DSP - for children

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Introduction

This article is an edited version of a paper presented at the International Computer Music Conference in Thessaloniki in 1997, and describes a new tutorial tool developed by NoTAM. Instructional material is organised on a CD-ROM, where computer music theory and practice is made available to students at the elementary school level and beyond through DSP programs, texts, help files and examples. The students learn through a demo mode that allows a pre-programmed piece of music to be dissected through calls to the various programs used in developing the timbres of the piece. Pertinent theoretical topics are discussed in texts commissioned especially for this project, help-files and the glossary, as well as in an accompanying handbook.

This CD-ROM is currently in use in Norwegian schools, and is also used in collaborative ventures between professional concert organisers and the educational system at junior college level. The CD-ROM will eventually be distributed to schools throughout Scandinavia.

Background

The task of promoting an understanding of the long neglected field of computer music in Norway necessarily involves tutorial programs for children. This is in keeping with the Ministry of Education's reform program, which clearly states that "technology shall be used in conjunction with music education," and that "students shall compose as part of their music education." This CD-ROM project is directed toward students from eleven to sixteen years of age, although the material would also be of interest to students at higher levels.

A principally electroacoustic composition project for children, *Breaking the Sound Barrier*, organised and developed by the Norwegian Concert Institute, has been a part of the Norwegian contemporary music scene for several years. The project has suffered from a lack of relevant composition tools for the children, however, and NoTAM's CD-ROM will provide an anchor for this important mediation network that is realised in the form of various art music festivals throughout the country. "Breaking the Sound Barrier" serves as a link between Norwegian professional and non-professional music communities, and a revitalisation of this potentially exciting project is crucial in order to maintain its aesthetic relevance as a creative program for children. The national distribution of the project is secured through a collaboration with the Norwegian Broadcasting Corporation (NRK), which considers "Breaking the Sound Barrier" an interesting foundation on which to build interactive concerts and interactive radio.

Educational goals

The purpose of the CD-ROM is to teach electroacoustic music, that is, music as organised sound; music that falls outside of the note paradigm. Music viewed (or listened to) as organised sound provides an opportunity to focus on aspects other than those prevalent in instrumental writing, and the CD-ROM allows children's creativity to be realised with a set of tools in a (de)construction process. The tools are simple to use but suited for advanced work as well - encouraging a learning process that is radically different from that found in traditional work with sequencers, samplers and synthesisers. Furthermore, for a small country such as Norway, it is important to develop domestic "culture technology" in the national language.

The construction of the CD-ROM is based on an assumption that knowledge of electroacoustic music is not prevalent in Norwegian schools. Therefore, the CD-ROM is self-instructional and recognises the need for an aesthetic correspondence between the look and feel of the CD-ROM and the "current" aesthetic in children's culture. In addition, the design of the CD-ROM is intended to reflect the creative potential in computer music tools.

CD-ROM contents

DSP programs written specifically for this CD-ROM include: Chorus, Delay (including dopplar and resonant filters), Harmonizer, Filter (Highpass, Lowpass, Bandpass and Bandstop), Reverb (constructed through room simulation), Ring modulation, Sieve, Spectrum Shift, Time stretch, Granulation, Synthesis (Additive, FM, Plucked string, Buzz, Noise), Recorder, Sound Editor, Scratch, Algorithmic composition.

Tutorial texts written especially for this CD-ROM have the following titles:

The History of Electroacoustic Music, What is Sound? (simple acoustics, frequency and amplitude), Sound and Space, Sound Waves, Sound in the Environment, Harmonics and Spectra, Sound in the computer, Synthesis and sound processing, Working with Sound - Working with Notes, Algorithmic Composition, Cross-Disciplinary Common Characteristics in the Arts, Playing in Real Time, Technology in Pop and Rock, Tutorial Text on the work "And the Birds...?"

All tutorial texts contain hyperlinks to short explanations, illustrations, sound examples, etc., and all material favours non-linear learning, which will be further explained below.

A demo-mode consists of a text describing a short musical work (approx. 2.5 minutes) "And the Birds...?" that can be taken apart and whose individual sounds may be traced to their origins through the actual DSP programs that were used in making them. The DSP programs are called from the hypertext, with the parameters set as they were when making the different sounds. The parameters can be changed, and users may either start their (de)construction process immediately or continue to follow the tutorial.

A handbook contains theoretical discussions and suggestions for projects.

A Web-browser has links to NoTAM's CD-ROM pages on the WWW.

Functions and Options

Most Norwegian schools are equipped with PC equipment, so the choice of machine base was relatively simple: any PC running Windows 95 with a built-in or added soundcard is able to run the DSP programs on the CD-ROM.

The mixer screen appears first upon startup and is the home domain for the project. One may proceed directly to the DSP programs and make or record sounds, investigate the tutorial texts or select the demo mode. The demo mode brings up a text describing the existing piece of music "And the Birds...?" (Fig. 1) in a hyperlinked file, from which one may access the various programs used in the construction of the piece. Each sound may be "opened" in a DSP program with the settings that made that particular sound. One may also open the project "And the Birds...?" as a mix-file, alter it and save it as something else.

