Sketching Sonic Trajectories

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ABSTRACT

Sketching Sonic Trajectories (SST) is a software tool for IanniX that allows multitrack audio reproduction and facilitates advanced graphic control of spatialization for sound design and musical applications. Developed within the New Technologies and Musical Languages Department of the Conservatory of Cuneo (2019) and Padua (2020), this application offers a user interface that works in combination with IanniX and a component of ICST Ambisonics tools. SST focuses on certain characteristics such as suitability for studio/live projects, flexibility in terms of different electroacoustic setups, and a usability-oriented graphic design approach to sound spatialization.

INTRODUCTION

In current artistic and design practices with electroacoustics, multichannel audio systems are often involved (Otondo, 2008; Peters, Marentakis and McAdams, 2011). Several algorithms such as WFS (Berkhout, de Vries and Vogel, 1993), Ambisonics (Malham and Myatt, 1995), and VBAP (Pulkki, 1997) have been developed to simulate the position and movement of sound in space accurately, and different approaches have been adopted regarding how to use them in design and compositional processes. In addition to standalone applications, certain implementations can be integrated in software environments (e.g., Max/MSP or SuperCollider) and DAWs. Among the notable tools are Ircam Spat (Carpentier, Noisternig and Warusfel, 2015), ICST Ambisonics (Schacher, 2010), HOA Library (Sèdes, Guillot and Paris, 2014), Zirkonium (Wagner et al., 2014), and SpatGRIS (Ledoux et al., 2018); these offer a high degree of customization. Common software plugins that rely on multitrack sequencers have the advantage of an easier approach, but limited control over the design of spatial movements; their representation is often trivial consisting in the variation of single parameters versus time. In different ways, these applications face the difficulty of interfacing the user with the notation and the representation of space as a compositional parameter.

SST DESIGN

Various reasons led us to the creation of SST: the desire for an immediate way to formalize the spatial parameters, the facilitation of the design of complex trajectories in multichannel works, the search for a handy and easy-to-use instrument. We believed that this kind of approach could restore the focus on design/artistic issues instead of distracting the user on technicalities.

Regarding the spatialization algorithm, we have chosen to consider the ICST Ambisonics tools because they offered advantages in terms of customization, suitability for a wide range of contexts, and Max/MSP integration. In particular, the uncoupling of audio channels from loudspeakers makes the system adaptable to different speaker setups. In real-life scenarios, loudspeaker configuration is usually different in relation to the host organization's choices and other factors. For this reason, we consider the said Ambisonics feature as a strong upside.

As for the graphic design features, we have decided to use IanniX and discard the objects included in the ICST Ambisonics package. IanniX proposes a poly-temporal and multi-formal open-source sequencer that is useful also in the creation and the performance of message-emitting control scores for sound spatialization (Scordato, 2020). Through the basic functions of the IanniX GUI, it is possible to notate and store various data such as the 3D position of sound sources and speakers, to design custom spatial movements and patterns with precise event timing, and to visualize a clear representation of global behavior in time and space; this approach significantly facilitates the spatialization design process. Instead, the combined use of ICST `ambimonitor~` and `ambicontrol` objects provides flat representations of the current position of sound sources and performs only simple and stereotyped motions such as rotation, translation, and random walks within boundaries. In addition to this, trajectory descriptions are given in a breakpoint format that forces the user to a clunky approach, especially in the perspective of a macro-form.

In order to interface IanniX with Ambisonics, we have decided to develop a patch in Max/MSP also including a multitrack audio reproduction device for dynamic playback of audio files; this choice was intended to facilitate the user interaction with IanniX and to avoid dependence on other software for audio playback purposes only. However, the user is given the option of choosing the preferred audio input which could also be external hardware or third-party software (through Jack[1] or similar).

FEATURES AND IMPLEMENTATION

SST was created in Max environment. The main window allows the user to enable audio I/O and to access four sub-windows: graphic score management, OSC implementation, Ambisonics preferences, and I/O configuration.

