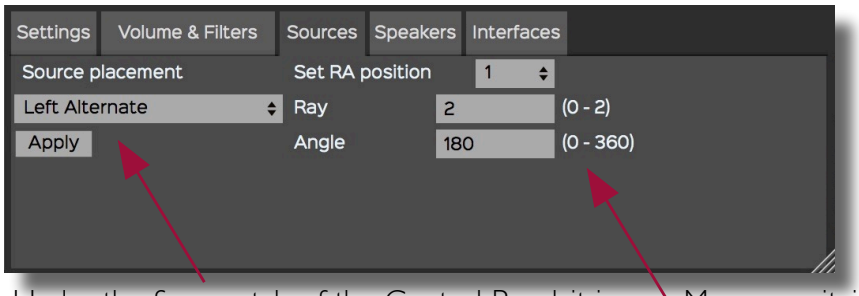
2.5.1. Volume

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 in a predefined location will have its volume attenuated according to the control value (in dB). Also, *SpatGRIS* modulates these values taking the panning law into account when a source is located between two speakers.

2.5.2. Filters

The three sliders of the *Filter* section set the filtering of a source in relation to its position in the 2D spatial plane. The filter applied to the source is a low-pass filter, whose control value can be set 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.

2.6. Sources

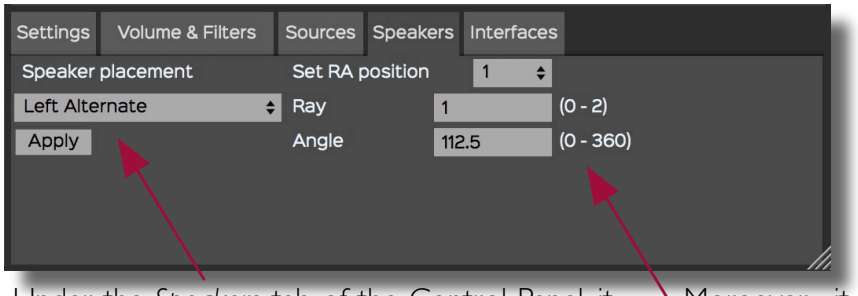


Under the *Sources* tab of the Control Panel, it is possible to accurately position sources on the 2D spatializer. Using *Source placement*, it is possible to equidistantly position sources following a clockwise or alternate order. To do so, simply select the desired layout from the drop-down menu and 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 its new coordinates. The *Ray* and *Angle* correspond to the 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 3 o'clock.

2.7. Speakers



Under the *Speakers* tab of the Control Panel, it is possible to position the speakers accurately on the 2D spatializer. Using *Speaker placement*, it is possible to position speakers equidistantly 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 adjust the position of the speakers manually 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 the current polar coordinates of the selected source

N.B.: In Pan Span mode, the speaker position is constrained to the circle of speakers (Ray of 1) while in Free Volume mode it becomes entirely free.

2.8. Controllers

2.8.1. OSC

SpatGRIS is controllable via an external Open Sound Control[1] (OSC) controller. The first version of a *TouchOSC*™ interface is already available. Under the *Interfaces* tab, you can configure the connection between the OSC controller and the plugin. The default OSC output channel for SpatGRIS is 18032.

2.8.2. 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.

2.8.3. Joystick and gaming device

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

2.9. How to use it

SpatGRIS is a plugin that can be inserted on any audio, auxiliary or master tracks that requires spatialization. Source spatialization can be performed directly with the GUI plugin or with an external controller. *SpatGRIS* comprises a trajectory system that can write predefined movements quickly and efficiently. The automation function of the host software assures the recording and playback of the source's movements. It is therefore essential to understand the various automation modes that your preferred host uses.

2.9.1. 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 first been configured to support the desired spatialization format. Please note that this process is largely dependent on the host software.
Most often, *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 process the signal with these other plugins first before spatializing the sound using *SpatGRIS*.

2.9.2. Saving presets

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

- speaker positions. A system that has a peculiar positioning of the speakers can be quickly recalled at the initialization of *SpatGRIS*
- source positions
- volume and filter configurations linked to the "Pan span" mode
- trajectories settings

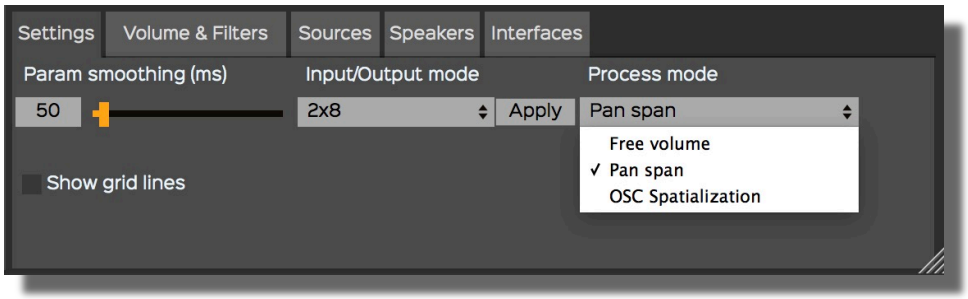
2.9.3. Recording of the multichannel files

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.

[1] http://opensoundcontrol.org/introduction-osc

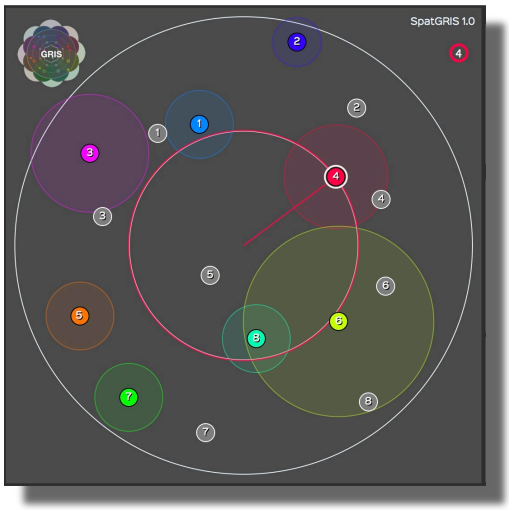
3. SpatGRIS: Description of functions

3.1. Spatialization Modes



3.1.1. Free volume

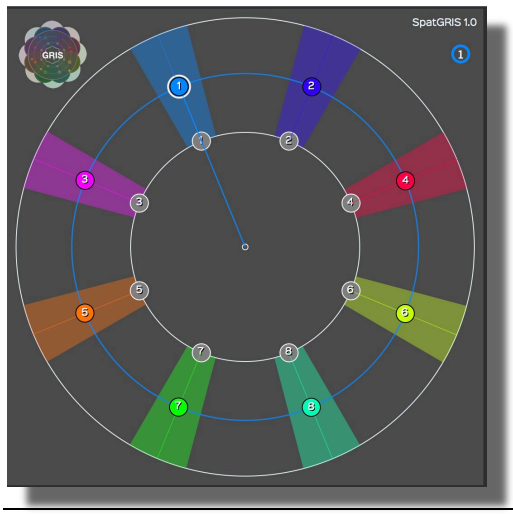
Free volume is a mode of spatialization inherited from the first version of *Octogris*. In this mode, a source has an emission area that can reach one or more speakers. A translucent circle around the source represents this emission area. Its size is set with the *Surface* settings. The level of the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



In this mode, it is possible to position the speakers freely on the entire 2D Spatializer. There is no pan law applied though, which means that if a source doesn't touch any speaker (like with sources no. 2, 5, 7 and 8), this source will not be heard. Conversely, 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 according to its distance from the centre of the interface. A low-pass filter can also be applied to the source according to 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 panning. In this mode, a source has an emission area that

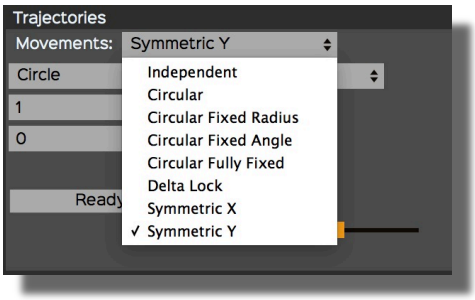
can expand at will. It covers the entire surface of the 2D Spatializer or be reduced to a monaural source. This emission area is represented by a coloured distribution zone surrounding the source. Its width is set via the *Surface/Span* panel. The signal sent to the speakers touched by a source's emission area 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 although 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: 3D spatialization*.

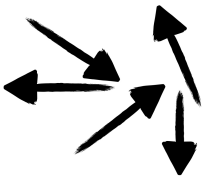
3.2. Group Movements

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

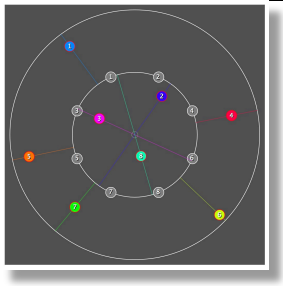


3.2.1. Types of movements

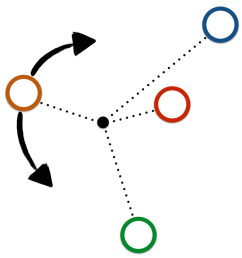
1) Independent STEREO + MULTIPHONIC



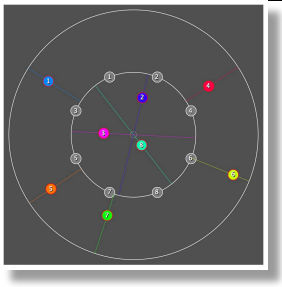
This mode is selected by default. The sources can be moved independently from one another.



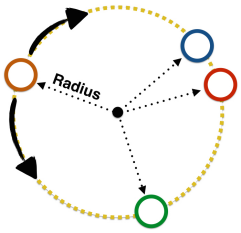
2) Circular STEREO + MULTIPHONIC



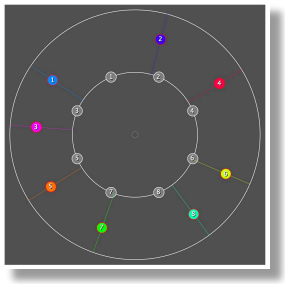
This mode enables the circular grouped movement. The angles between the sources remain constant while the radius adjusts proportionally.



