AlphaSphere

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ABSTRACT

The AlphaSphere is an electronic musical instrument featuring a series of tactile, pressure sensitive touch pads arranged in a spherical form. It is designed to offer a new playing style, while allowing for the expressive real-time modulation of sound available in electronic-based music. It is also designed to be programmable, enabling the flexibility to map a series of different notational arrangements to the pad-based interface.

The AlphaSphere functions as an HID, MIDI and OSC device, which connects to a computer and/or independent MIDI device, and its control messages can be mapped through the AlphaLive software. Our primary motivations for creating the AlphaSphere are to design an expressive music interface which can exploit the sound palate of synthesizers[1] in a design which allows for the mapping of notational arrangements.

Keywords

AlphaSphere, MIDI, HID, polyphonic aftertouch, open source

1. INTRODUCTION

Synthesizers contain a number of controls for affecting their generated sound, which exist beyond the physical properties of acoustic musical instruments. At the beginning of the twenty-first century the most common interface for triggering and controlling synthesized sounds is the keyboard interface.[2]

This keyboard interface was originally designed for playing notes in an organ and later refined for the piano, with a mechanism which allowed felt hammers to hit steel strings in order to create a tone and affect the volume of it through the velocity the keys are played.[3] This interface is most ideally suited to the excitation of single notes, rather than the continuous control of timbre over time. The pads of the AlphaSphere are designed to offer greater control and tactile feedback than that of the conventional aftertouch mechanism within a keyboard. The design organises a hexagonal lattice of notes into a spherical form that provides a series of notational arrangements. This ergonomic structure affords a range of expressive playing styles, and qualifies a highly configurable musical interface which enables the exploration of user defined mappings.

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2. INTERACTION DESIGN

2.1 Modular spherical form

The spherical form of the AlphaSphere is designed to be ergonomic, fitting between the hands when mounted on a stand or raised on a flat surface. Forty-eight pads are tessellated into six rows of eight pads, shown in Figure 1. The four different size pads are designed to help the user navigate their way around the sphere, by designating six distinct areas on the sphere, which also lend themselves to different sounds and notational mappings (see section 3, musical design).

Figure 1. The modular design of the AlphaSphere

2.2 Tactile Pressure Sensitive Pads

The series of elasticated pressure sensitive pads have a depth of between 17mm to 12mm depending on the pad size being used. The pads are designed to give minimal upwards resistance to encourage exploration of the control and to prevent fatigue during sustained use. The pads are all pressure sensitive on one axis, and have the capacity for velocity sensitivity.

3. MUSICAL DESIGN

3.1 Notational arrangements

The arrangement of pads across the surface of the AlphaSphere affords a flexible mapping strategy for musical purposes. This section summarises a few example arrangements.

3.1.1 Diatonic Scales

The full diatonic scale can be mapped around the eight pads of each row. When a major diatonic scale is mapped around a row of pads, perfect fifths can be played with opposing pads, resulting in circles of fifths spiralling around the AlphaSphere.

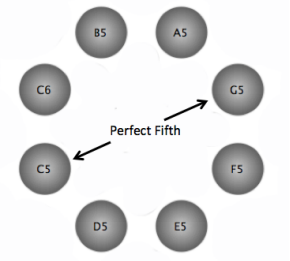

Figure 2. Diatonic major scale on one row of pads

3.1.2 Chromatic scales

3.1.2.1 Chromatic scale (two-rows)

This notational arrangement features four whole chromatic scales which are played from the top-to-bottom between two rows. Figure 3 shows this arrangement starting on note C2.

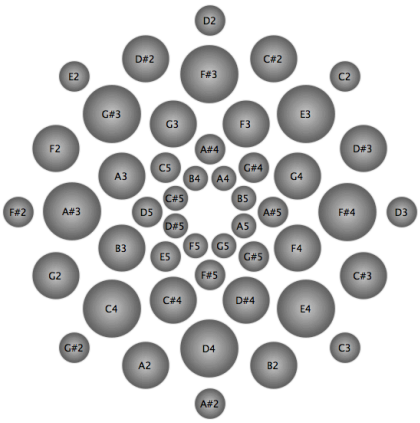

Figure 3. Four chromatic scales mapped between two-rows

3.1.2.2 Chromatic scale (one-row)

Notes progress up the chromatic scale, passing up the eight pad rows in sequence, once all pads in a row have been played.

