Sound capture and real-time composing

I have been working with sound artist Ben Jarlett on the use of live electronic sound mixed with live acoustic sound. This is a paper given at the MAXIS III International Festival: Symposium of Sound and Experimental Music at the University of Leeds, UK April 2003

The application of the live sound capture techniques in this particular performance collaboration started with the search by Barry Edwards and Optik for an electronic sound dimension to their work that could inter-act creatively with their own site-specific body based approaches.

During the period 1993 – 2000 Optik developed a distinctive performance practice. At the core of the practice is a performer technique that enables performers to improvise but within a structure organised by specific conditions of body, space and time. The precise conditions are determined by what is present at each performance event. The term improvisation should not be taken as verbal improvisation in the traditional theatre sense: in Optik's practice the performers use no spoken words. To improvise in the Optik sense is to work with key human actions but with no pre-planned temporal or spatial score given in advance of the actual performance.

The development of real-time electronic composing was the key breakthrough for Optik in terms of sound, but acoustic sound has always been, and still is, an important element in this work. Improvised acoustic music was also a major element. Throughout this period (1993-2000) the company worked with a live percussion player using a range of instruments (marimba, drum kit, congas, and so on). He improvised his drumming in the same independent way as the performers moved in the space; he was given no structure or code. The result of this collaboration between acoustic, temporal and visual space was not chaos (as might have been assumed) but rather a texture of self organised and self organising patterns of sound, action, stillness and silence. The challenge was to integrate

electronic sound into this environment without losing the high levels of intuitive, often unpredictable response.

The trigger for moving into electronic sound came from one of the last pieces made with the acoustic percussion player. It was an experiment that played on the border between acoustic, live, captured and electronic. In October 2000 Optik gave in internet linked performance with simultaneous sound and action in Sao Paulo Brazil and Uxbridge London. The percussion was played in a studio in West London linked via the internet to the performers who were performing in the Karman Theatre in Sao Paulo. The random delay and manipulation of the sound reaching Sao Paulo from London added a key texture to the event. The system of transmission became another player in the inter face between musician, instrument, cable-lines, speaker, performers and audience.

Following this project Optik took the decision to build on the idea of electronically manipulated sound. Ben Jarlett, sound consultant to the Brazil project, was asked to investigate possibilities. Full details of what he developed, and is developing as a result, follow.

For the Optik process to keep its core compositional structure intact, any electronically generated sound had to be sourced in real time and real space, that is with real sound, happening in the moment, *and* composed in real time. Anything pre-recorded, or pre-edited and then played alongside the performers would have immediately destroyed the *raison d'etre* of the performance.

The search for such a system began in March 2001 and was first trialled publicly with Optik in Belgrade in October 2001. These first trial performances used ambient sound only: three performers in the space and one sound composer. In its essentials the process was working successfully, the performance structure was not only maintained, but was growing in complexity. Texturally, the sound was very percussive, often moody or tense, and it had proved difficult to affect transitions away from tension to a lighter texture. As a result, in subsequent performances in April and then October 2002 (ICA London) first solo voice was added (April) and then solo viola (October). This allowed the electronic

sound to be generated from both ambient and instrumental sources, crucially involving pitch.

Granular Synthesis

The initial request by Barry Edwards for a looped delay effect prompted Ben Jarlett to thoughts of Rasmus Ekman's software granular synthesiser Granulab. Granular synthesis - the process of taking digital audio, slicing it into pieces of definable length and then playing them back at definable times, with definable pitches – seemed perfect for Optik as it enables you to create rich textures from practically any sound input. A performance system was developed consisting of a PC, a copy of Granulab and Steinberg's Wavelab (although practically any wave editor would do), a 16 slider midi controller, mixer and reverb unit. The reverb is there to smooth out some of the harsher textures produced, it is not involved in the improvisation.

When sound is produced on stage (be it by performer, voice or viola) it can be captured by microphones in the performance space. It was found that two PZM microphones placed on the floor of the space adequate to capture the sound of the performers walking, running and breathing. The addition of voice and viola required separate close microphones so that their sound could both be amplified as you would in a normal performance and routed to the computer.

The mixer was set up so that the ambient mics did not have a route direct to the PA. This is important as Optik does not perform in conventional spaces where the audience is sat facing a stage, instead the audience is (as far as is possible) in the same space as the performers, making audio feedback a problem.

The faders of the mixer are used a lot in performance to easily select inputs and alter levels.

