Studio Report:
The Electroacoustic Music Studio at
The University of Birmingham (UK)

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Abstract

The Electroacoustic Music Studio at The University of Birmingham (UK) has established itself as a major centre of production in Europe, with a number of international awards to its name (Bourges, Prix Ars Electronica, etc). Since 1991, with the installation of the University’s High Speed Campus Network (HSCN), a number of exciting new possibilities have become available, extending into the digital domain the Studio’s concern with the transformation of real sounds. A prime concern has been the integration of a range of established and proven facilities into a compositionally useful, usable and friendly environment.

1. History and Educational Policy

The Electroacoustic Music Studio at The University of Birmingham (UK) was founded in 1978. When the present Director, Dr Jonty Harrison, was appointed in 1980, the equipment consisted of three stereo tape recorders and one four-track, three microphones, a 12-4-1 mixer, two stereo amplifiers and four loudspeakers. Today, the Studio complex occupies six rooms, with a further two rooms required for the storage of the BEAST concert system.

From the outset, the Studio’s work has been based around recording and working with real, concrete sound sources; synthesis has never been a major feature of work at Birmingham. In the early 1980s, the major development in the Studio was the purchasing of (largely analogue) outboard signal processing units; by the later 80s, the emphasis had shifted to digital effects units. Throughout the 80s, the working and storage medium was analogue tape with Dolby A, as this was the only affordable means of achieving one of the more significant transformations of sound: transposition. PCM and, later, DAT systems were gradually incorporated into the working environment. Today, analogue tape recorders remain only in Studio 3, where the foundation course in Studio Techniques is run. This reflects the Studio’s educational policy of teaching composition which happens to use

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technology, rather than teaching the technology itself. Analogue tape is still an easily assimilated way of bringing students into contact with sound as the basic ingredient of music; it also provides a different experience of sound, enabling students to leave behind preconceptions formed after even a short period studying music. Once a response to sound material has been established, then more advanced technology can be addressed without the result being simply a collection of cliches.

The continuing use of analogue technology well into the digital era reflects the consensus among the members of BEAST (Birmingham ElectroAcoustic Sound Theatre), the group of composers based in the Birmingham Studio, that our primary interest is not in equipment or systems per se, but in tools which enable and encourage composition. This also explains the policy of building studio environments rather than installing 'workstations', and also gives some insight into the importance attached to the presentation of electroacoustic music in concert (the BEAST sound system will already be known to those who attended the 1990 ICMC in Glasgow).

2. Computers

In line with the policy of 'gradual assimilation' of new technology when (and only when) it had proved appropriate for our compositional needs (a policy not totally unconnected with our access to funds, it must be admitted), the move towards computer technology was extremely slow by comparison with many other institutions and individuals.

The first foray into digital technology as the centre of operations for composition (as distinct from a digital signal processor such as the Pablinon DHM 89) came with the purchase of a Fairlight CMI (later upgraded to a System IIb). This was not a popular development because of the severe limitations of 12-bit sound quality, and the machine was eventually sold after falling into disuse. By that time, MIDI had finally infiltrated the Birmingham studio in the form of an Akai S1000 and an Atari ST running C-Lab Notator. This system (along with DAT) seemed to imply a shift away from analogue media and marked the most significant modification of working patterns until the arrival of an Atari-based Sound Tools system in Studio 2 in 1991, supplemented by a Macintosh-based system in Studio 1 in 1992. This permitted us to run GRM Tools, the real-time DSP package from the Group de Recherches Musicales in Paris, as well as the more familiar Cubase Audio, Alchemy and Max.

In 1991, the return of Robert Dow who, after obtaining his MA from Birmingham in 1990, had spent some time developing software for the Vax system at EMS in Stockholm, Sweden, brought the realisation that the computational power required for advanced digital sound processing already existed on campus, though the means of transferring data was not available. The decision by the University to install the High Speed Campus Network provided a solution to this problem and the project to implement remote digital signal processing was born. From its inception, the project has had substantial support from the University’s Academic Computing Service (ACS), under the direction of Dr Jim Hendry.

