ORPHEUS: A GRAPHICAL COMPOSITION ENVIRONMENT

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ABSTRACT: Orpheus is a graphic oriented composition environment running on an Apollo Graphic Workstation. The composer works with 'real' (previously recorded) sounds, shaping and combining them by means of a graphic score which is drawn on the screen with the aid of a mouse. This score determines the start times, pitch contours, dynamic envelopes, stereo placing and movement in space of the sounds. Sounds can be layered and mixed to an unlimited density and graphical aids (such as copying screen areas) can be used to create textures or stochastic events.

Orpheus was written as a final year project for a Software Engineering degree at the University of Birmingham and was designed in close collaboration with the co-author, a composer in the University's Department of Music. It runs on an Apollo 3500 Graphic Workstation running Unix and produces sound file output in stereo at 44.1 kHz sampling rate which is immediately compatible with the Composers' Desktop Project sound filing system. (This is the system currently used to obtain sound output from Orpheus, although there are plans to add DACs to the Apollo.)

The heart of the system is the score drawer with which the composer draws lines, curves and complex shapes on a screen area which has time as its x-axis and frequency (pitch) as its y-axis. Thus each line on the score represents a sound with a certain duration and pitch contour. The dimensions of the score page are determined by the composer. Its frequency axis can cover any range and its duration be from a few seconds to several hours. The composer chooses which sounds are associated with which particular lines on the score by selecting sounds from a palette which he has previously created. These sounds can be synthesised tones (based on waveforms created using Orpheus's waveform editor) or complete soundfiles - perhaps pre-recorded acoustic sounds, sounds generated by other synthesisers or samplers, or even previously generated Orpheus output. Thus with Orpheus it is possible to design a score, compose its sonic result and then use that result as a basic sound for creating other more complex scores - and to go on doing this level after level without limit.

The score designer includes the ability to control graphically aspects of the sounds other than pitch - the amplitude or position in the stereo field, for example. This is achieved by drawing an amplitude or stereo position envelope in the waveform designer, and assigning this envelope to a particular line in a similar way that its sound is assigned. The combination of sound, amplitude envelope, and stereo position envelope is termed an instrument and a library of instruments can be developed for subsequent use.

The score drawer also incorporates a number of graphical tools (similar to those one might encounter in a PAINT or CAD application) as an aid to score drawing. These currently include the basic editing functions cut, copy and paste which allow individual lines or

ICMC GLASGOW 1990 PROCEEDINGS

216
screen blocks to be moved or duplicated, and an unlimited zoom function. This enables minute - even ultrasonic - details to be inserted, since with very high zoom factors it is possible to create events which are a fraction of an audio waveform in duration. This is also useful for achieving granular synthesis effects.

The workstation on which Orpheus operates utilizes the multi-tasking operating system Unix. This allows the sometimes time consuming task of score computation to be executed simultaneously with the interactive usage of the system - or indeed with any other usage of the workstation. A number of score pages could thus be 'queued up' waiting for computation, allowing the composer to concentrate on other tasks.

As Orpheus was a student project it was written in a strictly limited time span and many features originally conceived have not yet been implemented. However, provision for their inclusion has been made in the design and it is hoped that work will continue in the future to provide these additional features. The two main areas of improvement in the score drawer are additional drawing and editing features, including reflection about points and axes, panning, stretching or squeezing of screen areas in any dimension, together with 'fill area' and 'airbrush' functions for creating textured or stochastic material.

A major improvement to the system as a whole would be to convert the waveform editor into a fully fledged soundfile editing environment, with facilities for more complex processing of sounds prior to inclusion in scores.

CONCLUSION: Orpheus provides the composer with a unique way of working with sound. Its highly intuitive mode of operation, its emphasis on on-screen editing and its orientation towards sonically characterised material rather than note based structures make available creative possibilities which would not be feasible using other systems. It frees the computer music composer from the necessity to think in terms either of numbers or of note names and so enables him or her more easily to produce work in which musical considerations rather than technical limitations or system peculiarities are the determining factor.