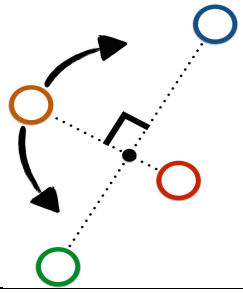
3) Circular Fixed Radius STEREO + MULTIPHONIC



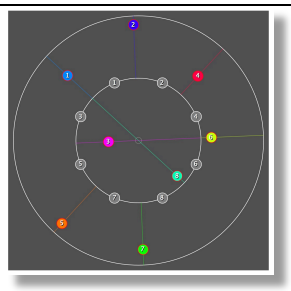
The sources are linked in a circular motion by the RADIUS parameter, which remains fixed and equal. The relative distance between each source and the centre is the same for all sources.



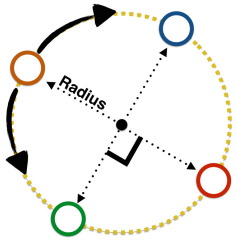
4) Circular Fixed Angle STEREO + MULTIPHONIC



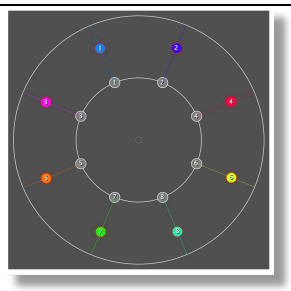
The sources are linked in a circular motion with the ANGLE parameter, which remains fixed and equal. For example, in the 8x8 option (eight sources), the opening angle between each of the sources will be fixed to 45°.



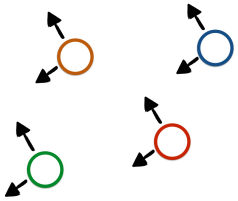
5) Circular Fully Fixed STEREO + MULTIPHONIE



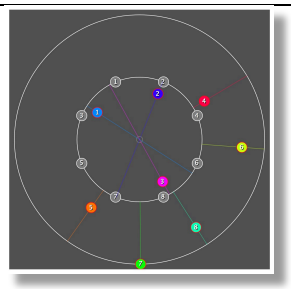
The sources are linked in a circular motion by both the RADIUS and ANGLE parameters, which remain fixed and equal. The opening between the sources and their radius is therefore always identical.



6) Delta Lock STEREO + MULTIPHONIE

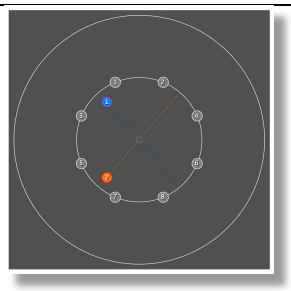


This mode locks the position of the sources in relation to others along the X and Y axes, without the possibility of rotation.

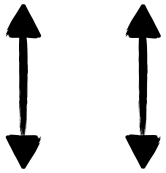


7) Symmetric X STEREO

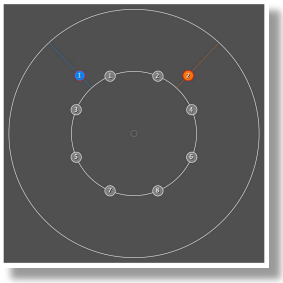
This mode enables the symmetry between two sources following the X axis.



8) Symmetric Y STEREO



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



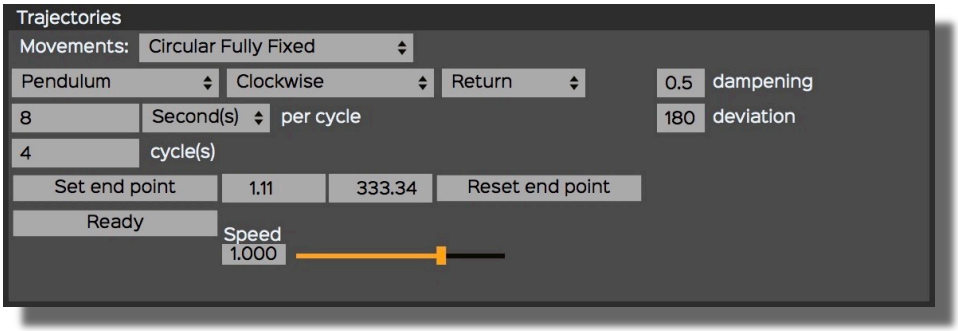
N.B.: A reminder of the concepts mentioned above:

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

The following shortcuts are available:

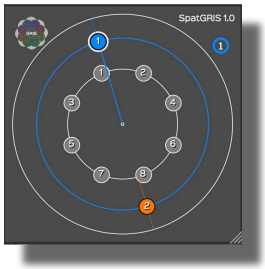
• Alt/option: fixed radius and adjustable angle;
• Cap: adjustable radius and fixed angle.

3.3. Trajectories

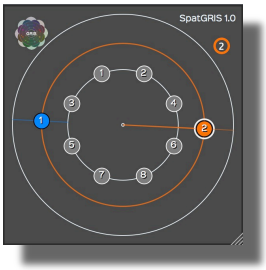


It is possible to automate the movement of the sources using predefined trajectories. Within the *Trajectories* control panel, you can set and adjust these movements to the musical context. The concept behind the movements is that there is a source master while the others are slaves. When you select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



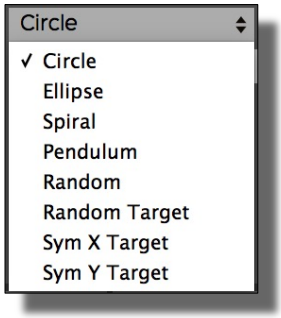
Master source is No. 1



Master source is No. 2

3.3.1. General Settings

Automating the movement of a source is quite simple. A drop-down menu with different types of movements allows you to select a particular one to apply to as many sources as you like, from a single one to all of them. A great variety of movements are made possible such as *Circle*, *Ellipse*, *Spiral*, *Pendulum*, *Random*, *Random Target*, *Sym X Target*, *Sym Y Target*:



Other settings of the trajectories include:

- the direction of rotation: *Clockwise/Counter Clockwise*;
- the size 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.

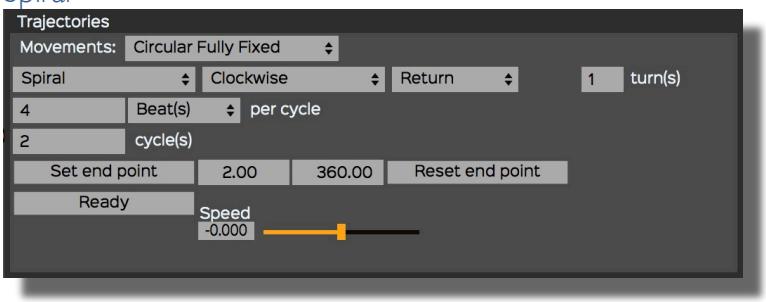
3.3.2. Speed

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 ± 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. Experiment with it. *Speed* cannot be automated, but the affected parameters are.

3.3.3. Specific parameters

Specific parameters will show up depending on the chosen trajectory.

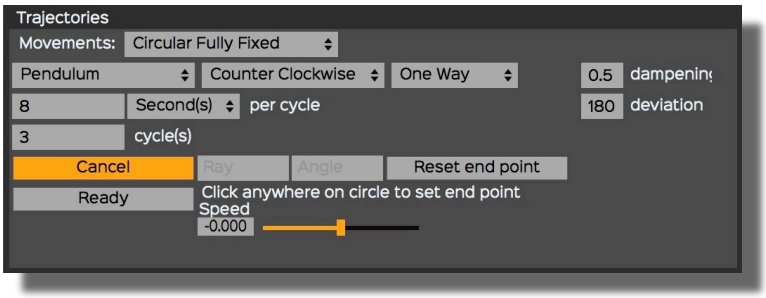
Spiral



- *One Way/Return*. *One way*: at the end of the trajectory, the cycle the cycle resets directly from the beginning. *Return*: at the end of the trajectory, the cycling motion is reversed back towards the beginning.
- *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 also possible to *Reset the end point* which will then return to the default settings for an end point at the exact opposite of the start position.

Pendulum

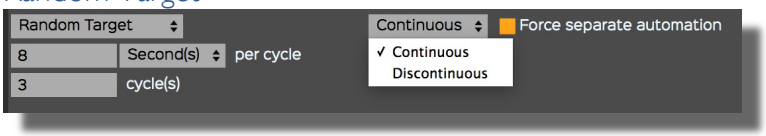


• *Dampening*. The movement of the pendulum is dampened over time, like in reality. The maximum amount of dampening is 1 where the pendulum will be completely dampened at the end of the trajectory. A value of 0.5 corresponds to a value of half.
• *Deviation*. The pendulum deviates from its initial trajectory 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

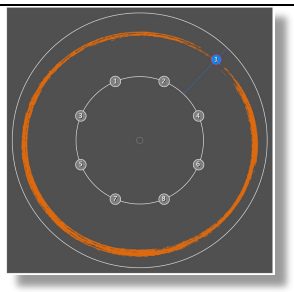
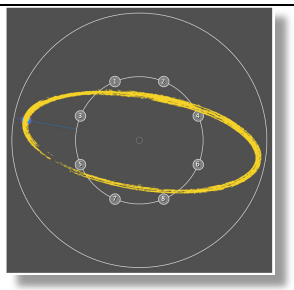
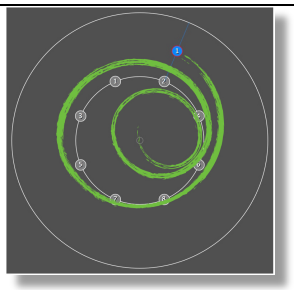
Pressing the *Ready* button arms *SpatGRIS* to wait for the start of the sequencer. When the sequence is initiated, the plugin will start the trajectory according to the specified settings. The movement produced can be recorded — essentially X and Y coordinates of the Master source — like any other automation. 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.

