Proceedings of The Institute of Acoustics

THE COMPOSERS' DESKTOP PROJECT

A.Bentley(1), T.Endrich(1), R.Orton(1,2), T.Wishart(1,3)

(1) Composers' Desktop Project, c/o 83 Heslington Road, York.
(2) Dept. of Music, University of York, Heslington, York.
(3) Dept. of Music, University of Keele, Keele, Staffs.

HISTORY OF THE PROJECT

A group of Yorkshire-based composers, latterly calling itself "Interface", has been meeting to discuss new ways of making music since the early 1970's. The orientation of the group's work in recent years has reflected the increasing availability of low cost microcomputers. Members of the group had amassed some considerable experience in computer synthesis systems and software design, but any joint progress was hampered by the fact that individuals were using a variety of languages on different machines. The arrival of the Atari ST computer in the market place, with its attractive range of ports including built-in MIDI for musicians, led to a decision to standardise on this machine and a single computer language, C [1]. All project members bought the machine and development has taken place at an unprecedented pace.

Composers in Britain have a considerable incentive for doing their own research and development work in the field of computing for music. In brief, they have little choice: no national centre equivalent to the French IRCAM exists in Britain. Facilities for composition and research in electro-acoustic music as do exist are typically of a standard 10-15 years behind those of the USA and France, and are embedded in University music departments. Many British composers spend a lot of time abroad, relying on the good will of foreign institutions to provide them with facilities. Although education in the field is good in Britain, many composers are forced to forget what they have learnt through the lack of continuing facilities with which to practise their art. It became one of the aims of Interface to investigate the viability of individual electro-acoustic composers owning systems for use in their own homes. Four members of the group initiated the Composers' Desktop Project, with three ongoing commitments:

1) To take estabished tools for computer composition running on large mainframe computers in the world's major computer music centres and implement them on small machines for use on the composer's desktop. By "tools" we refer to programs for sound synthesis, signal processing and musical composition, including software synthesis engines such as the Cmusic program from the University of California San Diego, and the Phase Vocoder [2].

2) To develop new software to work compatibly alongside the existing programs, especially generalised tools for interactive composition, written by ourselves.

THE COMPOSERS' DESKTOP PROJECT

3) To devise a hardware configuration for digital sound synthesis and signal processing cheap enough that it could be bought by any serious composer in Britain for use at home or, on the same premise, by any educational institution. To follow this up by establishing a national bulletin board system through which composers could offer mutual support and download new software for their digital home studio.

Several of these ambitions have been achieved. To date we have succeeded in getting Cmusic and the basis of a complete digital sound studio running on the Atari ST. Several new programs, including routines for the graphical display and manipulation of sound have been written by members of the group. We have high quality 16-bit digital sound out of the Atari and we are already preparing for the launch of our bulletin board early in 1987.

THE CDP DIGITAL HOME STUDIO

The project has benefitted from the generous help of David Malham, of the University of York's Electronic Music Studio, in developing a hardware interface between the Atari and the Sony PCM converter, and of Martin Atkins of the University's Dept. of Computer Science, in providing high speed software for it. This is soon to be marketed commercially.

Sound input and output is through an interface box inserted between the Atari and the Sony converter, and can therefore be easily directed to or from digital audio cassette. The box provides high quality 16-bit samples at either the full Sony sampling rate of 44.1 KHz or by subsampling at half that frequency. Experience has shown that, for synthesised sound at least, the lower sampling rate is quite adequate, and the doubled disk storage capacity gained by doing so is advantageous. Restrictions on disk capacity for sound sample storage remains the largest single obstacle to implementing a software-based sound studio, but use of SCSI interfaces allows us to connect hard disk drives up to a size of 380 Mbytes at the present time, and developments of these and other storage media (with a commensurate lowering of prices) is taking place faster than we can produce the software to make use of them!

Our main motive for choosing the Atari ST computer was its low cost, acknowledging that the ST does offer a great deal of power and good possibilities for program development. We are fully aware of the financial contraints on buying equipment faced by independent composers such as ourselves, and our criterion was that the entire system should be affordable, i.e. under £4000 for a package comprising computer, floppy disks, monitor, PCM converter hardware, hard disk and interface, MIDI keyboard, telephone modem and basic software.

