A Multichannel Performance Space For Presenting Experimental Polymedia Compositions

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Introduction

As this is a symposium on mixed media, I thought it would be interesting to give you an overview of an experimental polymedia project that I have been working on over the last 12 years or so. This, what has turned out to be, rather large project has many component parts so I will restrict myself to a general overview. It is an ambitious project and one that I could not possibly have undertaken on my own. Others who have worked with me over this time are too numerous to mention by name but it gives me pleasure here to acknowledge their contributions.

Background and aesthetic considerations

Anyone who has had to face the problems of publicly performing electroacoustic music - especially multichannel work - will attest to the lack of suitable performance venues for such music. Whilst some proscenium-arch concert halls have appropriate acoustics, many are too reverberant for works which involve subtle control of this parameter, a necessity for good spatial projection; many have raked seating which restricts the placement of loudspeakers in musically appropriate locations, such as overhead, for example, and many have both characteristics. In addition, these halls promote a type of music-making which enshrines a divide between performer and audience which, for me anyway, is socially unacceptable in that it promotes an ideology of "us and them" and encourages the maintenance of the relatively recent institution, the "work" [Goehr 1992], as a one-way transmission of a composer's thoughts (sometimes through inspired performers) to a relatively passive audience.

A solution to some of these dilemmas is to take the music out of the concert hall. In 1983 whilst touring regional Australia, where there often aren't concert halls anyway, I presented electroacoustic music mainly in art galleries. Whilst more flexible spatially, one still had to contend with very varied and mostly inappropriate acoustics, not to mention often incongruous paintings! So, at that time I resolved to find a solution. What was needed was a portable, reconfigurable and more controllable sonic space. At about that time I also met the computer animator Stuart Ramsden who was seeking ways to explore more fully his ideas on the complementarity of music and the visual image following on from the work of John Whitney Snr. for example, and to do so, had begun work on his Retinal Orchestrator [Ramsden 1988].

I was led to the work of Buckminster Fuller initially through the writings of John Cage. Fuller's pioneering work on geodesic domes suggested a possible architectural solution to the performance space problems I've outlined. Geodesic domes, being spherical in origin, enclose a maximum amount of space for a minimum surface area and, as structures in both tension and compression can be made lightweight (which is good for portability) and require no internal supporting pillars or other such structural necessities.

So, a small group of composers and computer artists formed as *floating exceptions* in 1985 to design and build a portable geodesic space suitable for realising their works in sound and light. Whilst I was aware of the spatial works of Edgard Varèse and Karlheinz Stockhausen, their architectures were certainly not portable and also, as we were funding this work ourselves, not financially viable. The structures for Iannis Xenakis' *Polytopes* seemed more appropriate but as they are solutions to his specific compositional explorations, were not general enough for our needs.

The Dome

What resulted is a portable seven meter radius white geodesic dome (a four frequency icosahedral geodesic hemisphere, class II method II) with a seating capacity of approximately 200, which we first used in festivals in Adelaide in 1987 and in Sydney in 1988 to perform the large collaborative work *Life Dreaming* [Worrall and Ramsden 1988], commissioned by the Australian Bicentennial Authority and based on the Life algorithm of John Horton Conway. (Figure 1 and slides).