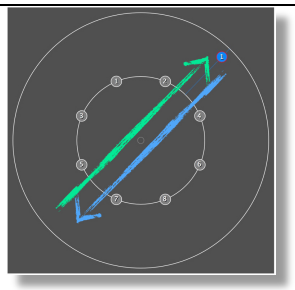
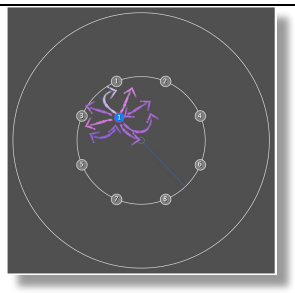
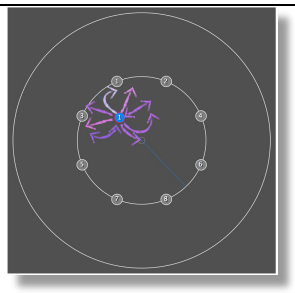
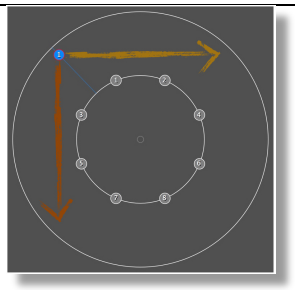
3.3.5. Trajectory recording in the DAW

As explained above, *SpatGRIS* waits for the host sequencer to start before starting a trajectory. A progress bar is displayed by the plugin to monitor the progress of the trajectory. The tracks that contain *SpatGRIS* as an insert can be set in a write mode (Touch, Latch, or Write) in order to record the sources' movements as automations. These automations are then available for playback and editing.

N.B.: In grouped modes, only the source No. 1 (master) should be recorded, the other sources being slaves. If different sources are recorded, then the plugin doesn't know which one is the master and which ones are the slaves and therefore, unexpected behaviours could occur. It is always preferable to record the automation of trajectories after experimenting, because it frees up the CPU of the DAW.

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 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 configure the host software in which it is used correctly. 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 the physical outputs on your audio interface. There are too many DAWs to describe the specificity of them all. Please consult each sequencer's manual.

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

4. ServerGRIS: 3D spatialization

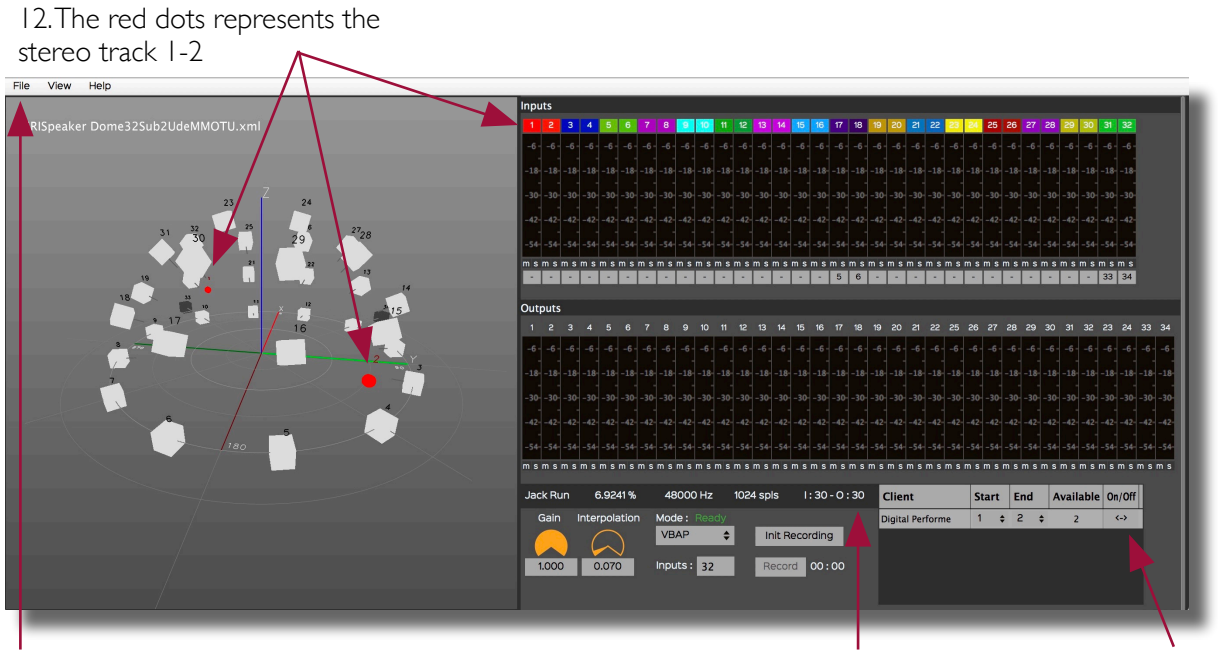
SpatGRIS has a mode called *OSC Spatialization*. In this mode, the audio is not spatialized within *SpatGRIS* but externally by the *ServerGRIS*. In this case, *SpatGRIS* sends only Open Sound Control (OSC) data to the Server to place the sounds in a set of speakers. The sound itself is sent from the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

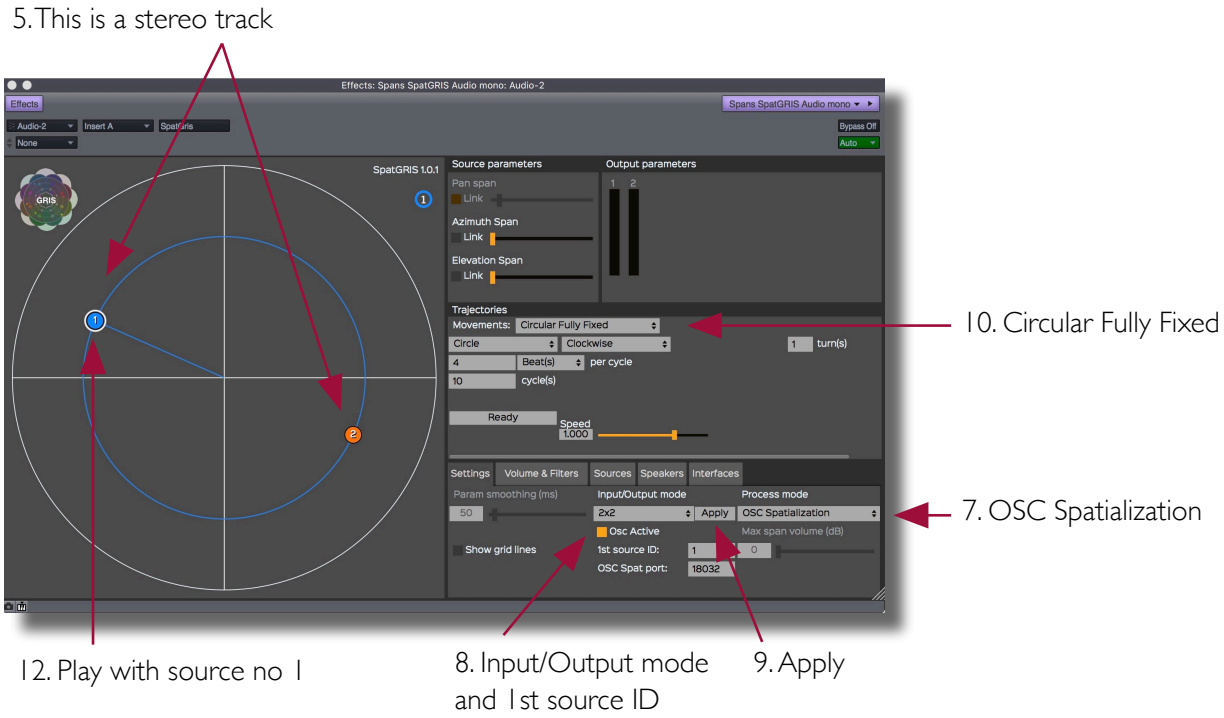
4.1. Quick Start

You don't need/want to read the manual? Here are the basic steps. In this example, spatialization of a stereo track on a 30 inputs/30 outputs audio interface. **The order is very important.**

1. Assign the Input **and** the Output of MacOS System Sound Preferences to your interface
2. Open ServerGRIS
3. Open a Speaker setup (File menu) or use the default one
4. Open your DAW
5. Assign the audio of your DAW to *JackRouter* and create a stereo track
6. Assign this track *to JackRouter 1-2*
7. Insert a SpatGRIS in *OSC Spatialization* mode
8. Input-Output mode to 2X2 and 1st source ID to 1
9. Apply
10. Select *Circular Fully Fixed* in *Movements*
11. In *ServerGRIS*, put your DAW to On mode
12. Play with Source no 1 and see the result in *ServerGRIS*.

You are ready to play and to record automation.

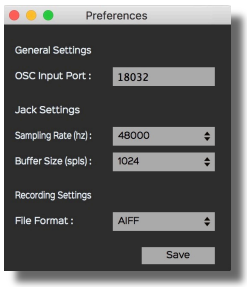




Questions? Details? Read the manual!

4.2. Sampling Rate and Buffer size

The Sampling Rate and the Buffer Size can be change in 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 require closing and reopening *ServerGRIS*
- The recorded file format, AIFF or WAV is selected here.

N.B. Changes in Sampling Rate and Buffer Size should be done only when there is no opened DAW in your computer. *ServerGRIS* has to be closed and reopened before the changes take place. Once done, you can open the DAW.