THE COMPOSERS' DESKTOP PROJECT

PROGRAM DEVELOPMENT AND IMPLEMENTATION

An intensive period of software development and implementation has been taking place since mid-August. Since much of the software so far implemented is in the C language and designed to run under Unix, some considerable effort had to be made to make the Atari operate in a Unix-like way. It seems likely that a full Unix implementation for the Atari is not far off in any case. Creating a suitably Unix-like environment for program development unearthed many interesting problems about the Atari operating system (such as redirection and numbers of program arguments), and differences between our compiler and the Berkeley system Unix. We are now able to work with a Unix-like "make" environment for program maintenance, and a wide selection of Unix-like utilities. Another important area is the development of a graphic shell. One member of the team, Rajmil Fischman, is working to provide a GEM window environment to allow the user friendly mouse-driven operation of the composition and synthesis programs. In this way, mixing, editing and synthesis can all be accomplished using icons and pull-down menus, in much the same way as the modern word processor allows one to manipulate text.

THE CARL SOFTWARE

Our first implementation effort has concentrated on the CARL software [3] written by D.Gareth Loy and F.Richard Moore of the Computer Audio Research Laboratory of the University of California, San Diego. This is a comprehensive package of public-domain programs for sound signal processing running under Unix, and includes the Cmusic synthesis program and the Phase Vocoder. Operations on soundfiles can take place using 16-bit integer numbers (termed shortsams) such as used by the Sony converter, or to the very much higher quality offered by single precision floating-point numbers (termed floatsams) at the cost of a soundfile which is twice as long. These modes of operation are compatible and transparent to the user and conversion to shortsams can be made at any time for transfer to the PCM converter.

The Cmusic synthesis "engine" already implemented deserves special mention. It is a software synthesiser written by offering any number of voices of almost unlimited complexity and is the latest descendant in a long line of such programs which began with the Music 1 program written by Max V.Mathews at Bell Labs in the late 1950's, and which includes Music V, Music 360, Music 10, and Music 11 (implemented at York on a PDP-11 minicomputer)[4]. Cmusic is notable for its very wide range of unit generators, including a sophisticated space generator, a global reverberator and a generator for the Karplus-Strong algorithm. The CARL package also includes other programs for sound synthesis, control function generation, speed-changing and sample rate conversion, mixing and editing, reverberation, filtering, analysis of sound and spatialisation, as well as a miscellany of signal processing utilities for dealing with problems in recorded sounds such as noise and clicks. It also offers powerful

analysis/resynthesis tools in the form of the phase vocoder and linear predictive coding, and it is our intention to implement the programs for spectral transformation written by Trevor Wishart at IRCAM this summer.

The development of the CDP's own software has had to take second place to this implementation work so far, but we expect that it will become the main thrust of our activities from the new year. Some programs, such as sound display and manipulation utilities, have been written and we are beginning to create a library of routines for interactive composition using MIDI [5] which will be more much more useful to the serious composer than currently available sequencers. Our concern is also to make them compatible with already existing tools such as Cmusic and Music-11 and establish certain well-documented standards for use by our members to ensure compatibility with future programs written within the CDP.

THE CDP AS AN ORGANISATION

Although yet to be established publicly, the CDP has generated a substantial interest among composers and the music press [6]. It is rapidly becoming clear to us what the role the CDP is likely to assume at a national level, via the soon to be established bulletin board network. It will obviously be of particular appeal to members of EMAS, because of its particular commitment to the needs of serious composers. These have been poorly catered for so far by the commercial sector. Being connected to a national support network by telephone could be an attractive advantage to individuals, and is also likely to appeal to those universities and studios who do not have resident programming or service personnel. The CDP will also be open to those who wish to contribute programs and develop existing ones in a fairly disciplined and well-documented environment. Those wishing to test new programs in exchange for the (dubious) privelege of having new and untested tools may form their own special-interest groups within the network. Strong ties are already developing between the CDP and courses being run in universities to train people in computing skills for musical applications.

Perhaps the most important role of the CDP will be to build a bridge between the kind of facilities offered by institutions and those affordable by the individual user, eventually making it possible to use these facilities in tandem in a more rationalised and resourceful way, thus creating a more productive future for British electro-acoustic music.

THE COMPOSERS' DESKTOP PROJECT

REFERENCES

[1] B.W.Kernighan & D.M.Ritchie, "The C Programming Language", Prentice Hall, Englewood Cliffs, N.J. (1978).

[2] T.Wishart, "Musical Applications of the Phase Vocoder", Proc. of the I.O.A. Conference, November (1986)

[3] F.R.Moore, D.G.Loy et al., "CARL Startup Kit", Computer Audio Research Laboratory, Center for Music Experiment, University of San Diego (June 1985).

[4] D.G.Loy and C.Abbott, "Programming Languages for Computer Music Synthesis, Performance and Composition", Association for Computing Machinery Computing Surveys, Vol.17, no.2, pp.235-265 (June 1985).

[5] T.E.Endrich, "Using Computers in Music - The Composers' Desktop Project", University of York Computer Science Seminars (June 1986).

[6] K.Potter, "IRCAM on your desk?", Classical Music, 19 April (1986)