3.1.3 Harmonic table

In this arrangement the neighbourhood of the pads form the notational arrangement of the harmonic table[4] as shown in figure 5. As this layout is restricted to forty-eight notes, it is better implemented as a selection of two full chromatic scales from root-note to root-note, rather than a full harmonic table.

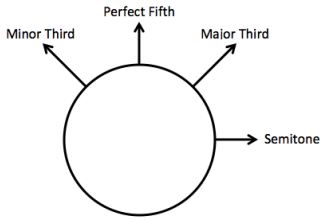

Figure 5. Harmonic table pad arrangement

3.1.4 User defined notational arrangements

As each pad can be mapped independently, users may also explore alternative notational arrangements using the AlphaLive software. The arrangement of pads could allow for innovative intuitive arrangements custom-designed for the spherical form of the AlphaSphere.

3.1.5 Other notational arrangements

AlphaLive includes a series of other notational arrangements including the Wicki-Hayden note layout.

4. SOFTWARE DESIGN

4.1 Overview

AlphaLive is the standalone software application that can be used as the AlphaSphere's MIDI mapping editor, a dedicated sampler, a step-sequencer, and for sending Open Sound Control messages. AlphaLive communicates with the AlphaSphere through the HID protocol, and the messages from the MIDI interface can be remapped using the software. It is an open source application licensed under GNU General Public License version 2, developed mainly using the C++ programming language and the JUCE library. [5]

4.2 User Experience Design

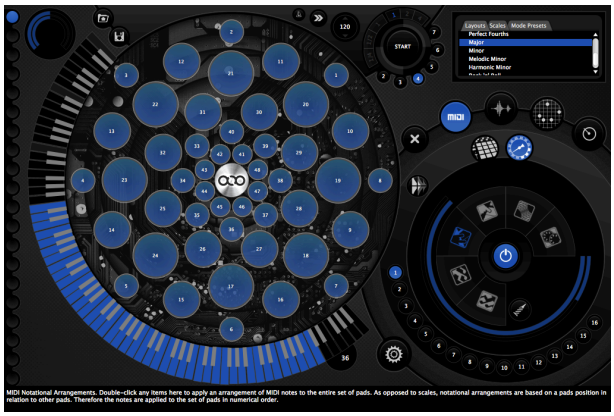

Figure 6. An example of the AlphaLive user interface

The UX of AlphaLive is conceived as an intuitive way of programming the AlphaSphere, by unwrapping the structure of the sphere into a circle (see figure 6). Using the interface the whole pad layout can be selected; or pads can be selected individually, by row, or custom groups, enabling notes, scales or layouts to be arranged as required. The piano interface aids custom notational arrangements to be selected and mapped. Pad sizes help indicate the position of the pad being played and offer visual feedback of the interaction with the AlphaSphere.

4.2 Use as a Performance & Compositional Tool

AlphaLive allows for custom layouts of functions; audio samples, sequences, OSC messages, and multi-channel MIDI data can be mixed within a single layout. This allows for whole musical projects to be accessed from a single interface.

4.2.1 Play modes

Each pad, custom group, row or the complete layout can be assigned into each of the different modes - MIDI, sampler, sequencer and controller. Sampler and sequencer modes feature a series of effects, which can be controlled using the pressure data. Sequencer mode has the ability to record note or sample data played from assigned MIDI or sampler pads.

5. CONCLUSION

The AlphaSphere is a freely programmable instrument for exploring electronic music, which has been specifically designed for its ability to control sound and embody a variety of playing styles. It is designed to incorporate many different notational arrangements, as well as doubling as a compositional tool that can incorporate samples and sequences.

6. ACKNOWLEDGMENTS

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7. REFERENCES

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[3] Sadie, S. *The New Grove Dictionary of Musical Instruments.* Macmillan Publishers, 1985

[4] http://en.wikipedia.org/wiki/Harmonic_table_note_layout

[5] http://rawmaterialsoftware.com/juce.php

8. ONLINE CONTENT

http://www.alphasphere.com