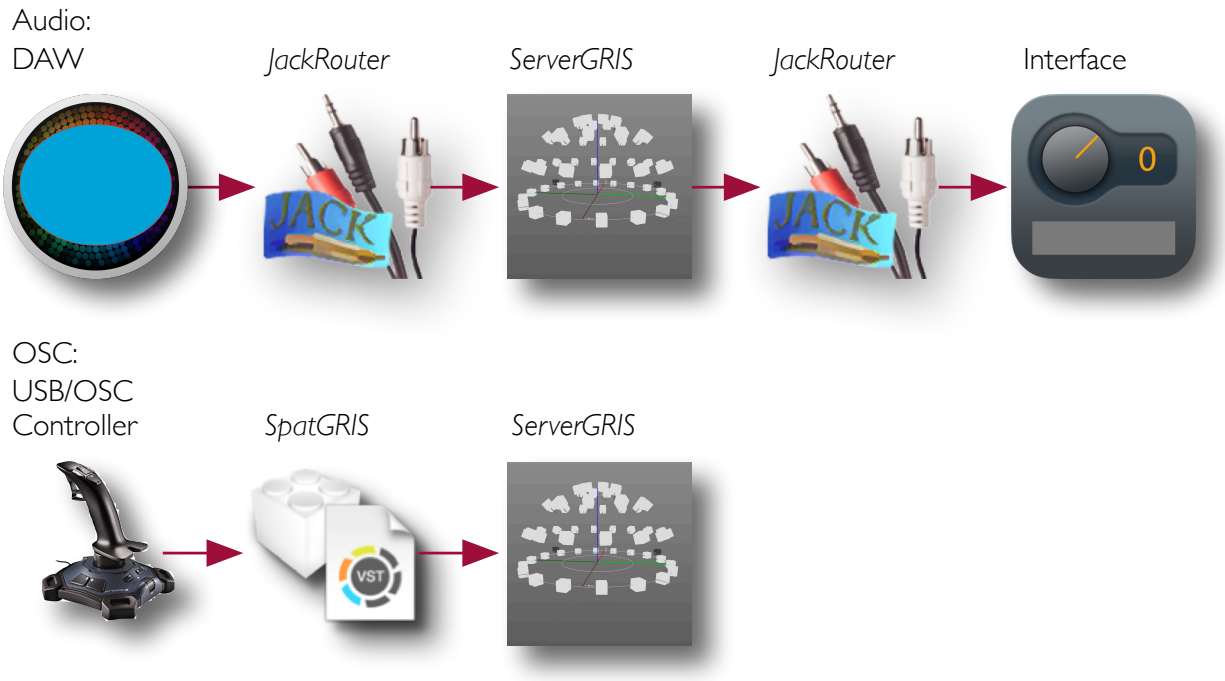
4.3. 2D or 3D?

ServerGRIS is capable of 2D and 3D spatialization. It can be useful to use the Server in 2D with DAWs that are stereo only like *Ableton Live 9*. Doing so can turn these stereo DAWs into a multichannel software even though its only with an octophonic setup. But of course, the real power of the Server lies in its 3D capabilities.

4.4. Architecture

The *ServerGRIS* setup is made of three elements:
- the *ServerGRIS* itself that spatializes the sound
- the *Edit Speakers* page that designs the setup of the speakers
- the *SpatGRIS* that designs and records the trajectories.

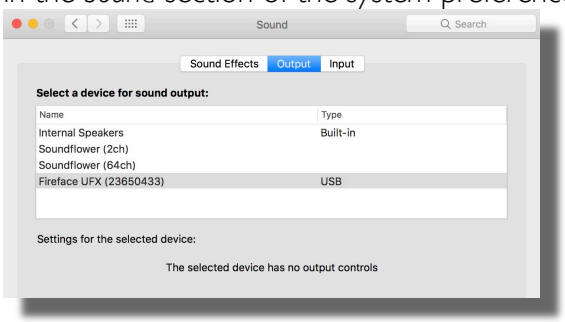
The whole architecture includes these elements (Audio and OSC are working in parallel):



4.5. Audio: How to connect the DAW to the Server

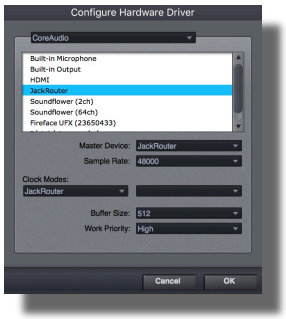
4.5.1. Assign Core Audio to your interface

In the *Sound* section of the system preferences, assign the **input** AND the **output** to your interface:



This setting has two functions:
• to connect Jack to your audio interface automatically
• to synchronize your audio software over long periods of time.

4.5.2. Opening the Server



The first time, you'll have to:
• determine the numbers of inputs (up to 128). 64 would be enough in most cases (less inputs mean less CPU);
• design a Speaker Setup.
After these first two steps, save the Speaker Setup and the Server document. Following sessions will automatically open last saved Speaker Setup and Document at the start-up of the Server.

4.5.3. Adjust the output level

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

4.5.4. Assign your DAW to Jack

There are many differences between one DAW and another. Please refer to each manual. *JackRouter* should be seen like 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	<->

4.5.5. Audio On/Off

Before you can hear any sound, you have to press the audio *On/Off* <X> button. 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.

4.5.6. Multiclient

ServerGRIS is a multiclient software, which means that you can connect it to many different DAWs. Keep in mind, though, that its primary usage is to spatialize sounds coming out of a single DAW. The Server receives two types of information:
• audio signals from Jack;
• OSC data from *SpatGRIS*.
If you use only one DAW, there is no problem, and 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 which are, most of the time, limited to 64 outputs in total. Consequently, you might be thinking that the channels and their numbers as represented in your DAW correspond to the ones displayed in the Server, when in fact their real numbers in the Server will be organized according to the Start and End numbers allocated to each DAW.

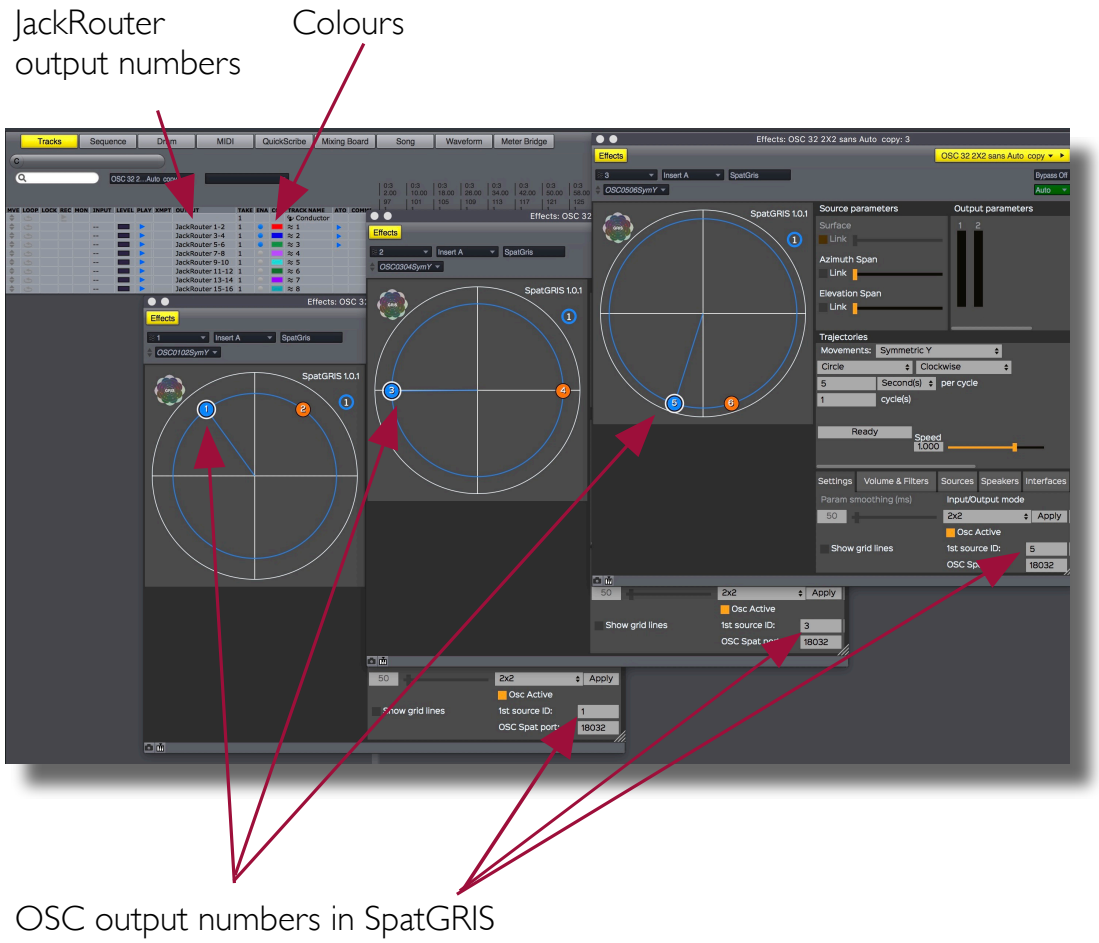
In the example shown in 4.4.4., inputs 1 to 20 are assigned to DP and inputs 21 to 148 to Reaper.

• OSC channel numbers on the other hand, must 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 this!

