sutoolz 1.0 alpha: 3D software music interface

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ABSTRACT

The demo sutoolz 1.0 alpha is a 3D software interface for music performance. By navigating through a 3D virtual architecture the musician uses a set of 3D tools to interact with the virtual environment: gameplay zones, speaker volumes, speaker volume membranes, speaker navigation volumes and 3D multi-band FFT visualization systems.

INTRODUCTION

Su-studio, the author of sutoolz 1.0 alpha has combined hybrid environment design, digital architecture, video game design and 3D sound production, to produce a music software interface that can be performed using any analogue controller device compatible with DirectInput in Windows. The software consists of a 3D virtual environment that the musician navigates through, controlling the music with his/her navigation and using a 3D control menu that appears inside this virtual environment when called upon. The interface uses many of the new multimedia presentation standards propagated by the video game industry such as 5.1 3D sound, high resolution 3D graphics along with analogue controller devices such as joysticks. Sutoolz 1.0 alpha aims to transform some of the momentum of video game culture into a new music performance tool.

Interface Concept and Design

To adequately describe the way a performer interacts with the 3D environment we will introduce a number of new terms to describe 3D music environment interaction. The graphic user interface consists of a navigatible gameplay zone[1] with a central desk[2] area that is a platform from where the musician or player[3] can control all the audio tracks called speakers[4]. These speakers emit sound omni-directionally within the virtual acoustic. The distribution of speaker sound in the virtual space is visualized as a speaker volume[5] to illustrate where a sound can be heard in 3D space. There are 8 different speaker volumes placed within the gameplay zone. The circumference of each speaker volume is visually represented by an animated membrane[6]. The diameter of a membrane represents the audible field of the speaker volume and is controlled by the player (Figures 1,2). With the navigational capacity of the gameplay zone and the exceptional freedom of movement within a speaker volume, sound localization is far more complex than the more linear left-to-right panning control found typically in stereo performance software. The player navigates around the gameplay zone running and/or jumping through speaker volumes. The players behavior localizes the speakers in stereo or a 5.1 physical speaker system. Player behavior also determines the rolloff factor[7] of a speaker volume, which in effect is a type of 3D mixer. Sounds are mixed according to the players proximity to a speaker. Dopplar effects[8] are also applied to speakers according to the velocity of player navigation. When two or more speaker volumes intersect, all the speakers within these intersections are auralized when the player moves through them.

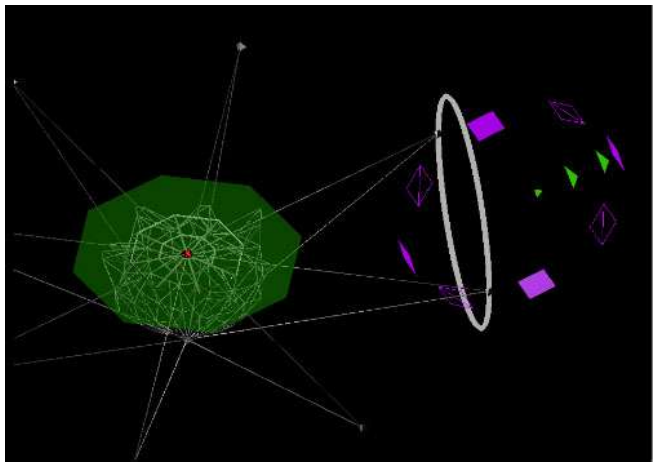

Figure1.Contracted speaker volume.

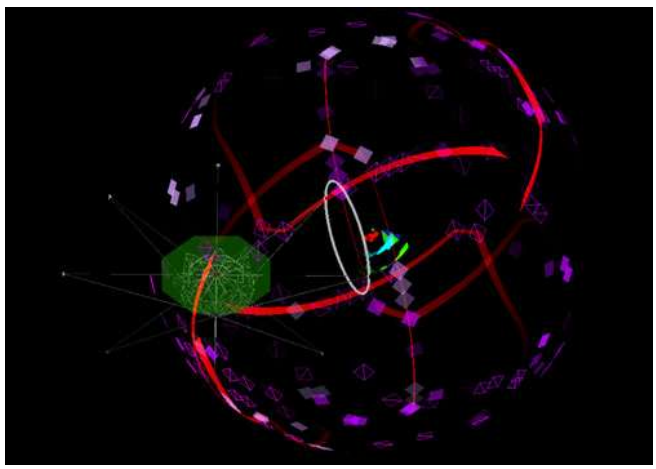

Figure 2. Expanded speaker volume.

[1]Gameplay Zone: the navigatable space the software provides.