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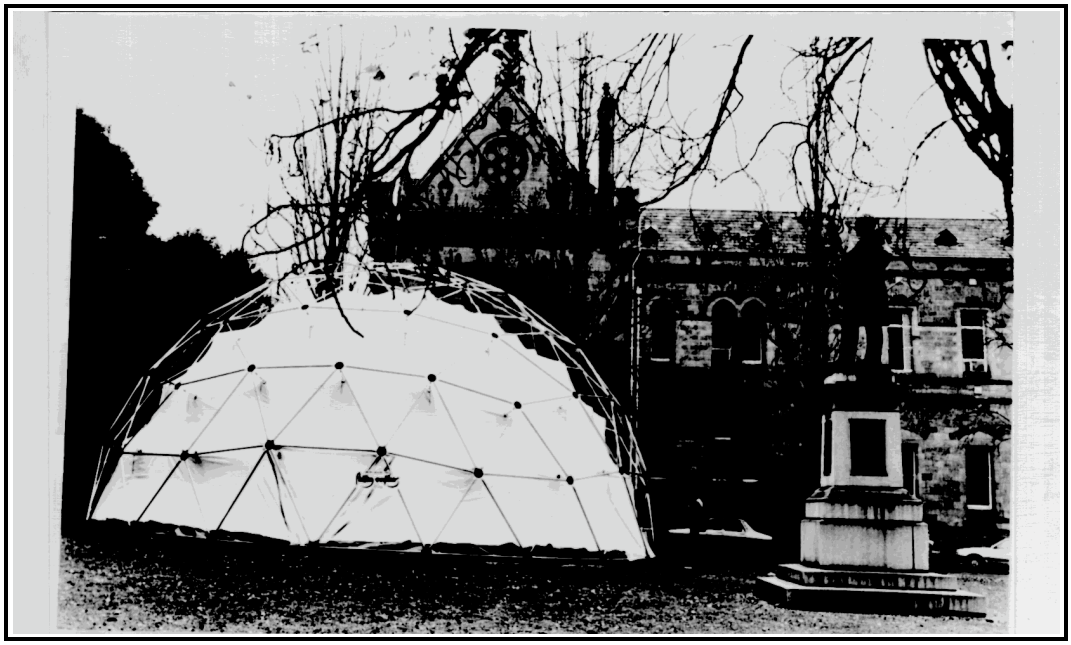

Figure 1. The *Floating Exceptions* portable geodesic dome performance space.

General Hardware & Software Overview

Figures2a and 2b, show elevation and plan views of the dome performance space without its canopy, gives an idea of the physical layout of this instrument.