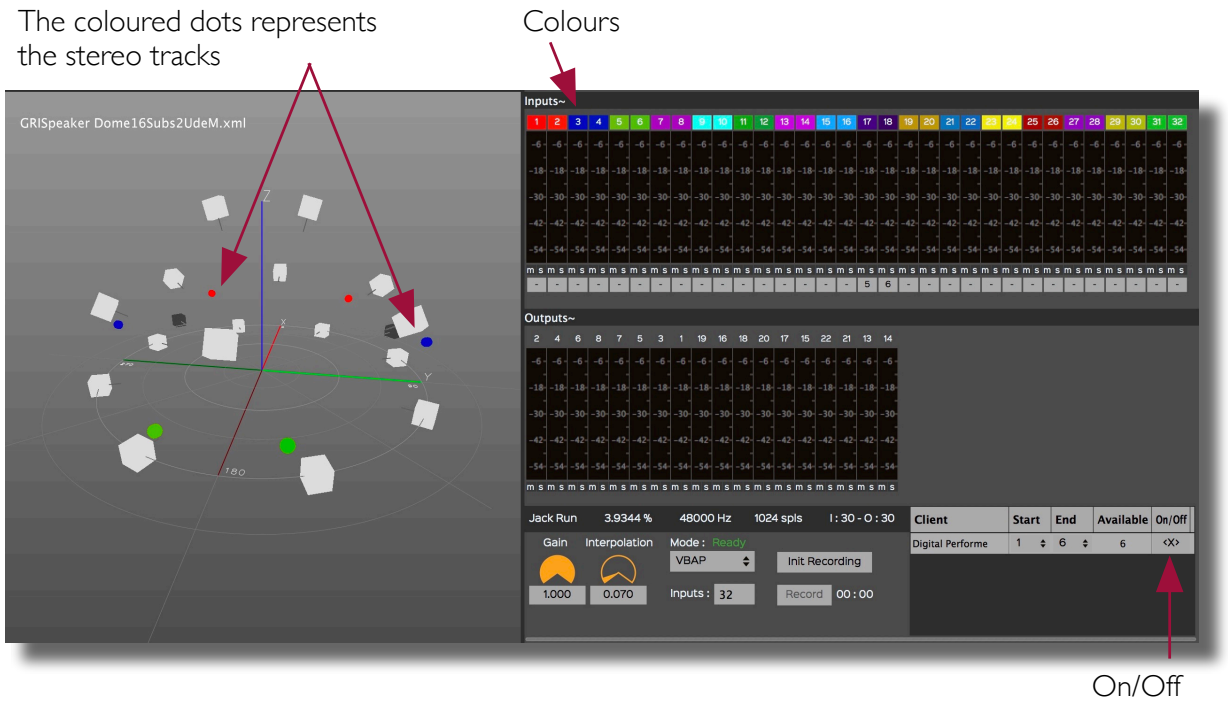
4.6. OSC: How to connect SpatGRIS to the Server

The spatialization is handled by the *ServerGRIS* which receives OSC data from *SpatGRIS*. To avoid confusion, it is better to synchronize *JackRouter* output numbers in the DAW with the OSC numbers in the *SpatGRIS*/*ServerGRIS* combination.

In the following example, three stereo tracks (red, blue and green) are assigned to *JackRouter* 1-2, 3-4 and 5-6. The three *SpatGRIS* use the same OSC numbering: 1-2, 3-4 and 5-6. With a clear relationship between audio and OSC numbering, it helps to keep coherent complex projects.



To help to keep things clear, it is better to use the same colour scheme in the DAW and in the *ServerGRIS*.



4.6.1. OSC information of ServerGRIS

OSC input port number: 18032 by default (can be changed in the preferences)
OSC server address: "/spat/serv"

Source position control messages

- The server is waiting for a list of the type ifffffff (an integer and six floating-point numbers)

The elements of the list:
1. (i) The source number starting at 0.
2. (f) The azimuth value between 0 and pi*2.
3. (f) The elevation value between 0 and pi.
   - 0 = top vertex of the dome.
   - pi/2 = center of the sphere (the height of the lower circle of a half-sphere).
   - pi = lower vertex of the dome (under the floor).
4. (f) The span in azimuth between 0 and 2.
5. (f) The span in elevation between 0 and 0.5.
6. (f) The radius (1 is the surface of the dome)
   - Not used with VBAP.
7. (f) The gain of the source.
   - Not used at the moment.

Reset messages of the position of a source

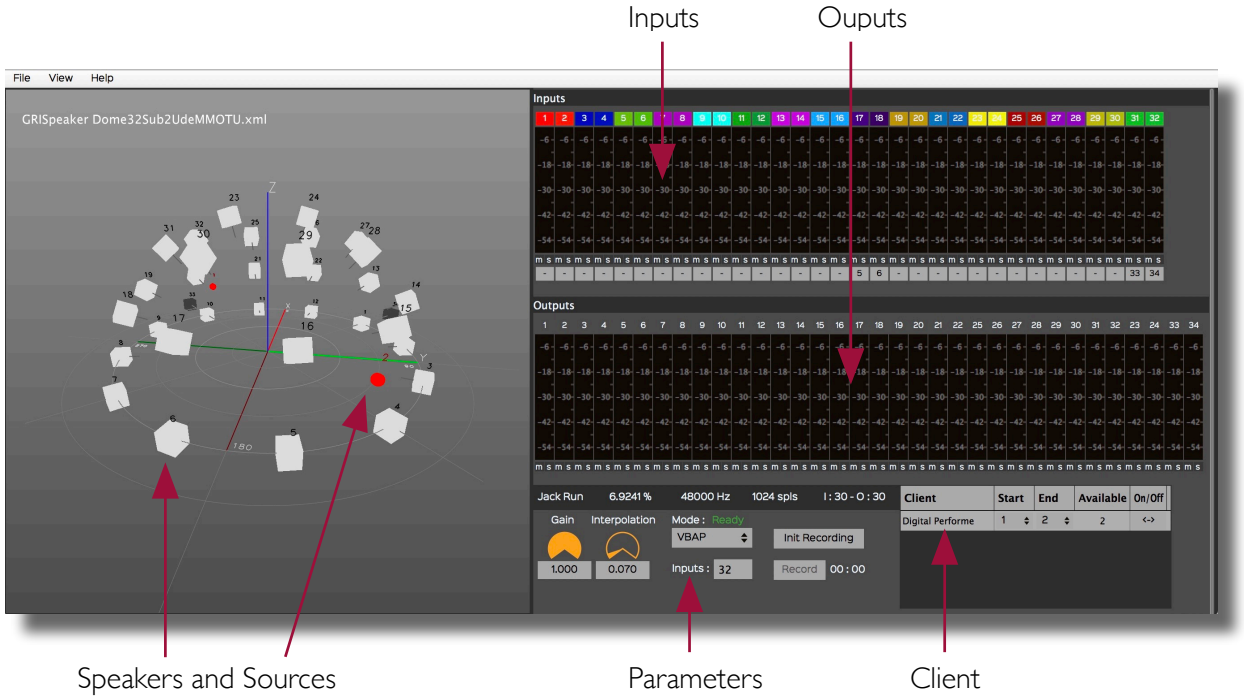
- The server is waiting for a list of type si (a string and an integer)

The elements of the list:
1. (s) The string "reset"
2. (i) The number of the source to be reset starting at 0.

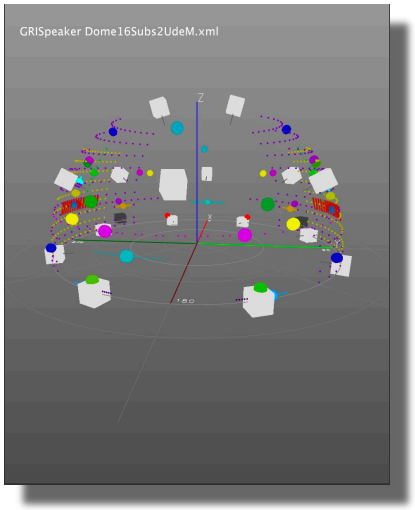
4.7. ServerGRIS Zones

The *ServerGRIS* window is divided into 4 zones:

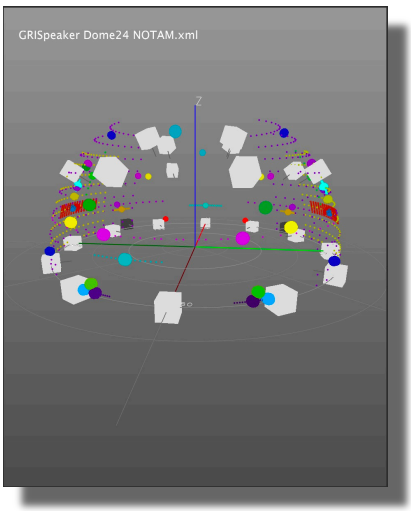
- *Speakers and Sources*
- *Inputs/Outputs*
- *Parameters*
- *Client*



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



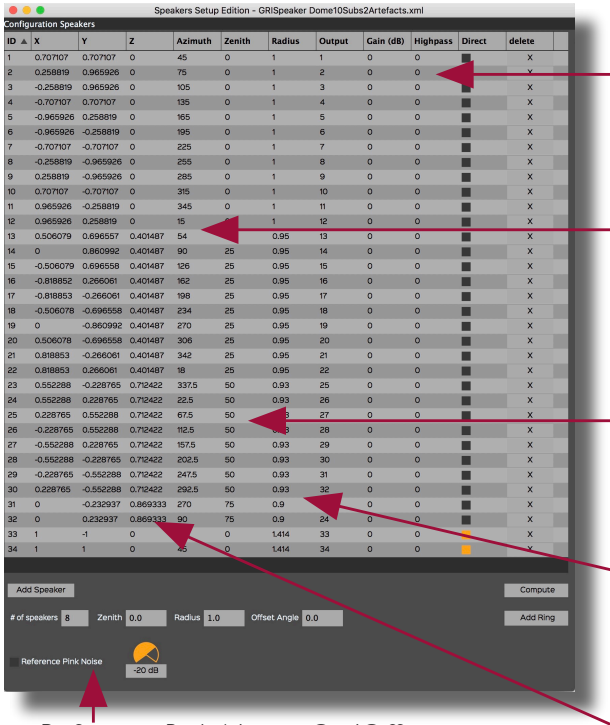
As you can see, all the sources remain at the exact same coordinates. They will be played by different speakers but heard at the same location in the concert hall.

4.8. 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).

4.8.1. Speaker parameters

A speaker configuration is 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).



- 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.

