SpiralSet: A Sound Toy Utilizing Game Engine Technologies

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Abstract

SpiralSet is a sound toy incorporating game engine software used in conjunction with a spectral synthesis sound engine constructed in Max/MSP/Jitter. SpiralSet was presented as an interactive installation piece at the Sonic Arts Expo 2008, in Brighton, UK. A custom made sensor-based interface is used for control of the system. The user interactions are designed to be quickly accessible in an installation context, yet allowing the potential for sonic depth and variation.

Keywords: Sound Toys, Game Engines, Animated Interfaces, Spectral Synthesis, Open Work, Max/MSP.

1. Introduction

SpiralSet is an interactive composition incorporating real-time sound synthesis controlled by a dynamic, animated visual interface designed for "non-experienced" users [1]. The intended accessibility of the project informs the nature of the physical interactions implemented, which require little or no instruction for operation. Simulated physics algorithms[1], and users physical interactions determine the motion of three spheres within a virtual 3D structure consisting of interconnected pipelines, which symbolically represent sonic pathways. The motion, (rate, direction & route) and position of the spheres within the pipeline dynamically control the sonic output, allowing the user to manipulate the spectral landscape and shape the musical structure of the piece. The player engages with the piece using a custom built IR (infrared) sensor interface, allowing them to tilt and rotate the pipeline structure, which subsequently affects the degrees of motion in both the visual and audio domains.

2. Sharing the Composition

SpiralSet is designed as an open work, as discussed by Umberto Eco. Aspects of the project are pre-composed, but with a significant degree of influence over the sound world allocated to the player. Controllable shifts in timbre, rate of modulation, combinations of sound types and overall sonic structure offer the player a "field of possibilities"[2] [2], a common characteristic of sound toys such as Masaki Fujihata's *Small Fish* [3], and Golan Levin's *Painterly Interfaces* [4].

The shape and form of the virtual transparent pipeline, with its optional spiral pathways and inclines, is designed to encourage variable motion of the audiovisual objects. The patterns of motion and positions of each of the three spheres within the pipeline are intimately linked with the progression and development of the sonic materials. The sound engine responds to even small movements of the spheres, providing a responsive and dynamic sonic output that relies on a degree of sensitivity from the player, despite the simplicity of the input control interface.

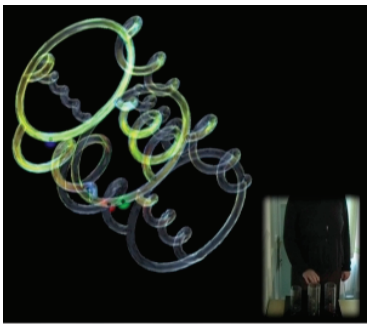

Figure 1. SpiralSet Structure.

Each section of the SpiralSet pipeline has its own attributed sonic characteristics (or sound-set), allowing differing combinations of sonic materials when each sphere enters a different part of the structure. There are eleven sound-set zones in total. These being the three linking rings, four upper spirals, and further four lower spirals. Once a sphere enters a new sound set zone within the pipeline a different timbre is generated, with the corresponding frequency and amplitude datasets being recalled in the synthesis engine.

3. System Overview

The IR sensor interface used for the rotation of the virtual pipeline influences the simulated physical behaviors of the spheres contained within. The height of the player's

Figure 2. IR Interface.

[1] Unity 3D engine incorporates Ageia PhysX physics engine.

[2] A term used by Henri Pousseur to describe his piece "Scambi".

hands above each IR sensor determines the direction and rate of rotation. The interface design shares aesthetic similarities to the virtual pipeline structure.

Each of the three spheres within the pipeline emits a colored light, (red, green and blue). The lights allow each sphere to be easily identified by the player, and generate additively mixed colors that refract around the transparent structure according to their position and proximities to each other. The lighting effects represent the mixing and varied additive combinations of spectra heard in the sound world, reflecting the synthesis techniques utilized in the project. Each sphere corresponds to a dedicated synthesis voice. The additive synthesis sound engine monitors the position of each sphere, with coordinate data used to control and manage extensive frequency and amplitude data sets. The movements of each sphere, and their positions within the pipeline are intrinsically linked with the timbre and development of the sonic materials. When a sphere becomes stationary, its corresponding synthesis voice will remain static. When a sphere moves more quickly, this is reflected with quicker transitions in timbre. The shape of the pipeline allows the player to "capture" and hold a sphere within different sections of each spiral, providing more minimal shifts in timbre, or allowing a sound to be "frozen" at a single point in time.

3.1 Structure

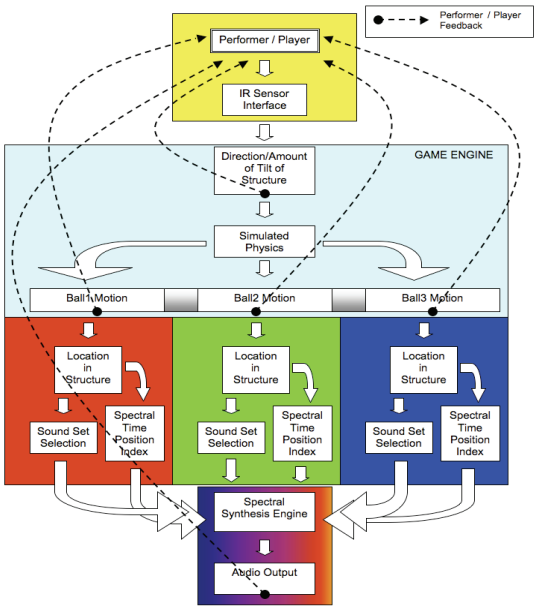

Figure 3. SpiralSet Structure.

Communication between the Unity 3D game engine software [5] and the synthesis engine is achieved through an internal network connection. The visual domain is constructed within Unity 3D. All sound synthesis and sensor data management is dealt with within Max, MSP & Jitter. Max communicates the sensor data to Unity. Sphere coordinate data is communicated from the game engine back to Max for tracking, subsequently recalling spectral data. Jitter matrices are utilized for the extensive frequency and amplitude data sets required for spectral synthesis.

3.2 Sound Materials

Sound materials are derived from the spectral analysis of both acoustic recordings and synthesized tones. The software application SPEAR [6] is used for analysis and to create SDIF files that provide the frequency and amplitude data used for sound synthesis. Vaguely recognizable timbres such as a re-synthesized saxophone motif coexist alongside more abstract electronic sounds. All sounds are transformed to some degree through the re-synthesis process and with the motion and rate of the controlling sphere in the visual domain modulating spectral time progression, even the more familiar acoustic tones may not be recognizable by the player.

4. Final Comments & Future Work

The SpiralSet project is a preliminary exploration of the creative application of game engine technologies for compositional and sonic purposes. Despite its simplicity of design, players at Sonic Arts Network Expo 2008 were observed engaging with the SpiralSet installation for extended periods of time (up to 20 minutes). This demonstrates the projects capacity for variation, nuance and immersive sonic exploration.

The integration of game engine and external sound software applications provides potentially exciting creative possibilities. Future personal projects in this field include further animated interfaces for the real-time control of synthesis engines (see MagNular [7]), and real-time musical notation/score systems using computer game influenced models of interaction, competition and control.

References

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