Sound Design for an Exhibition

Peter Coulter

Powerhouse Museum, PO box K346 Haymarket Sydney, NSW 2000, Australia and Department of Architectural and Design Science University of Sydney, NSW 2006, Australia.

Abstract: Museum exhibitions commonly use visual design to orientate and inform visitors. At the Powerhouse Museum in Sydney, Australia, an exhibition, entitled Ngaramang Bayumi, was recently developed on indigenous music and dance. The exhibition was designed to orient the visitor using aural cues, in addition to the visual ones. This has been achieved by the use of acoustic design and through the use of specialised sound systems that present a 3D sound (ambisonics), that calls and guides the visitor through the space. The experience, along with audiovisuals, objects, text and graphics uses unusual geometries, layouts and building materials. Using this design as a case study, this presentation will explain the research and development of the acoustic elements within the exhibition. Visitor reaction to the exhibition are also discussed.

EXHIBITION DESIGN

There are few straight lines in nature - or in this exhibition. A particular style of curve has been used repeatedly throughout Ngaramang Bayumi (in the seats and the walls, for example). This curve is a feature of much central desert art and a symbol of people coming together. The curved shapes and the building materials minimise sound reflection, helping you to focus on the sounds in a particular area. A specialised sound system has been installed for the soundtrack that you can hear throughout the exhibition. It uses a technique called ambisonics which presents sound in a more realistic way than systems previously used. The result is a sound that feels three-dimensional.

Sound plays a very important part in Ngaramang Bayumi and contributed to nearly one third of the exhibition budget. The exhibition has been designed as a series of five listening rooms that replicate the acoustics, as well as some geometries, of the bush. The listening rooms are set out in Figure 1.

FIGURE 1. plan of exhibition
THE SOUNDTRACK

The soundtrack that you hear as you move through the exhibition was composed and recorded by an indigenous composer, David Page, and performed by David Page and Djakapurna Munyarryun. The composer writes about the piece: ‘Music is about our relationship with the land, how we can we all sing the stories of belonging to a world of beauty and peace. Of how we maintain the songs of hope. Creating and passing on the Songlines through times of change, while dancing on one earth. So, mother earth can hear and feel our appreciation of creation.’

One of the aims of the exhibition is to call and cue the visitor before they reach the beginning of each of the sequential spaces or pods. This was achieved by using the soundtrack. Additional introductory information is presented by way of large text and graphic panels which are visible after hearing the sound track. Further information is presented via selectable audio visual units. This operates from laser disk. The music piece is played back on a sixteen track hard disk recorder. The sound track which has four parts or movements each six minutes long, is played on a continuous loop. “Sound sources are encoded into a general three dimensional format called B-format by combining source position and orientation, the position and orientation of the listener and the acoustic properties of the simulated space they inhabit “ (1) The sound was mixed using a convolution software, down to four channels and presents using a four speaker array (tetrahedral configuration) This was the minimum array. The visitor automatically walks through the sweet spots of this mix to experience the three dimensional sound. Locating these spots required physically measuring the distances from the centre of the sweet spot and keying this data into the software.

The mood of the composition changes slightly (remix) from one listening space to another to reflect the theme of the space.

EXPERIMENT

An experiment was conducted where the sound levels of the exhibition were altered and visitors were asked to comment on the sound in a questionnaire. Both the ambisonic sound and a remixed monosound were used to determine the effect on visitors.

SPECIFICATION AND CONSTRUCTION

An aural space was required where reverberation time and ambient sound is low, the dynamic range is wide. Such an environment permits a high degree of localisation which is requisite for effective use of the ambisonic music and is also conducive for a story telling atmosphere.

In each room there is approximately a 10dBA drop over the 11m length. This allows the second sound source from the audio visuals to be audible but not interfere and crossover with the soundtrack. The use of see through barriers (convex shape) in each of the rooms serve purpose as showcases as well an acoustic control and assist to achieve a 10dBA sound level drop.

The Rt testing of the space was measured several times throughout the construction and is presented as a graph of successive additions of the building materials. Some of these materials have a rating (STC and absorption co-efficient) This made it possible for some degree of acoustic prediction.

CONCLUSION

The conclusions were: (1) Two different sounds can exist within the same exhibition space and not cause undue concern for the visitors. (2) Respondents react differently to the degree of ambisonic sound and the sound level used.

REFERENCES