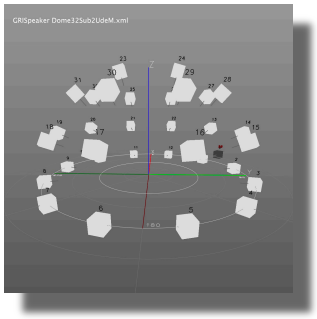
- *Reference Pink Noise*: On/Off,
- Default -20 dB, to calibrate the outputs.

4.8.2. 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 and can be put anywhere, since they are independent of the spatialization.

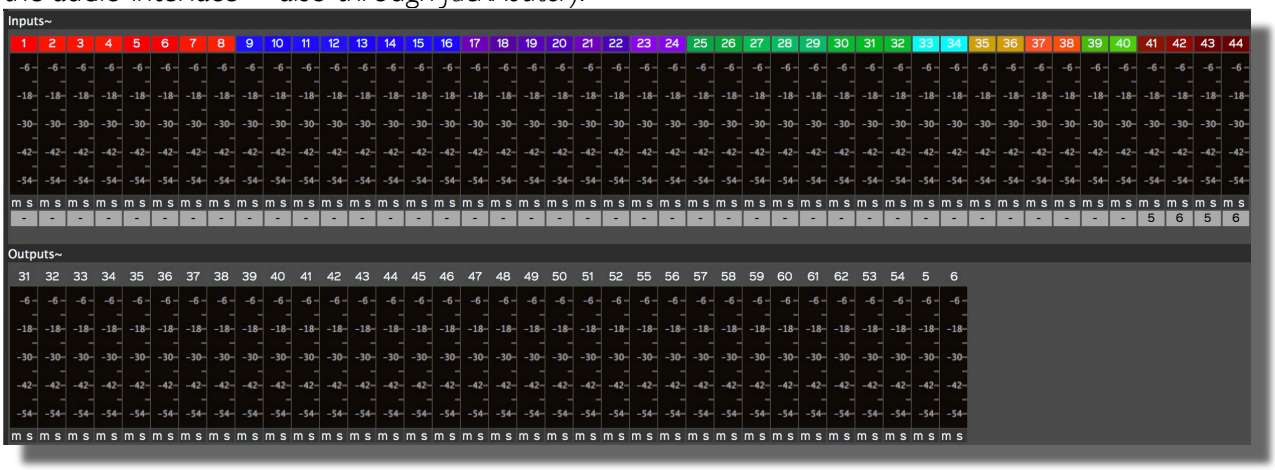
4.8.3. Show and select/deselect a speaker

- 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.
- Clicking on a speaker or its number selects it; Right-clicking deselects it.



4.9. Inputs and Outputs

The *ServerGRIS* receives 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*).



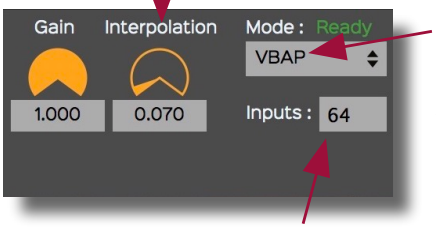
In this example, the inputs are made of 4X octophonic tracks (1-32) plus 4X stereo tracks (33-40) and 4X low frequency tracks (41-44, assigned to direct outs 5-6) for a total of 44 tracks identified by different groups of colours, distributed on a 32-speaker dome with 2 subs (outputs 5-6). The VU meters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

4.10. Parameters

4.10.1. 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*: this is a smoothing factor. If you hear some glitches when a sound is moving from one speaker to the next, you can adjust this value for smoother transitions. The higher the value, the higher the CPU usage.



- *Mode*: A set of different spatialization modes is accessible here: *VBAP* (Vector Base Amplitude Panning); *DBAP* (Distance Base Amplitude Panning); *BINAURAL* (based on 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.

N.B. Keep Interpolation value as low as possible in order to get precise localization of the sources.

4.10.2. Algorithms

ServerGRIS uses a number of algorithms and there will be more in the future.

VBAP

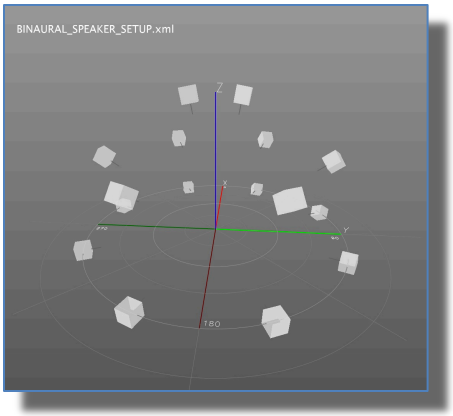
Vector Base Amplitude Panning (VBAP) is an algorithm created by Ville Pulkki in 2001. It allows the user to spatialize the sound under a dome of speakers by placing the sound according to the relative amplitude of three speakers (instead of two in 2D spatialization). Therefore, the dome is made of triangles of speakers. This way, the sound can travel smoothly within the dome, with no bumps or holes. *VBAP* is the first algorithm we implemented in the *ServerGRIS*.

DBAP

DBAP is not yet implemented. It will allow the placement of a source anywhere in a cube of speakers. Stay tuned, we are working on that.

BINAURAL

This algorithm was implemented to help users to work on 3D spatialization from home when access to a speaker dome is limited or none existent. It is based on a *Head Related Transfer Function* (HRTF). HRTF is a function that reproduces the way we perceive the localization of sounds in the space. It is a set of phase and amplitude calculations for listening on headphones. Primarily, it is designed for 5.1 reproduction or immersive listening on headphones, situations found in the gaming and the VR industries. In order to lower down, as much as possible, the amount of calculation (HRTF can be very demanding in terms of computing power), *ServerGRIS* first calculates a *VBAP* spatialization over 16 speakers and then transfers the result to *HRTF*. Don't worry, even if your speaker setup is bigger than 16 speakers, no information is lost in the process. The *BINAURAL* Speaker Mode looks like this:



N.B.: The maximum amount of Server inputs in BINAURAL mode may vary according to other project parameters, such as interpolation.

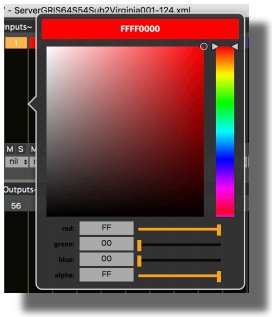
BINAURAL modes use the outputs 1 and 2 of the selected audio interface (even if these outputs are not used in the Speaker Setup).

STEREO

There is 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, no elevation). The Span automation are cancelled in this mode. *STEREO* mode uses the outputs 1 and 2 of your system.

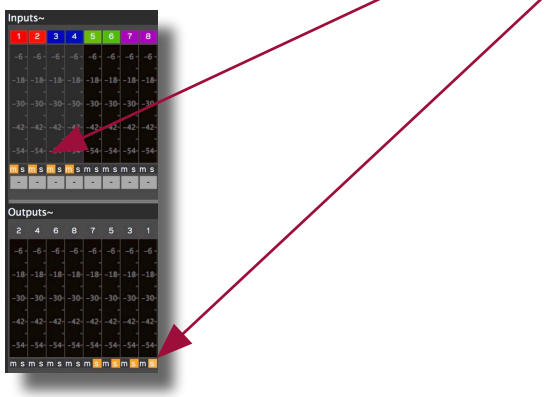
4.10.3. Input Colour

The colour of the inputs can be set to any value by double-clicking in the colour panel. 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 design your colour set carefully.



4.10.4. Mute and Solo

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

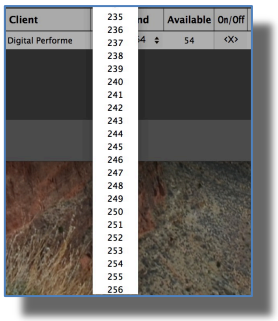


4.11. Client

This zone informs you which DAW is connected to the server and which OSC numbers it is 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 32 channels per client, however this can vary since some DAWs indicate only the channels they actually use (like here with DP).

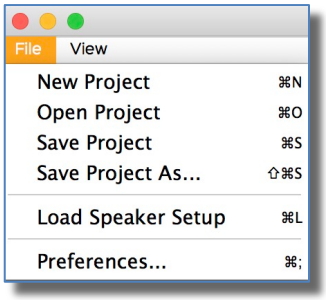
Client	Start	End	Available	On/Off
Digital Perfo...	1	20	20	<->
REAPER	21	148	128	<->

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



4.12. File Menu

In the file menu you can pick all the operations you normally find in relation to a project, hence you can:

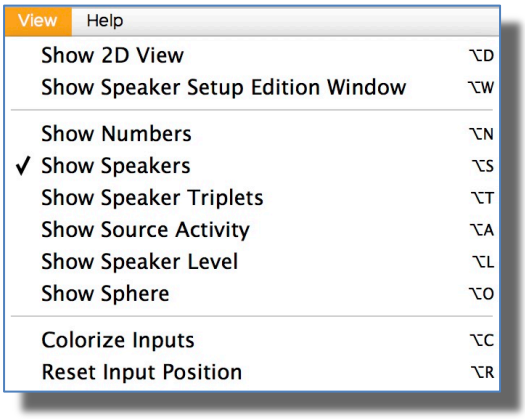


- Create a New Project;
- Open an already existing one;
- Save or Save As — make a copy;
- Load Speaker setup;
- Set the Preferences (See *4.2. Sampling Rate and Buffer Size*).

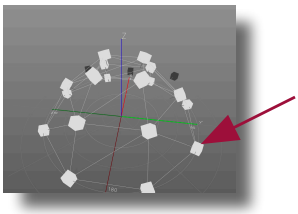
N.B. Loading a Speaker Setup that includes 64 speakers or more could take a while (several minutes for a 128 speakers setup). Be patient!

4.13. View Menu

Under the View Menu different perspectives allow the magnification of the representation of the speakers and sources in real time capture.