3. High Speed Campus Network

The connection of local computer workstations within studies to the HSCN, a network of 10 MBit ethernet LAN’s connected via a 100 MBit FDDI ‘hard spine’, has allowed composers access to a
variety of sound synthesis and sound processing software on relatively fast platforms. The use of large central facilities has offered many advantages, of which perhaps the most important is that these machines are maintained in terms of both hardware and data-integrity by A.C.S. However, access to the IBM3090-200S VF and other central facilities has established an extremely efficient use of Studio resources. During production, the composer has not only access to real-time or very fast processing offered by the local Studio system (e.g., Sound Tools and GRM Tools running on a Macintosh micro-computer) but also non-real-time processes (such as phase vocoding) on remote machines. In a Studio whose basis is a single micro-computer it is important to minimise time spent on CPU-intensive processing. The mainframe may be set to run many non-real-time processes as batch jobs, with sounds transferred over the HSCN via the FTP TCP/IP protocol when required. The main real-time tools such as editing and sequencing are thus not held up by non-real-time processing.

The IBM3090-200S VF was chosen firstly for its speed (maximum speed of ca. 15 MFloats normally or 120 MFloats with the vector facility) and secondly for the availability of both permanent and dynamic storage (128 MBytes of RAM, 400 MBytes of permanent storage and 1 GByte of address space allocated to the Studio). The main aim of the Studio's 'Computer Music Project' was to mount both publicly available and custom-built software on the 3090, but with programs being rewritten so as to present only one standard parameter format (and therefore interface) to the user. Thus all software in the BEAST system deals with stereo files at 44.1 and 48 KHz sampling rates, in short integer format (16 bit) with either no header or an Atari SD2 header (the programs are currently being modified to accept both Mac SD2 files in MacBinary format and IRCAM headers). In short, the point was to produce programs which would work at professional standards, but which would be as friendly as possible for the less computerate electroacoustic composer.

The interface to all programs was standardised into a REXX/XEDIT format, common on the 3090, which then calls the processing module in command line format. To allow for portability, all source codes for the modules have been standardised to ANSI C, although vectorised versions use the standard NAG library of mathematical routines. The user is confronted with a 'form' page and must fill in all blank values for parameters. S/he may also alter displayed default values. The user cannot proceed until the values supplied are valid, thus avoiding run-time errors. The processing can either be done in the foreground or as a batch job, without the need for a complicated command line or an esoteric batch file construction. The user may also choose to store or retrieve data in the form of a 'parameter file' (cf. CHANT), thus allowing the construction of process data to be done at home and the cataloguing of work in progress to be made.

The software at present is predominantly phase vocoder-based, the original sources coming from many places, with modifications and interfaces by Robert Dow. All phase vocoder subroutines are based on Chris Penrose's modifications of F. Richard Moore's original code. As CDP (Composers' Desktop Project) developers, CDP programs such as Trevor Wishart's SPECE and SPECSH and others such as Andrew Bentley's PT RANS and LOOP have been successfully modified and ported (thereby overcoming limitations such as mono-only operation). Software such as
HARMY (harmonic amplifier), TPNVTV (tracking and time-varying spectral inversion) and MCOMB (multiple comb filters) have been written specifically in response to composers' demands. CHANT is available on a VAX platform in its original form and many programs (such as CSOUND and PINV) are available on several different platforms (VAX, IBM3090, Apollo, HP710 and Sun).

4. Future Developments

With the redirection of the ACS towards distributed computing and UNIX 'black boxes', the Studio must also develop non-platform-specific UNIX-based sound processing tools. At present, the basic command line-oriented module is very portable for all but the most obtuse compilers. However, the interface is specific to IBM 370-like platforms, and so development will very soon begin on an X-window-based system. This will integrate a 'Sound Designer II-like' editing package with sophisticated sound manipulation routines and the project will investigate the possibilities of playing sound at CD quality directly over the HSCN.

In parallel with these specifically computer-oriented developments, the broad policy of the Studio to provide maximum flexibility for composers will be maintained, with investment in real-time and off-the-shelf systems continuing alongside the possibilities offered by the HSCN.

There are also hopeful signs on the personnel front: as well as actively looking for people with programming expertise, the appointment of a technician is now, for the first time in the Studio's history, a real possibility.

5. Summary

The policy of the Electroacoustic Music Studio at The University of Birmingham has been to offer flexibility, choice and appropriateness of system for the compositional job in hand. This approach has been maintained throughout a number of shifts in the 'technology base' of electroacoustic composition, permitting composers based in the Studios to adapt to new developments with the minimum disruption in output. Developments in the Studio will continue to be composition-led, refining existing resources for their compositional potential as well as proposing new strategies and possibilities to any programmers and developers to whom we may be fortunate to have access. In the final analysis, it is music itself which drives the composers of BEAST.

Footnote: BEAST 1992-93

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