The Acousmographe, a Macintosh software for the 
graphical representation of sounds

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Abstract: The Acousmographe, a Macintosh software for the graphical representation of sounds is demonstrated. This tool has been designed for the generation of scores of musics based on sound morphologies. Developed in the SuperCard™ environment, it interactively associates sounds with color graphics. Several levels of graphical representation are available, from the DSP computation of sonograms to the standard Macintosh graphical tools and the access to libraries of graphical symbols. Examples of scores of musical works made with this tool are also shown.

1-Introduction

Since the existence of musics based on sound morphologies, there has been no satisfying technical solution that could answer to the need of a graphical notation of these musics, and the techniques used have remained primary and empiric. The appearance of small computers integrating performing graphical drawing and editing tools, associated with DSP boards for a high quality playback of sounds have made possible the development of a software that offers a first attempt of solution to these issues. The Acousmographe has even gone beyond its initial specifications of a notation tool, and integrates functionalities of a multimedia presentation tool associating sound with colour images.
2. General description

The Acousmographe is a software running on the Apple Macintosh™ (MAC II cx, ci, or fx), associated with the Digidesign Sound Tools™ or the Studer Editech DYAXIS™ system.

This software has been designed for the black and white and colour graphical representation of sounds recorded in sound files.

It is implemented in the Supercard™ environment, as a stand-alone application with a system of documents, storing all the graphical work, associated with sound files.

The user can create pages in the representation window associated with a fragment of the chosen sound file. The comment point between all the possible graphical representations is the use of the X axis as the time dimension. This enables an interactive association between the sound and its representation by means of a vertical cursor synchronised to the sound. When successive pages are created in correspondence with successive fragments of sound, the pages are automatically turned over during the playback.

Several levels of representation tools are available, from the most objective and close to the original signal to the most symbolic ones:

- signal representation: 2 different colours for right and left signals in additive colour synthesis
- sonagrams
- standard Macintosh colour graphical tools (draw and paint)
- libraries of graphical symbols

The application integrates standard printer routines for black and white and colour high resolution printing of graphical documents.

The current developments aim the implementation of signal processing functions like variable speed playback and looping for a precise localization of sound events, sharp edge bandpass filters associated with horizontal cursors moved on the sonagram and the possibility of creating graphical markers during the playback.

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2 - Sonagrams

The sonagrams can be computed by the Mac CPU or by the Sound Accelerator, the second solution being about 30 times faster with standard computation parameters.

The amplitudes are represented in a linear or log scale on 16 levels addressing one of several colour tables in the document (the 16 colours can be also grey levels or even black and white).

The features of the DSP sonagram computation algorithm are:

- FFT sizes: from 256 to 16K
- set of standard input windows
- lin or log amplitude scale
- lin or log frequency scale, between 2 variable frequency limits.

The last feature is made possible by a special DSP algorithm that interpolates or averages the FFT output to the required display format.

3 - Graphical tools

The application provides a complete set of colour graphical draw and editing tools (draw and paint modes) that are accessible through menus and palettes.

4 - Symbol libraries

Graphical symbols can be imported from external library files that may be supplied with the application or created by the user and containing the most frequently used symbols in a specific field of application. In draw mode, the user can choose the graphical attributes of a library symbol to be imported to the document: shape, colour, pattern, etc... The symbol and its attributes are automatically copied to the clipboard by just clicking on the symbol.

5 - Applications

This software has applications in all the fields where graphical representations are used for the analysis of existing sounds. The traditional sonagram devices deliver only paper documents from sounds stored in external media. This software offers, with more features and an improved quality of the sonagrams, an integrated, low-cost system with an interactive access to sound and image, graphical editing tools, and the possibility of storing the graphical documents in files.

In the musical field, the Acousmographe provides several levels of graphical representation adapted to different needs: automatic sonagram computation for a concert score of diffusion, symbolic representation for a musical analysis.