SPATIALIZED POLYPHONIC GRANULAR

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ABSTRACT

This paper aims to present a novel interface for composing and performing with granular synthesis. The described system allows handling individual spatialization for independent groups of voices and controlling various parameters of the granular synthesis in real-time. The DMI tries to create a new interaction, outside of the norms of traditional controllers, giving the user the freedom to move the groups of grains over the space and at the same time curate the sound on a fundamental level. This paper describes the sound synthesis and the interface design as well as its various functions.

1. INTRODUCTION

Granular synthesis is a relatively new composition tool, with the rise of computer power software-based synthesis became accessible to artists and composers, and GS is used extensively nowadays. Besides, electroacoustic music introduced us to new terms and ideas about how the composer faces the sound. Musical parameters such as density of sound, timbre, space, etc. became a reality for composition and expressiveness. This created the need to find new interfaces for musical expression for this type of synthesis.

2. INSTRUMENT DESCRIPTION

2.1 Polyphonic Granular synthesis in space

The concept of granulation of sound was firstly proposed by Gabor as ‘acoustical quanta’ and later on by Xenakis as ‘grains of sounds’. In the ’80s the first software for granular was made by Roads[1][2][3]. Early experimentation formed different techniques such as asynchronous GS, synchronous GS, FOG synthesis, etc. And today, there are programs and software written in various musical and programming languages. Most of them are VSTs or standalone programs and the UIs are based on knobs, sliders, XY controllers, etc. The user controls them with the mouse and the keyboard in most cases. Other interfaces for HCI can be found in GS like GR-1 or Collidoscope[4].

The presented DMI is written in the musical programming language MAX/MSP[5]. The main goal for this DMI is to deliver a qualitative granular engine with minimal and straightforward controls. Previous works for controlling the GS in space and creating grain clouds can be found here[6].

The engine behind it consists of a polyphonic grain generator. Grains are defined as small-windowed portions of sound with a duration from 10ms to 100ms. Except for the grain size, other parameters of GS are the position in the audio buffer, this can be imaged as the pointer of the audio buffer, the playback speed of the grains, the pitch, the position in the space(if we are choosing the stereo format this parameter is the panning) the amplitude of the grains and the window type. With polyphony we mean the instances of the same grain, we will refer to them as grain voices, these grain voices are forming the grain clouds. In MAX/MSP the polyphony can be created easily with the [poly~] object.

2.2 Users Interface

The main goal of this project was the creation of a new interface for polyphonic GS with direct controls both in spatialization and in the parameters of GS. With a minimal interface, the artist can expand his creativity without spending time understanding the controls and the mappings.

The instrument consists of two trackpads. With the left hand, the artist controls the position of the grains in the space and with the right hand, the artist controls the grain size, the location in the buffer, the playback speed, and the pitch.

On the left, for the spatialization of the grains, it is used the Sensel Morph[7]. With the specific trackpad, it is possible to have 3-dimensional controls with one touch, it tracks the position of the finger (in XY axis) and the pressure of the touch. Additionally, Sensel Morph detects multiple contacts and tracks the pressure sensitivity and position for each contact. In this case, each finger can control several grains in space, thus you can think of the Sensel Morph as a map with coordinates that you can arrange objects in a room.

On the right hand, another simple trackpad is used to control the mentioned parameters of the GS synthesis. Here, the trackpad is divided into 4 smaller horizontal areas and four different vectors are created. With this, fader-like controls are formed for manipulating the four parameters of the GS synthesis (Grain size, Location, Playback speed, Pitch). The difference between the created controller and faders is that the user can ‘jump’ from one value to another without interpolation. For example, if the system has values from 0 to 10 with the presented control the user could choose any value directly, on the other hand with a fader the system would need to read all the previous values to select the requested value. Additionally, the tangible medium to control the trackpad is a pen.

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Figure 1. The UI. On the left, the Sensel Morph is located, and on the right is the trackpad for controlling the parameters of the GS synthesis.

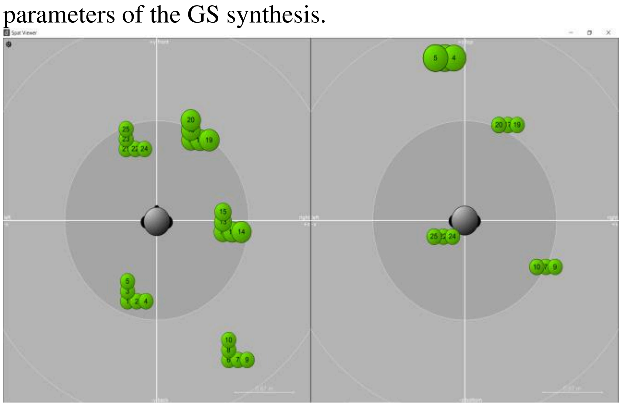

Figure 2. A screenshot of the spat.viewer. On the left side, there are the grain groups controlled by the fingers on XY axis (position in the space), and on the right the same grain groups on XZ axis (levitation).

2.3 Mappings

As we previously discussed, with the space controller (Sensel Morph) the user can control and move into the space the grains of the GS synthesis. The mappings of fingers and grains are direct. For each finger 5-grain voices are mapped, although the number could be changed. With this function, the user can create and control a grain cloud.

Depending on the format for the spatialization that is chosen the pressure sensitivity can be used as levitation control (in the case of binaural for example). The integration between the Sensel Morph and MAX MSP has been done simply by using the object [sensel]. This object gives access to all data of the Sensel Morph directly and is easy to map these data with parameters in the patch. For decoding and encoding in a spatialization format, the Spat5 library[8] has been selected. With the above library, the manipulation and the control of spatialization format are immediate and straightforward and it is a very handy tool for robust results. For mapping, the values from the second trackpad to the parameters of the GS synthesis of the [serial] object were used. Again the mappings into the parameters of GS were direct and they were treated as vectors.

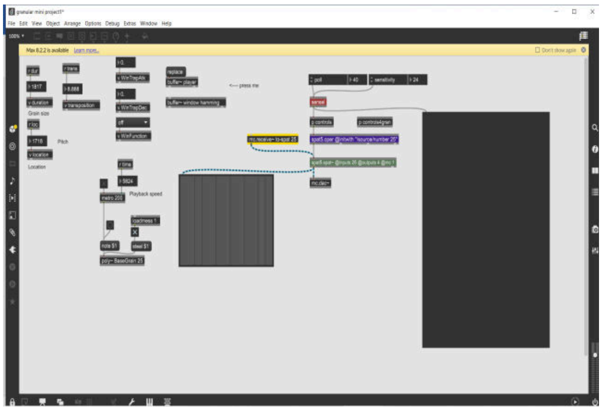

Figure 3. A screenshot of the MAX MSP patch.

3. CONCLUSIONS

This report describes a novel DMI for GS synthesis. Which gives the possibility to the user to spatialize groups of grains into space. The interface has direct controls to support the creativity of the performer/composer. A lot of new features can be added such as choosing the number of grain voices per finger, controlling the distance of each grain, and using real-time audio as an input. Moreover, improvements can be done for a more accurate design of the user's experience[9], by updating the values of GS to the controller (for example to rescale the values of the controller for different duration of the buffers), making the pitch vector logarithmic, and finding a mechanism for muting the grains when there is no contact in the Sensel Morph. And finally, the specific GS instrument could be tested in other spatialization formats to explore its expressivity.

4. REFERENCES

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