[2] Desk: a central platform from which the player can reference (hear) and mix all speaker volumes in a gameplay zone.

[3] Player: a user who can navigate the gameplay zone.

[4] Speaker: an omni-directional sound source that can be triggered from within the gameplay zone.

[5] Speaker volume: the scaleable 3D acoustic space a speaker occupies within the gameplay zone visualised with an animated membrane.

[6] Membrane: a series of 3D objects that animate around the circumference of a speaker volume creating a visual cue of where a sound can be heard in the gameplay zone.

[7] Rolloff factor: the gain of the speaker determined by the proximity of the player to the speaker.

[8] Doppler effect: a type of pitch shifting that is applied to a speaker relative to the velocity of player navigation.

Additional control is provided in a 3D menu (Figure 3). When a player presses on a speaker volume the menu displays itself inside the speaker volume. Here the player can select a sound file, control how much 3D space the speaker volume occupies, mute the speaker and choose between speaker membrane visualization presets. Once a sound file is selected it begins to play with reference to the players proximity to the speaker volume. The speaker volume membrane is made up of polygons spaced around the circumference of the speaker volume. This membrane has two FFT streams sent to it. FFT data from the low band frequencies of the sound file changes the speed of movement of these polygons and the high band frequencies control the amount of blur that is applied to the polygons.

To aid sound previewing and visual decisions of what sounds could fit well together during a performance we have implemented a 3 band FFT reader for each speaker (Figure 4). Each speaker volume has a 3 band FFT reader running inside the circumference in a circular pattern. The length of a sound file is represented visually by the time it takes for the 3 band FFT reader to make a complete circumference of the speaker volume. It is possible in a sense to create a navigatable audio mix without hearing any audio at all.

Midi data can be accepted by the interface but our development path is more aligned with analogue controllers to take advantage of the higher controller value resolution. The popularity and familiarity of using joysticks in 3D gameplay zones, for example the First Person Shooter game genre, is a broad point of entry for users to learn the interface. The type of camera (or visual perspective) used in sutoolz 1.0 alpha is very similar to the cameras used in games like Quake, Doom and Unreal. Customized analogue controllers and sensors compatible with DirectInput in Windows could easily be applied to sutoolz 1.0 alpha, adding unique options and playabilities to musicians using sutoolz.

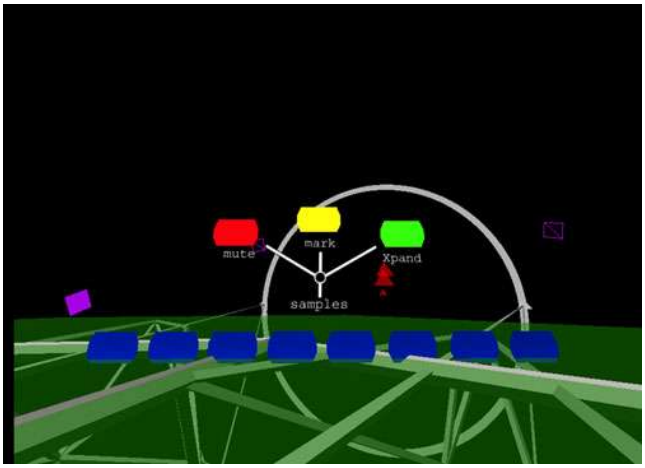

Figure 3. 3D control menu.

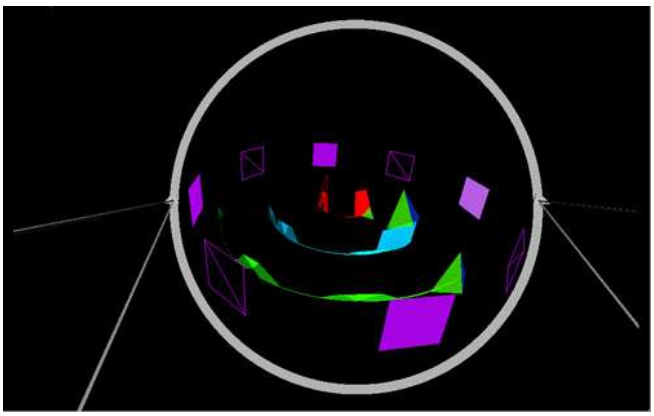
Figure 4. Multi-band FFT reader in 3D

CONCLUSION

The technological acceleration within the video game industry has enabled new standards in multimedia presentation systems to emerge. The power of calculation available for 3D graphics processing presents new potentials in audio visualization systems for music software designs. By merging complex audio visualization and manipulation techniques with third party or customized analogue input controllers new forms of music interface articulation are made available to music performers.