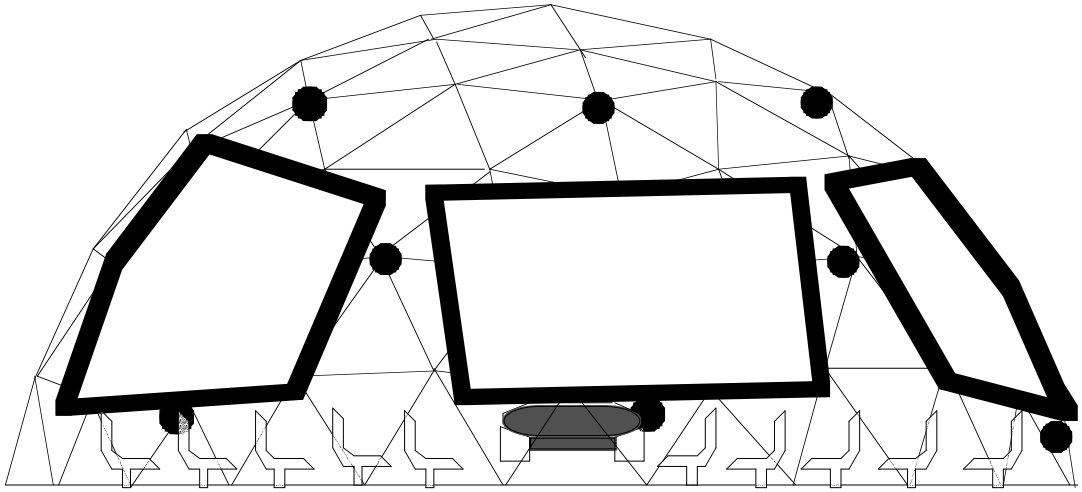

Figure 2a. An elevation view of the geodesic dome performance space

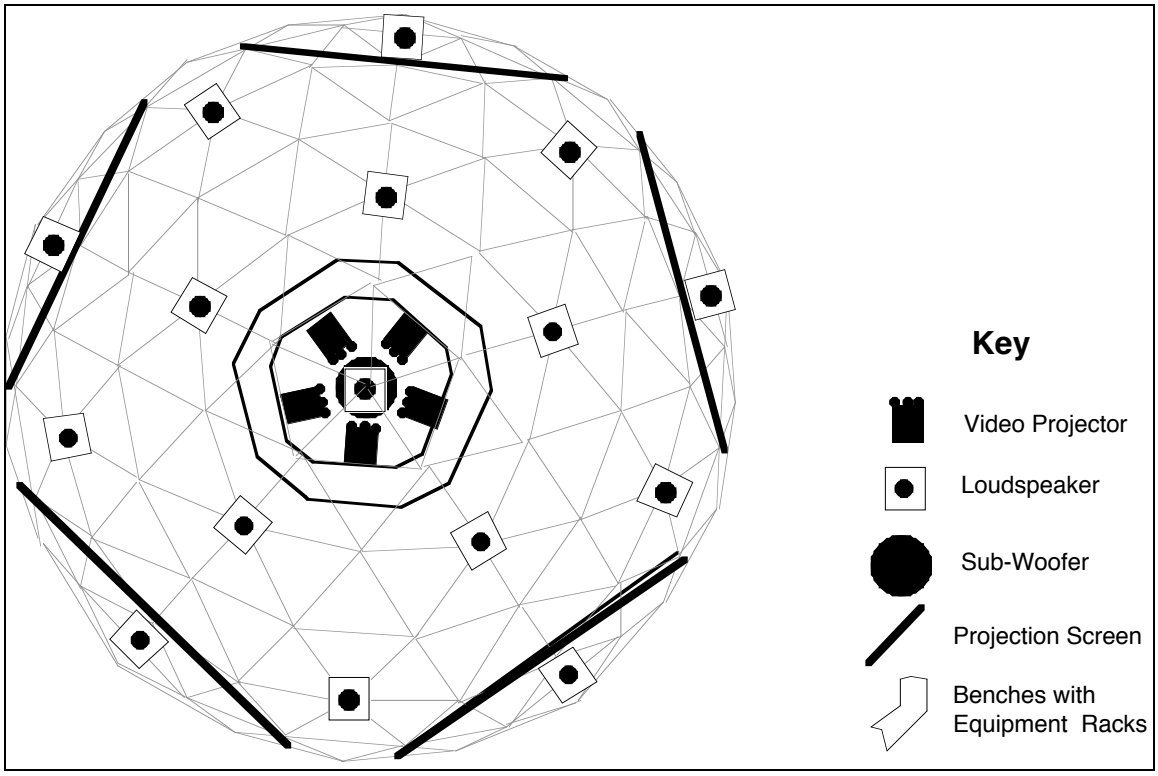

Figure 2b. A plan view of the geodesic dome performance space

Loudspeakers that are suspended from sixteen equidistant locations are used to create the three dimensional aural environment. A sub-woofer system on the floor in the centre of the dome provides the low frequency components of the sonic spectrum. Surrounding this are five appropriately angled video projectors which are used to project graphic images onto the screens opposite them. These projectors are themselves surrounded by a decagonal desktop under which computer, synthesiser, and amplification sub-systems are rack-mounted.

Figure 3 summarises the sound and image composition systems: It consists of

(a) The sound system:

- various analog and digital devices such as synthesisers, samplers, tape recorders and signal processors;
- Two computers for music composition running *Streamer* [Worrall and Read 1990], my own realtime MIDI event generator.
- a sixteen channel equalisation and amplification playback network;
- a spatial distributor for controlling the localisation and movement of the sounds in the space [Vennonen 1994];

(b) The image system:

- five computers (one for each of the projectors) for generating graphic images in realtime;
- a computer for generating image composition and image location instructions which communicates with the sound system via MIDI.