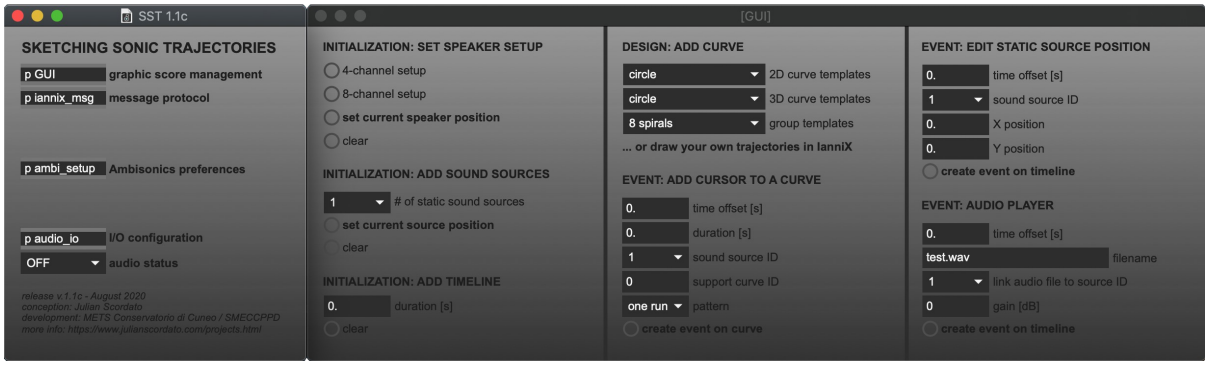

Figure 1: Main window and graphic score management

The *graphic_score_management* (see Fig. 1) includes the core functionality to interface the user with the IanniX score in a simple way, facilitating the creation of IanniX objects, their arrangement within the spatialization score, the setting up of related control messages, and the triggering of audio clips. This window is subdivided into three sections: initialization, trajectory definition and templates, and timeline management. After loading the default IanniX score, the first step for the user should be the initialization of the speaker setup, which can be chosen from quadraphonic or octophonic, or set directly from the IanniX score: a *trigger* corresponds to the speaker position in the 3D spatial representation. As for the sound sources, two options are possible: static sources (as *triggers*) are created in the *Initialization:_add sound_sources* and set on a global timeline through an *Event:_edit_static_source_position*; dynamic sources are represented by cursors with their own parameters configured through the *Event:_add_cursor_to_a_curve*. Trajectories for dynamic sources can be chosen from the curve templates or created in IanniX (see Fig. 2). In addition to the organization over time of static sound sources, the timeline can also be used for defining audio playback controls through the creation of an *Event:_audio_player*. All commands conforming to the IanniX scripting language[2] are sent from the SST GUI to IanniX through the OSC protocol.

The *iannix_msg* window contains a documentation on the syntax of OSC messages used for communication from IanniX to Max; Ambisonics-related data are reformatted to the `ambipanning~` control syntax. Additionally, this window shows how to control IanniX transport from a mobile device via TouchOSC[3].

1 https://jackaudio.org
2 https://github.com/buzzinglight/IanniX/wiki/4.-Messages-and-commands
3 https://hexler.net/products/touchosc

Ambisonics parameters can be configured from the *ambi_setup* window. These include output gain, *distance encoding algorithm* and *directivity* (see `ambipanning~` documentation).

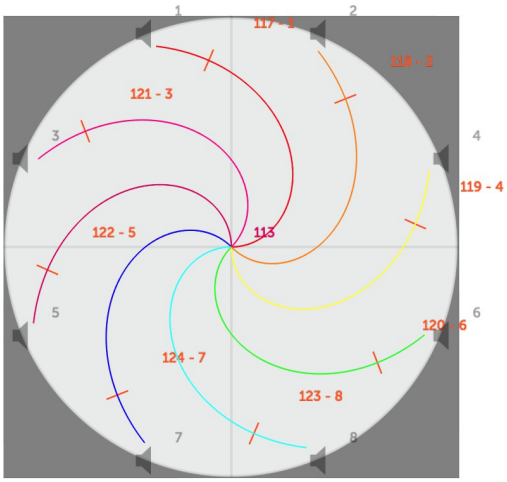

Figure 2: Score example with 8 dynamic sources

The Ambisonics sources receive either the correspondent ADC inputs or the integrated audio player consisting of 16 modules based on the `sfplay~` object with amplitude control. For testing purposes, a white noise signal can be routed to source 1. Users can select the audio input from a menu within the *audio_io* window; DSP status and I/O mappings can be accessed by double-clicking on the `dac~` object.

The block diagram in Fig. 3 illustrates the interfacing of the components discussed above.

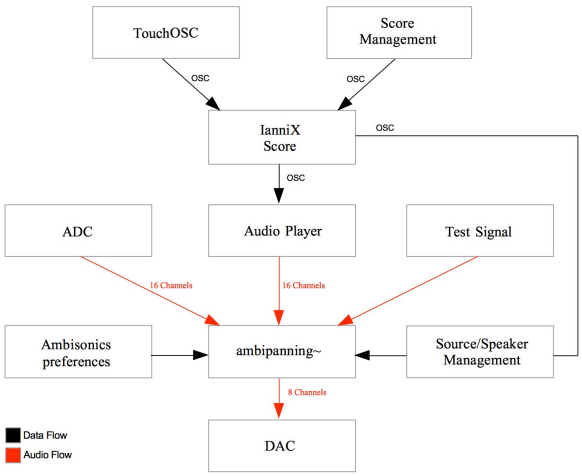

Figure 3: SST block diagram including related components

RELEASE

SST tool is released as an application for OS X and Windows[4]; also included in the package are a Max collective file and several examples of IanniX scores.

CONCLUSIONS

Intended as a part of a self-sufficient system, SST simplifies operation in a specific usage of IanniX and combines its notational and performance features with multitrack audio reproduction and Ambisonics spatial audio processing. The proposed approach to sound spatialization and spatial parameter notation should allow the

4 https://www.julianscordato.com/projects.html#sst

user to design and articulate advanced movements of the sources to achieve a sound projection without getting entangled in excessive technicalities.

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