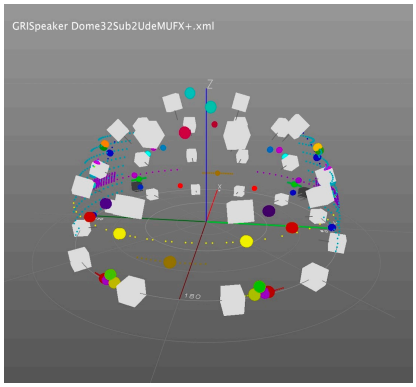


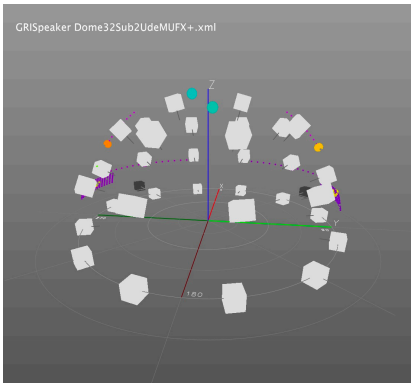
• *Show 2D view*: A 2D view from the top of the dome is given with only the sources showing.
• *Show Speaker Setup Edition Window*: A window access to all the parameters taken into account for a valid configuration of speakers (See *4.7. Speaker Setup*).
• *Show numbers*: Show or hide the numbers of the sources and speakers.
•*Show Speakers*: Show or hide the speakers in the 3D view.
•*Show Speakers Triplets*: Show or hide the triplets in the 3D view. Triplets reveal how the speakers are connected to each other, a very useful tool for troubleshooting.



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. There might be a silence when the sound moves from one level to the next.

• *Show Source Activity*: This option allows you to see the trajectories of the sources (big dots) as well as their energy, displayed according to the Azimuth and Elevation Span (small dots) sent via the *SpatGRIS* plugin. Note that there is nothing to see when the DAW is stopped. The threshold is set at -70 dB. When not selected, all the sources are shown in a static 3D view, even when the DAW is stopped.



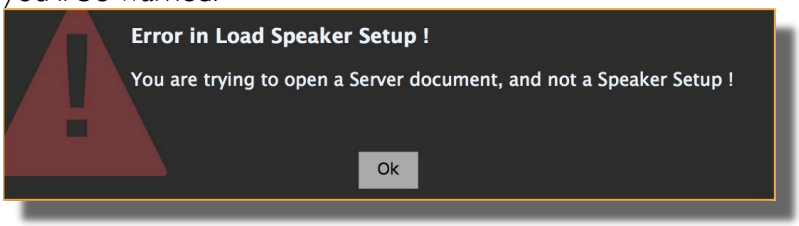


Show Source Activity Off: shows the static position of all the sources in stop position	*Show Source Activity* On: shows the real activity of the sources in play mode

• *Show Speaker Level*: Shows 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 option allows you to set all the inputs to a different colour within the visible spectra from red to purple. Be careful, it erases all the custom colours already in place.
• *Reset Input Position*: When changing the project in your DAW, sources may stay in place until you use this option to clear up the 3D view.

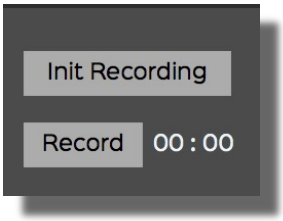
4.14. Naming and Saving

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 and they are therefore 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.
If you try to open a Server document with the command Load Speaker Setup (or the opposite), you'll be warned:

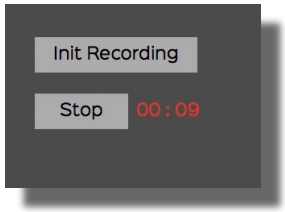


4.15. Recording

When the automation of the spatialization is completed, you have two options:



1. To play the piece "live" with your DAW and the *ServerGRIS*.
2. To 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: press *Init Recording*. A popup window will then open, allowing you to specify the location of the recorded files.

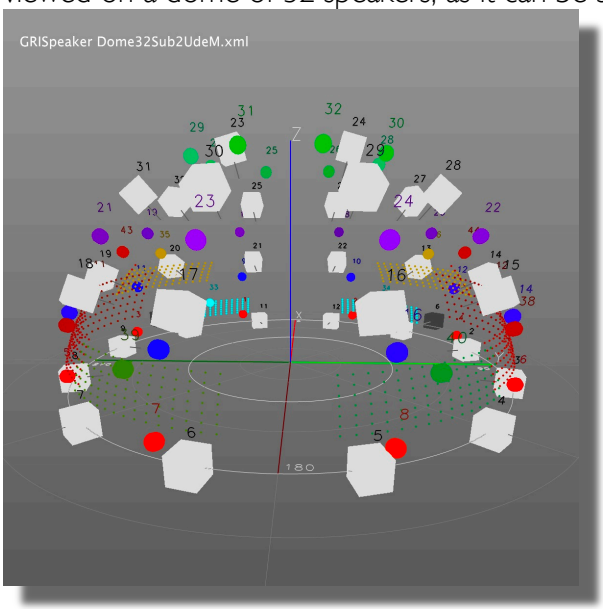


Afterwards, pressing the *Record* button (once) will start the recording and the timer; and pressing it again will stop the process. You can then import the separate mono files into any DAW to play your piece in concert.
These two strategies differentiate one from another by presenting both a fixed and perhaps safer version in the case of a recording, as well as an adjustable version with greater flexibility for the purpose of a concert.
N.B. Please note that you can record the many outputs used in VBAP mode, or the stereo outputs (outputs 1-2) in BINAURAL or STEREO mode.

4.16. Representations

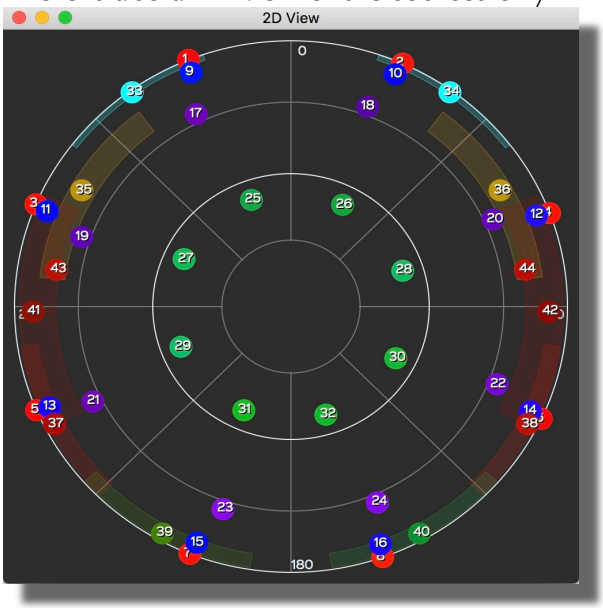
4.16.1. 3D Representation

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:



4.16.2. 2D Representation

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



4.17. Performances

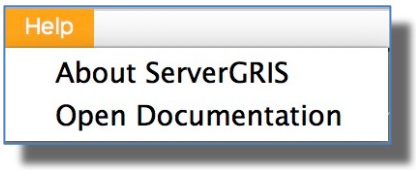
The performances of *SpatGRIS* in audio mode or the *SpatGRIS*/*ServerGRIS* combination depends a lot on the different settings in your project. As a general statement, let's say that a project with 64 audio channels sent to 64 speakers, on recent computers, will work perfectly well. That being said, 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:
• Spans (Audio or OSC modes): spans distribute the signal to more speakers than the normal settings, and therefore the activity increases very rapidly in the setup. A setup with no spans can easily divide by two or three the performance of the same setup with active spans.
• Interpolation (OSC mode): the interpolation factor helps some sounds achieve a better transient time when they move from one place to the next. Therefore, the higher this parameter, the higher the number of speakers involved in the process since it takes more time to reach a speaker and to leave it (not to mention that it also blurs localisation).
• 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!
• Number and kind of tracks: multiplying of the number of tracks by the number of speakers actually determines 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/system version, etc.

What to expect then? Experience it for yourself!

4.18 Help Menu

The Help menu comprises information about the GRIS and this manual, under the Open Documentation option.



5. Combination of Audio and OSC modes at the same time

N.B. Warning: this setup is for advanced users only and it assumes that this manual has been read and understood since what we describe here needs a perfect understanding of the *SpatGRIS* and *ServerGRIS* functions and parameters.

The way the *VBAP* algorithm is designed puts all the sources on the surface of a dome of speakers. Therefore, it is not possible to put a source inside or outside the dome. We are currently working on a new algorithm, based on a *Distance Base Amplitude Panning* (*DBAP*), that will allow to put a source anywhere in a speaker setup. In the meantime, here is a suggestion for those who would need a combination of direct panning and *VBAP*.

5.1. PanSpan and OSC

The *PanSpan* mode in *SpatGRIS* allows to place a source inside or outside the circle of speakers. Therefore, if your speaker setup designed in *ServerGRIS* is made of circles of eight speakers or less[2], it is then possible to use a combination of direct outputs and VBAP spatialization.

5.2. ServerGRIS needs OSC information

To send a source to its outputs, *ServerGRIS* needs to receive *OSC* information from the *SpatGRIS*. Therefore, to use *SpatGRIS* in *PanSpan* mode within the *ServerGRIS*, it is necessary to send the *OSC* information AND the audio information, but both on separate tracks in the DAW.

5.3. An example with 9 sources

In the DAW:

- 8 mono sources each with a *SpatGRIS* in *OSC* mode with numbers from 1 to 8.
- 1 mono source with 2 SpatGRIS on two different tracks, one in *OSC* mode, with numbers from 9 to 16, and one in *PanSpan* mode.

