

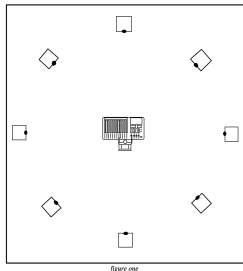
# Correction of Spatialization Issues in Acousmatic Music: Remedying Incompatibility Between SpatGRIS and Logic Pro X

John Levee  
Stetson University

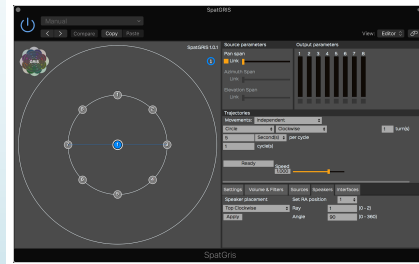
## Abstract

In this project, a technical solution for incompatibility among software programs involved in the spatialization of sound in multichannel speaker arrays was designed and implemented. Acousmatic music is a genre of electronic music intended for playback by a group of loudspeakers with the central concept being calculated ideation by the composer on how sound moves in space. Dr. Robert Normandeau, a pioneer in both acousmatic composition and sound spatialization research, describes the genre as “Cinema for the Ear.” Through his efforts with Groupe de Recherche en Immersion Spatiale (GRIS), Dr. Normandeau created a software plugin, SpatGRIS, which allows composers to send sounds around the space to come seemingly from anywhere in relation to the listener. This allows acousmatic composers to send sounds around, over, or through the audience for a completely immersive experience. Through use of SpatGRIS in conjunction with Logic Pro X, one of the most globally popular Digital Audio Workstations, the plugin has proven useful to create complex sonic movements in acousmatic compositions produced throughout the completion of this research. However, when trying to export these projects in their entirety for playback and sharing, both programs labeled and exported channels differently in octophonic (eight channel) compositions. This difference resulted in sounds from the composition being spatialized incorrectly. Therefore, a method using a free third-party software, which can easily remedy this error and correct the final recordings to their originally intended state, was created to serve as solution.

## Octophonic Ring



## SpatGRIS



## The Problem

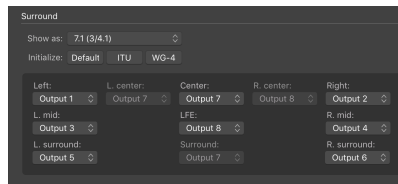
When using SpatGRIS in combination with Logic Pro X (a globally popular DAW) to compose acousmatic music for octophonic ring, an incompatibility exists, and the spatialization displayed in the plugin differs from the final spatialization heard upon playback. Not only is this difference heard during the composition process, but it changes yet again after exporting the final project as an interleaved file. Sounds are not only heard in the wrong place in the physical space, but some sounds are also occasionally omitted entirely. This makes it impossible not only to compose the music, but also to appropriately share it with an audience.

## Methods

In order to determine how to best correct the spatialization issues, a pattern of incorrect spatialization had to be discovered. Therefore, each channel was examined individually as compared to the other seven. Waveform analysis was used to determine which channel (and therefore which speaker) a particular sound was appearing in at a given time. This was compared to the channel that the sound was expected to appear in if the spatialization was accurate and as intended by the composer. Repeating this process established a pattern that showed certain channels always being mistaken for certain other intended channels. Channels 1 and 2 were always correct, but the intended channels 3-6 had been shifted to 5-8 respectively, and the intended channels 7-8 had been shifted to channels 3-4. The channels were simply out of order after exporting.

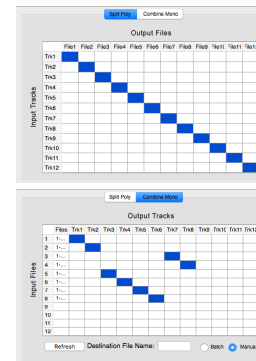
## The Solution

*During Composition*  
I/O assignments within the DAW must be configured to allow the composer to hear accurate spatialization corresponding to the movements generated in SpatGRIS.



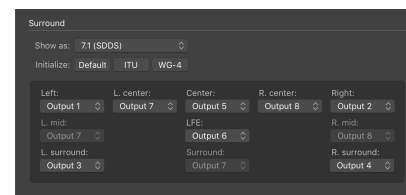
## After Exporting

The 8 channels of the multichannel file must be split into separate monophonic files and recombined with a new ordering.



## Playback

The new interleaved file must be played with new surround output preferences in Logic Pro X.



## Conclusion

Acousmatic music has been described as “Cinema for the Ear” by Dr. Robert Normandeau, for the music aims to paint a picture or scene in the head of the listener using only sound. To do this, the music has to be totally immersive, and the human brain's capacity for localization of sound allows this to be done through the calculated spatialization of the audio. Because spatialization is such a central focus for acousmatic composers, it is of utmost importance that there is a way to accurately place sounds in a space during composition and playback. Although Logic Pro X and SpatGRIS both have the ability to produce spatialized multichannel audio, composers seeking to produce works for playback on octophonic ring will find incompatibility issues that compromise the accuracy of their intended spatialization. Through use of a free third-party software, Wave Agent, composers can easily remedy these compatibility issues and properly share their music with a wide audience. Conveniently, this method places the final work into a file that can be played back with the 7.1 SDDS surround format, which is used in surround sound theatres worldwide.

## Future Work

Research should be conducted to investigate if similar incompatibilities exist when working with other multichannel speaker arrays and surround output formats. Additionally, will the same solution apply to fixing these incompatibilities, should they be found to exist? Further, no easy way exists to convert a piece from diffusion for one speaker array to another, while maintaining the same spatialization. A method for this has also been developed through completion of the current project, but it must be concisely communicated into a document to be shared with the public at a later date.

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