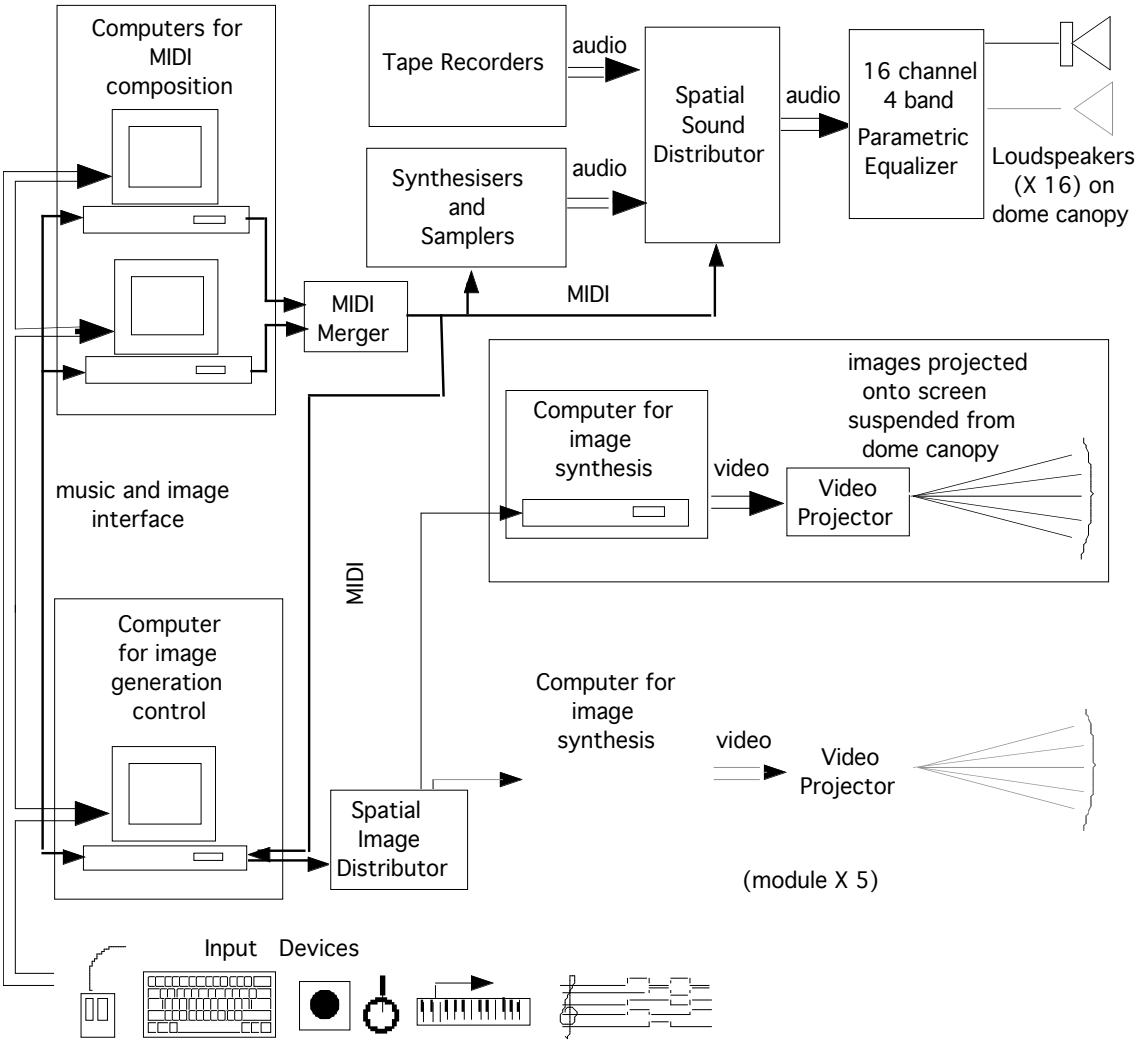

Figure 3. Diagram of the music and graphics composition system for the geodesic dome performance space.

Composing in Sound and Light: An Historical Context

Many visual artists and composers have realised that visual and aural perception are not mutually exclusive [Kandinsky 1979; Schoenberg 1984; Webern 1963]. Traditional theories of colour [Goethe 1970; Itten 1973] and harmony [Rameau 1971], and more recently psychophysics [Welch and Warren 1980] provide theoretical and psycho-physiological underpinnings of this thesis. See especially [Evans 1990].