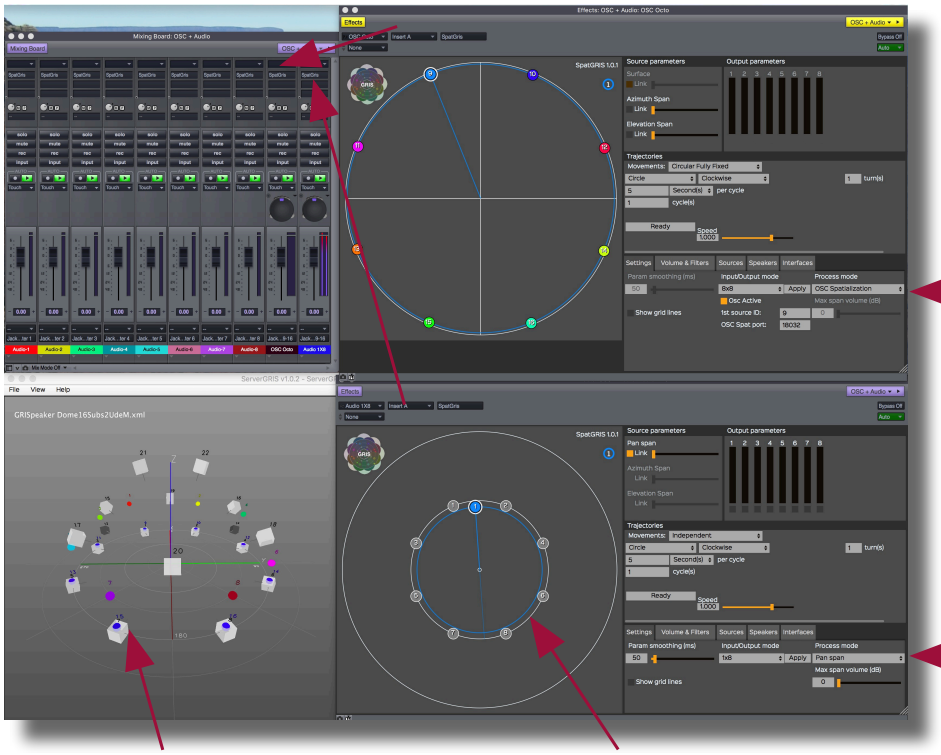
The first 8 sources are spatialized in *ServerGRIS* through the VBAP mode like expected (see the image below with the sources no 1 to 8 in different colours). The ninth monophonic source has first to send localization information to the ServerGRIS before anything else. Therefore, it is necessary to create at first an octophonic track with a SpatGRIS in OSC mode with the same audio and OSC numbers than the following track that will contain the audio itself. The OSC localization has to be placed on the eight speakers needed. This octophonic track is passive and there is no audio in it.
Then, a mono to octophonic (1X8) track has to be created next with the ninth mono source and a *SpatGRIS* in *PanSpan* mode 1X8. It is now possible to move this source inside or outside the circle of eight speakers.

N.B. Please note that since it uses the *PanSpan* mode, the source no 9 will not be shown in the *ServerGRIS*.

We present only one example here, but any combination of sources could be achieved in such a setup[3].

[2] The limitation of eight speakers is related to the maximum number of outputs per track allowed by DAWs in general. In Reaper, this maximum is sixteen with the SpatGRIS.

[3] Except for Logic which has only one surround output. And except for Ableton Live who can't accept multichannel files.



SpatGRIS in OSC mode on an empty track

SpatGRIS in PanSpan mode with a mono source

The SpatGRIS in OSC mode puts the sources number 9 to 16 (in blue) over the circle of 8 speakers

The SpatGRIS in PanSpan mode allows the source no 9 to be spatialized inside or outside the circle of speakers

N.B. The source no 9, spatialized with the *SpatGRIS* in *PanSpan* mode shows the number 1, as it can be seen in the above image and not number 9. Remember that *PanSpan*, contrary to *OSC* mode, which uses and absolute numbering system, uses a relative numbering system related to the number of outputs available on each track. So, on an octophonic output, the numbers shown by *SpatGRIS* are always from 1 to 8.

5.4. Limitations

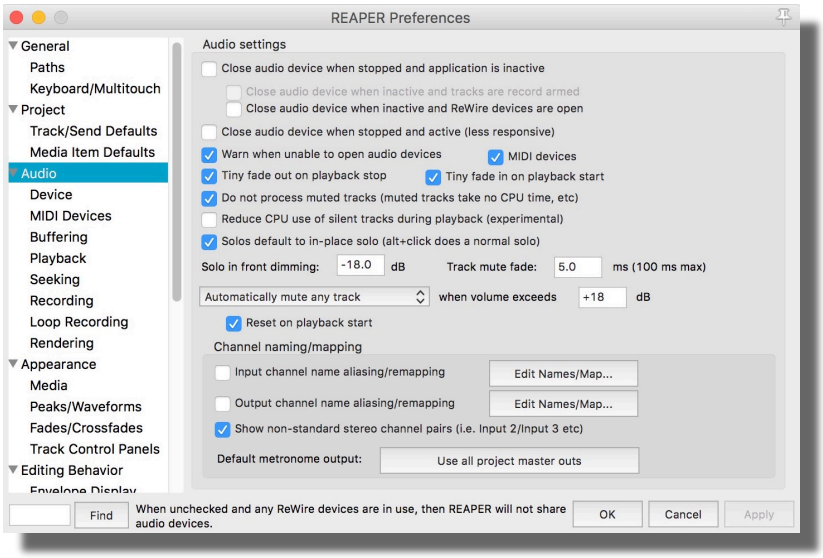
SpatGRIS in *PanSpan* mode is limited to 2D spatialization. Therefore, in such a setup, it is possible to move the source within the circle of eight speakers in the 2D mode, but the elevation is not possible for the source no 9. But since there is no combination limitations, the source no 9 can also be spatialized in *OSC* mode, independently of the *PanSpan* one!

6. 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 does not work 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.

6.1. Reaper: Device Preferences

In the Preferences of *Reaper*, under Audio of the Project tab: Uncheck *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.



6.2. 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*.

6.3. Digital Performer

6.3.1. Assign DP to anything but your audio interface

N.B. Crash with DP and ServerGRIS when both are assigned to the same audio interface.
When *ServerGRIS* and DP are both independently assigned to the same interface, they crash each other. Prior to open ServerGRIS, open DP and assign it to anything but your audio interface, and close DP. Then open ServerGRIS and DP, assign it to *JackRouter* and everything should work fine.

6.3.2. Enable/Disable

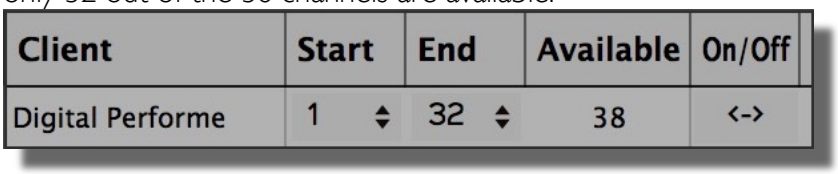
DP has a feature called *Enable/Disable* track. It is used to lower down the CPU usage, since it removes the track and all its plugins from the calculation. But it has a direct consequence on the *ServerGRIS*: the disabled tracks are not seen by *JackRouter* anymore, and DP reallocates the following tracks to the number previously used by the disabled 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.

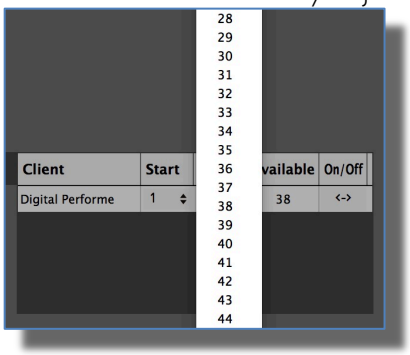
N.B.: We recommend that you don't use the disable function in DP with ServerGRIS.

6.3.3. Number of channels available

Digital Performer, contrary to all other DAWs, allocates channels dynamically to *JackRouter*. This means that if you have a 24 channels session, only these channels will be seen by *JackRouter* and therefore by *ServerGRIS*. Unfortunately, this communication process between DP and *JackRouter* is not always working properly. In a situation where you move from one session to the next, it is possible that the next session doesn't show the proper number of needed channels like here, where only 32 out of the 38 channels are available:

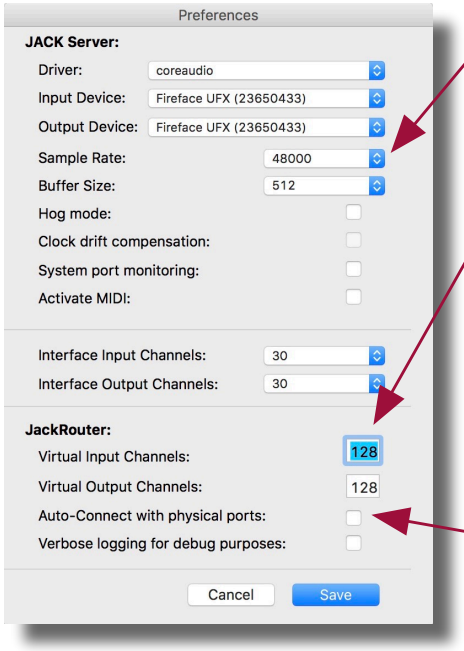


You will have to manually adjust the *End* number to 38 (or to any number that the session needs):



6.4. Warning about Jack

Some of the Jack's Preferences are not accessible from the *ServerGRIS* but they are set to the right values by default by the Server installer.
If for some reason, you need to access the Jack Preferences, do so by opening *JackPilot* (in the Jack folder) and go to Preferences in order to adjust them as follows.
N.B. Only experienced users should change these settings here. This could lead to strange behaviours in the setup.



Sample Rate and Buffer Size

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

Number of virtual inputs and outputs

The default value is 128 channels each (unused outputs don't take any CPU). Since the amount of channels may vary according to your project, simply ask yourself how many audio channels will be needed to make your project work; or how many channels are going out of your sequencer and/or how many speakers are connected to your system.

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.

Take the plunge and have fun!

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