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# DSP - for children

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## 1 Introduction

This document describes a new tutorial tool developed by NoTAM in which DSP programs, texts, help files and examples make computer music knowledge and practice available to students at the elementary school level and beyond. The educational material is organized on a CD-ROM, where students learn through a demo mode that allows a pre-programmed piece of music to be dissected through calls to the various programs that were used in developing the timbres of the piece. Pertinent theoretical topics are discussed as well, both in the texts on the CD-ROM and in an accompanying handbook.

This CD-ROM is currently in use in the Norwegian school system and has become part of collaborative initiatives existing between professional concert organizers and the educational system at the junior college level. As of this date, the CD-ROM is distributed throughout Scandinavia.

## 2 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 targeted for students from eleven to sixteen years of age, although the material is presumably of interest to students at higher levels as well.

A principally electroacoustic composition project for children, "Breaking the Sound Barrier," has been a part of the Norwegian contemporary music scene for several years, and is organized and developed by Nor-Concerts. The project has suffered from a lack of relevant composition tools for the children, however, and NoTAM's CD-ROM will hopefully provide an anchor for this important mediation network that is realized 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 revitalization 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" a foundation on which to build interactive concerts and interactive radio.

## 3 Educational goals

The purpose of this CD-ROM is to teach electroacoustic music, that is, music as organized sound; music that falls outside of the note paradigm. Music viewed (or listened to) as organized 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 realized with a set of tools in a (de)construction process. The tools are simple to use but suited for advanced work as well - and encourage a learning process that is radically different from that found in traditional work with sequencers, samplers and synthesizers. 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 well distributed in Norwegian schools. Therefore, the CD-ROM is self-instructional and recognizes 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.

## 4 CD-ROM contents

DSP programs written specifically for this CD-ROM include:

Chorus, Flanger, Delay (including doppler 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, Reverse, 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 in the Environment, Harmonics and Spectra, Sampling (how sound is represented in the computer), Synthesis (musical signal processing), Working with Sound vs. Working with Notes, Algorithmic Composition, Composers' Section, Cross-Disciplinary Common Characteristics, Real-Time and other Performance Technology, Technology in Pop/Rock Music, Computer Music Animation of Movement through Spectra.

All tutorial texts are hyperlinked to short explanations, illustrations, sound examples, etc.

A demo-mode consists of a short musical example (approx. 2.5 minutes) that can be taken apart, and whose individual sounds may be traced to their origins through the DSP programs that were used in making them.

A handbook contains theoretical discussions and suggestions for projects.

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

## 5 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 user is asked to name his/her project, and the mixer screen will appear. The mixer screen is the home domain for the project. One may proceed directly to the DSP programs and make sounds, investigate the tutorial texts or select the demo mode. The demo mode brings up an existing piece of music (Fig. 1, shown here with a drop-menu) as a mix file, where each sound may be "opened" in a DSP program with the settings that made that particular sound.

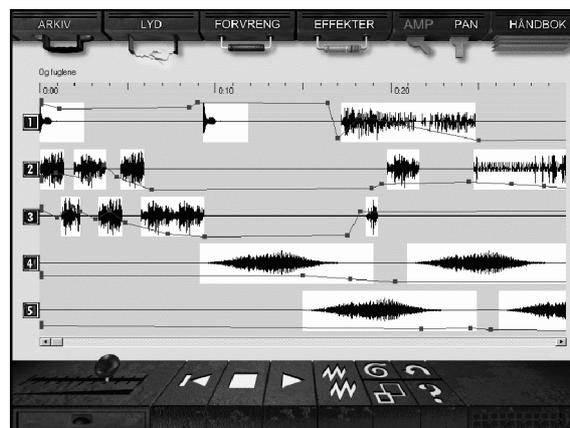


Figure 1

If a sound has been processed several times, the user may follow the process backwards 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):

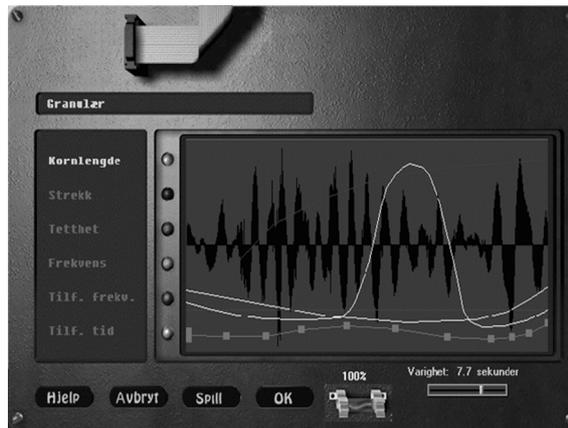


Figure 2

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*<sup>TM</sup> 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)

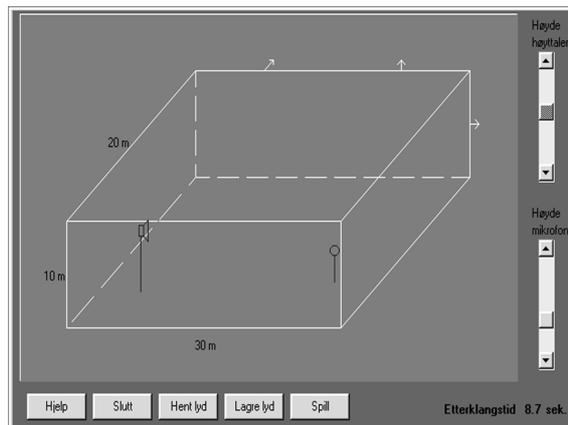


Figure 3

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

## 6 Further Development Plans

The CD-ROM presented at the ICMC 1997 is version 1.0, and NoTAM will most likely produce a version 2.0 in 1998 to fine tune and incorporate suggestions from young users for added material and new DSP programs. The CD-ROM has already proven successful as a tutorial tool in Norway, and international distribution with translated versions is under consideration.