Granulab (version T5) has 8 streams, each stream consisting of a granulated sound file. The controls of Granulab are as follows:

Sound Playback

- start time
- start time random modifier
- length
- length random modifier
- rate
- scale (used to fine tune the rate control)
- a->r (amplitude to random rate modifier)

This section chooses a part of a soundfile to loop, for example if the start controller is at the bottom and the length controller at the top the soundfile will loop in its entirety, whereas if they are both half way up the second half of the soundfile is looped. The Rate control controls a pointer moving through the soundfile, if it is set at 1 it runs through the file at a normal playback rate, at 2 double the playback rate, at -20 twenty times the playback rate in reverse and so on. When a grain is taken from the soundfile this pointer indicates from where.

Grain Density

- frequency (how often grains are produced)
- length (how long the grains are)
- a->f (amplitude to frequency modifier)
- a->l (amplitude to length modifier)
- random Frequency Modifier
- random Length Modifier

This section controls how often a grain is produced and how long the grain is when it is produced. This section is texturally the most important. The frequency control can be set low to produce grains slowly thus create rhythms, or high to produce textures. It is the

dynamic movement of this control that explores the area between texture and rhythm. If grains are produced quickly and are long in duration the density can increase to a level that requires more processing power than is available which luckily doesn't crash the program, rather creates a stuttering sound – which can actually sound quite effective, but is generally avoided. When pitched material is used the length control can overlap the different pitches in the sound producing chordal textures.

Grain Pitch

- pitch
- glissando
- random pitch modifier
- random glissando modifier
- a->p
- a->g

Pitch alters the pitch of a grain as it is played back. Glissando slides through a grain either up or down in pitch during the duration of that grain. When using multiple streams of one sound file the pitch control can enable you to produce harmonically related streams.

Envelope

- attack
- decay
- attack random
- decay random modifier

This section alters the amplitude envelope of each grain, which can change the texture of rapid grain streams, or be used to produce percussive sounds when using slower streams.

Output

- amp

- a->a
- pan
- pan random modifier
- a->p

Finally this section alters the overall volume and stereo position of an output grain. Using the pan and random pan modifier controls can be effective in spreading out the streams around the space.

It was important to use the MIDI controller in performance as it turned the computer into an instrument allowing the operator to respond instantly to influences coming from the stage. The main benefit of MIDI in this system is the ability to access more than one controller at one time – only one is possible using a mouse. An additional benefit is that with Granulab when the processor reaches overload due to creating to dense a stream you are able to reduce either the grain frequency or grain length – there is no control from the mouse at such a time. The most important controls were chosen for this:

1. start
2. length
3. rate
4. grain frequency
5. grain length
6. pitch
7. glissando
8. attack
9. decay
10. random start
11. random frequency
12. random pitch
13. random glissando
14. random pan

15. pan
16. amplitude

Improvements to this system would centre on reducing the amount of time and concentration needed to capture a sound and start it playing in a stream. Work has begun in creating a similar synthesiser to Granulab in MAX/MSP which includes capture and editing within the program as well as the addition of equalisation and reverb. This enables the operator not only to have more time to concentrate on performance (rather than the operation of the computer) but also reduces the amount of equipment to a laptop and midi controller.

Sound, Body and Space-Time

This is a very complex form of collaboration. Normally there is a fixed point around which the artists can meet and have a common focus. This is deliberately removed in this process, resulting in a 'floating focus' that shifts around the compositional and performance space. Crucially, no single artist can control where this focus is at any time, if indeed it is there at all. In a critical sense the artists are not and cannot be in control of the overall result. Rather the sensory environment in which it is taking place determines the total performance at any one moment. The key fields in this environment are the acoustic, physical, visual and temporal. The relationship between these fields is a dynamic one, that is to say there is no precedence of one over the other, and all are inter-dependent. However, what happens is that they all combine into one sense field, and are then experienced as the intuitive, creative and synaesthetic pulses that are at play in each spectator, each artist. It is a play of recognition, impulse, emotion. As has been said, this process of organised and organising chaos is beyond the control of any one player. But also, no one is free to 'opt out' from the play either. To be able to work within this collaborative flux this technique goes deeper inside the building blocks of sound, of action, towards the smallest units possible. Micro sound, micro action and beyond (i.e. towards the infinitesimal). The smaller the unit the more complex the overall structure

becomes. In this way the opening up of scale in sound terms (as in granular synthesis) corresponds to the border-shifting (temporal and spatial) of the human scale.