A GRAPHICAL EDITOR FOR BUILDING UNIT GENERATOR PATCHES

Michael Minnick
NeXT, Inc.
900 Chesapeake Drive
Redwood City, CA 94063
Mike_Minnick@next.com

ABSTRACT: The NeXT Music Kit (Jaffe 1989) can realize notes by controlling synthesis objects called UniGenerators (Smith 1989). Unit generators are dynamically configurable into synthesis patches - objects that encapsulate data specifying unit generator connections, execution order, and note parameter mapping along with methods that control the run-time execution state of unit generators. This paper presents a NeXT application program called SynthEdit that implements graphical editing of synthesis patches, instantiating unit generators, drawing connections between them, and specifying their default parameter values. Patches run in real-time on the DSP allowing immediate sonic feedback.

SynthEdit

SynthEdit is a NeXT application written in Objective-C. The user interface was developed using Interface Builder and relies on objects in the Application Kit - many SynthEdit objects are subclasses of Application Kit objects. Objects from the Music Kit that control synthesis on the DSP are also used.

SynthEdit is a multi-document application. Each document contains a graphic representation of a synthesis patch in an on-screen window. To activate the editing of a document, the user simply clicks the mouse anywhere in its window. New documents can be created, and documents can be read from and saved to disk files.

When SynthEdit is launched, the user is presented with a palette of icons representing unit generator objects. These include envelope generators, oscillators, filters, delay lines, and stereo outputs. To instantiate a unit generator, the user drags its icon from the palette into a document window. The icon can be placed anywhere in the window, optionally aligned to a grid. The window is resizable and scrollable both horizontally and vertically.

Every unit generator has at least one input or output connection, represented by a connection jack on its icon. To form a connection, the user clicks on a connection jack of one unit generator. A line representing a patch cord then tracks the user’s mouse until the mouse button is released over a connection jack on another unit generator. Connections may be drawn from input to output or visa-versa. Illegal connections are immediately destroyed.

Editing

Clicking the mouse on a unit generator icon or a patch cord causes it to be selected. If the inspector panel is enabled, the current values of the unit generator’s arguments are displayed in an editable panel (see The Inspector section below). The Cut, Copy, and Paste menu items affect the current selection. A unit generator or patch cord is removed with Cut. New unit generators can be added to the current document or copied or moved to another document with these commands. Groups of objects can also be selected for editing operations. Text annotation

ICMC GLASGOW 1990 PROCEEDINGS

253
can be placed anywhere in the document window, and is also affected by edit operations.

Figure 1 shows an example document window with a Plucked-String patch (Jaffe and Smith 1983) built with a noise generator, a timed switch, a delay line, several filters, and a stereo output. The connection looping back into the switch is shown in the process of being drawn.

Figure 1. A Pluck Patch
The Inspector

Unit generator default parameter values (e.g. oscillator wave able, output bearing, etc.) can be changed in an inspector panel that appears when the unit generator icon is selected. The mapping between Music Kit Note parameters and unit generator arguments is also defined with the inspector panel. Arguments may be specified as constants or as scaled combinations of Note parameters.

DSP Synthesis

SynthEdit manages the allocation of UnitGenerator and SynthData objects dynamically as a patch is being edited. When connections are added or deleted, unit generators are reallocated as necessary to preserve the correct execution order. The allocation and memory space of patchpreview objects is also optimized. A button controls when Note parameters are sent, thus controlling synthesis and sound output.

Playing Scorefiles

SynthEdit can create and archive an object called a FilePatchTemplate for each document. FilePatchTemplates allow SynthEdit to perform scorefiles using the patches in each open document. The name of the patch to use is specified in the scorefile by the parameter patchName. A special subclass of SynthPatch recognizes this parameter, unarchives the patch template, and uses it to determine the patch to be allocated or created. A future release of the Music Kit may support these objects so that other applications can use archived FilePatchTemplates to play scorefiles. Finally, note that SynthEdit is work in progress - it is not part of the current NeXT software release.

References