Before the advent of electronic technology it was not possible to integrate sound and light composition except in the most general of ways, for example in opera and ballet. As a medium, film is capable of exploiting the synthesis of sound and light more directly and this has led to an extension of technical and thus expressive possibilities. Many artists in the symbolist and transcendentalist movements have been concerned with this issue: Scriabin's colour organ [Scriabin 1911] and Termen's Light Music Projector [Galeyev 1991] being particularly interesting precursors, as are the colour-musical films of MaryBute [Bute 1964] (whose work was directly influenced by Termen) and Whitney. [Whitney 1980, 1990].

Integrating the visual and aural domains with the use of digital computers is now technically possible on the micro-(i.e. sample, pixel) as well as macro-(i.e. gestural) compositional levels. With the advent of more powerful multimedia workstations, such as those beginning to be produced by Silicon Graphics for example, and with appropriate software, more highly correlated composition, production and performance environments can be developed and this will encourage new artistic paradigms.

In fact, our own collaborative experiences [Worrall and Ramsden 1988, 1990] have convinced us that computer music and computer animation often have more in common with each other aesthetically, and certainly technically, than they do with their traditional origins. Over the years, I have been impressed by how "musical" many animators are. By this I mean that they seem to have a different sensibility to most other visual artists. Generally, they had a concern for gesture,

for phrase, for dynamics, in fact sensitivities which come from working in the time domain. Unfortunately most still reflect their filmic origins by treating music as a sort of gravy that's poured on at the end to fill up all the 'cracks' and make it more digestible. Interestingly however, the demands of computer animation on the available technology means that they frequently worked in ways that composers working in sound synthesis and transformation with computers do; long hours of waiting for the machine to realise experiments that form only a small part of the finished work or, more often, that are often of no immediate use.

Thus, convinced of the usefulness of composers and animators working together, we established ACAT, the Australian Centre for the Arts and Technology at the Institute of the Arts, Australian National University [Worrall, 1990] in 1989 where dome is currently located and developed a curriculum in which animators and composers study such things as the use of a broad spectrum of mathematical and algorithmic techniques together and in doing so provides an update on, or alternative to, traditional technical studies - such as Harmony and Counterpoint or Twelve-Tone Technique[Worrall, 1996]. See the WWW site http://Online.anu.edu.au/ITA/ACAT.

Current Research

Whilst the present dome has served us well, it was structurally over-designed for practical reasons; we did not know if it was possible to erect it with its loudspeakers and screens without having to climb on it. We are now working on a new prototype which will be even more portable [via air-freight], more quickly erectable, and will enable better loudspeaker placements. We are further developing the realtime ambisonic encode/decode system under MIDI control [Vennonen 1994] which is being integrated into our existing music composition software which itself is being extended to seamlessly include soundfiles and well as MIDI. This composition environment is being integrated with the image composition software onto a single hardware platform (SGI's). This is leading to a distributed network approach to our computing requirements which includes ethernet connection to massively parallel supercomputers such as Thinking Machine's CM-5.

Conclusion

This project, then, arose from a need to find a more flexible, three dimensional performance venue, one in which the music could "leave the ground" and become more truly three-dimensional. The use of multiple channels allows one to concentrate on the volume of the enclosed space and the way sounds and images are distributed in it, rather than a 'stage' performance. This allows the making of compositions in which the locations of sounds and images can be treated more parmetrically and encourages the development of spatial "grammars". The incorporation of dynamic realtime visual synthesis into a composition, allows the creation of experiences in which both the aural and visual domains play equal and/or complementary roles.

Our experience in performing in this environment is that audiences of all ages, far from being distracted by the unfamiliarity and "high-tech" nature of the environment, easily accept the new set of listening and viewing conditions and thus approach the compositions without the familiar resistance that many people still have to electroacoustic music.

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