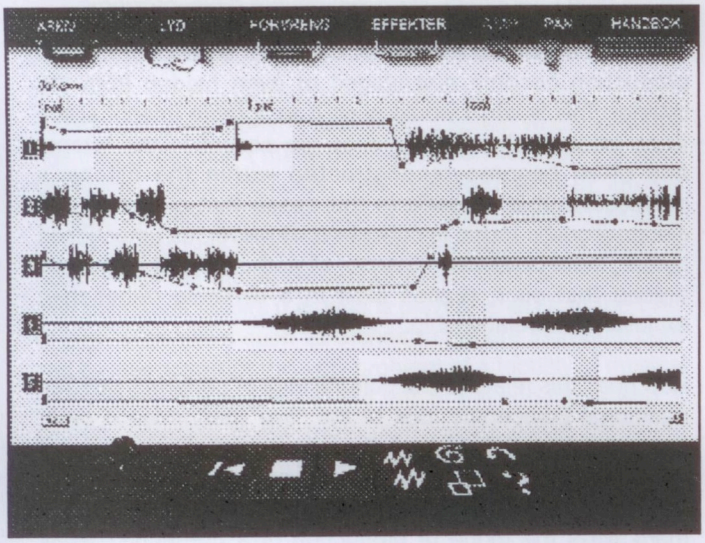

Fig. 1

If a sound has been processed several times, the user may follow the process backward until reaching the initial starting point. At any point, the user may tweak the parameters and save his/her own sounds.
A typical program window looks like this:

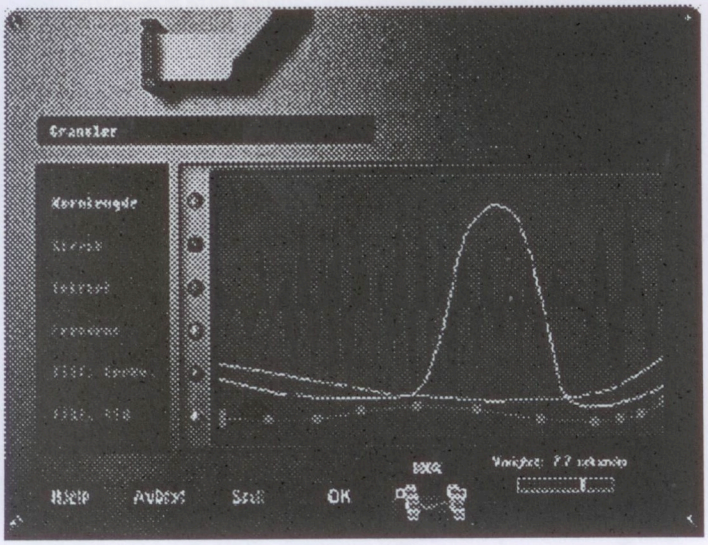

Fig. 2

After tweaking existing sounds, making new ones or treating one's own sounds, the project will contain enough sound files to make a piece of music. The mixing process works much the same as in the programs "Mix" for the SGI or ProTools for Macintosh . One can bounce the mix to disc, and then process it with a reverberation program that teaches acoustics through room simulation; moving walls and ceilings, sound source and listener position. Bounce again, and finish the piece as a stereo .wav file:

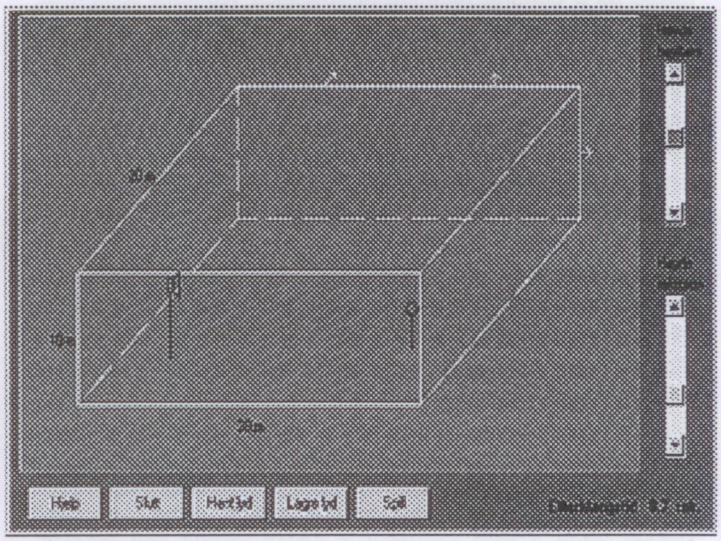

Fig. 3

Help files for the programs and tutorial texts are available as hypertexts through a browser that also has links to Web-pages on NoTAM's server. Here, one can find material such as articles, FAQs, examples, cool sounds, lists of works made with the CD-ROM, notices about different uses, special projects, etc.

Further Development Plans

The CD-ROM presented at the ICMC 1997 was version 1.0, and NoTAM will most likely produce a version 2.0 in 1998 to finetune and incorporate suggestions from young users for added material and new DSP programs. The CD-ROM has already proved successful as a tutorial tool in Norway, both for children and in the education of teachers. International distribution of translated versions is under consideration.

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Joran Rudi has concentrated his musical work within the genre of computer music. His list of works contain compositions for electroacoustic instruments or tape, and for dance, film, and performance art. He is currently director of NoTAM - the Norwegian network for Technology, Acoustics and Music.