The FCurve Sound Generator with Granular Synthesis

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ABSTRACT: The FCurve/Sound Generator System links digital sound created with granular synthesis on a NeXT computer, with graphics created in Softimage Creative Environment vs. Silicon Graphics workstations. Granular synthesis programs, written in the Cmix music programming language, have been expanded to contain eighteen function curves which describe the gestures of the unfolding grain parameters. Through an interface to Softimage which stores data in sound templates, these curves can be applied to various graphical parameters. The artist/composer may choose the mapping from the sound parameters hierarchy to the graphical parameter hierarchy through menus in the interface.

Introduction

The connection between sound and image is under exploration with new digital technologies. The goal of this project was to translate aspects of sound into related graphical parameters to create integrated multimedia works. Previous work with granular synthesis involved control of sound parameters through graphically displayed functions in the StockGrax interface (Helmuth, 1991). In a more general sense, images are important to a compositional approach involving timbral gestures (Helmuth, 1992). The ability to create flexible and systematic relationships between a sound composition and graphics is an enticing prospect.

Sound: Granular Synthesis on the NeXT

The granular synthesis program Fgran is a C program written in Paul Lansky's Cmix music programming language. Granular synthesis creates complex, evolving sounds from tiny "grains" of sound (Roads, C. 1978). It is similar to earlier programs such as fgran, which use a probability equation to generate parameter values within specified limits, and with a specified degree of preference (Helmuth, M. 1991). The grain parameters for each event change over time in rate, frequency, duration and amplitude. Fgran, however, has an expanded set of function curves which control these changes. Each parameter for a single grain has four 'values', a low, high, mid (to indicate a preferred value) and tightness (for amount of preference). In fgran the shape of change over the event for each of these four values is independently controlled by a separate function. The number of functions was expanded for greater control over sound, and in particular, to provide more data to map into the extensive graphical parameters.

Graphics: Fcurve/Sound Generator System on Silicon Graphics

The Fcurve/Sound Generator System takes two input files. The first is the granular synthesis data file created from the fgran parameters. The second input is a Softimage scene file which contains a hierarchy of models and their local materials and textures, global materials and textures, camera, lights, waves and fade. The graphic interface displays sound attributes, scene elements, and corresponding Softimage function curves for time-varying parameters such as model translation, rotation, and scaling. The interface enables users to map sound attributes data to the desired element function curves. For example, users can
map sound frequency data into a sphere's translation function curve so that the sphere would move in a visual three-dimensional space according to sound frequency. or sound amplitude data may be mapped into the sphere's hue color function curves. Initially, we proposed to design the interface using specified mapping structures similar to that proposed by Zeltl (Zeltl, 1973). Later, we decided to provide users with more flexibility to experiment with the tools and build their own sound/animation mapping techniques.

Since the graphic interface does not display actual scene elements such as models, the best method of using the system is currently to create sound templates, or graphic primitives, which have sound data mapped into their function curves. Then, function curves can be copied from the templates to other objects in Softimage.

Results

One study produced so far is composed of two layers of granular synthesis sound, and graphics generated from the sound data. The graphics consist of a wave with motion based on the frequency of the grain parameters of one sound, and several spheres moving in relation to the other sound's frequency. Less obvious linkings link grain parameters such as grain rate, duration, and location with color, transparency and object location. This example shows potential for more complex and interesting multimedia work with this system.

Future Research

We plan to expand and integrate the programs for sound and graphics. Translation from graphical data back to sound is an obvious desirable extension. An interface for sound generation can be created similar to the SpecWizran application on the NeXT for fgrarn. As fgrarn already runs on the SGI, sound generation may also be done on the same platform as the graphics. Finally, we plan to work with other graphical artists and composers to create multimedia works with this system.

Conclusion

The Fcurve/Sound Generator System provides an integrated approach to creating multimedia work. The sound program component, created on the NeXTStep platform, makes use of powerful granular synthesis techniques. The Fcurve interface allows the user flexibility in ways of mapping this sound data to images.

References