Fulldome Activity Report 2011-2012
Prepared for the Australasian Planetarium Society, 28-29 April 2012
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Unfortunately I am unable to attend the APS AGM this year but attached is a report on dome related activities by myself since the 2011 APS. My contribution to the projects outlined here ranges from consulting, acting as a hardware supplier, providing software tools and support, to full system integration. I've provided a brief one page description of each project and I trust there is something here of interest, please feel free to contact me if you would like further information.

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http://paulbourke.net/papers/aps2011/aps2011.pdf

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Dark Matter Production

Paul Bourke, Peter Morse, Carley Tillett, and Alan Duffy and engaged in a fulldome projection on DarkMatter, called simply “Dark”. The production is funded by iVEC and SciTech, it is expected to be released in May 2012 and will be supplied free of charge.

Dark matter is introduced from the perspective of simulations in astrophysics research, research being carried out at ICRAR, the International Centre for Radio Astronomy Research. An interesting/challenging aspect of the production is the amount of filming involved, this was accomplished using the LadyBug-3 360 degree video camera, arbitrary fisheye views can be extracted from such footage. The native resolution is around 2400 pixels square.

Opening scene, Alan Duffy on the beach.

Supercomputer scene discussing computer simulations and the use of the supercomputers managed by iVEC and the upcoming Pawsey Centre.

Sports car scene. "We can't see through the fog in the visible spectrum but can using radio waves".

ASKAP animation scene.

Running Room

This iDome project proposes to augment the gym treadmill running experience with an immersive experience, running through and across interesting parts of the world. While based upon the iDome it represents an example of the possibilities of engagement and entertainment within hemispherical domes, a projection surface that fills ones entire visual field of view.

The challenge has been largely how to capture sufficiently high resolution video footage in fisheye while also achieving a steady-cam result. The steady-cam requirement is important, due to the immersive nature variations in the sense of “up” in the footage is extremely disconcerting to the viewer. Experiments have been conducted with high end SLR cameras and fisheye lenses, the LadyBug-3 camera, and more recently the Red Scarlet with fisheye lens.

Manipal Planetarium

In March 2012 I was contracted to install a digital fulldome projection system in the planetarium in Manipal on the west coast of India. The planetarium is part of the Life and Physical Sciences at Manipal University, indeed Manipal is largely a university town focusing on medical training/research but covering the whole spectrum of disciplines.

The planetarium dome is 8m in diameter and is designed with omnidirectional seating. The currently functioning Ziess opto-mechanical projector is still in good working order and is now complemented with a HD based spherical mirror system.

Zeiss star projector and spherical mirror

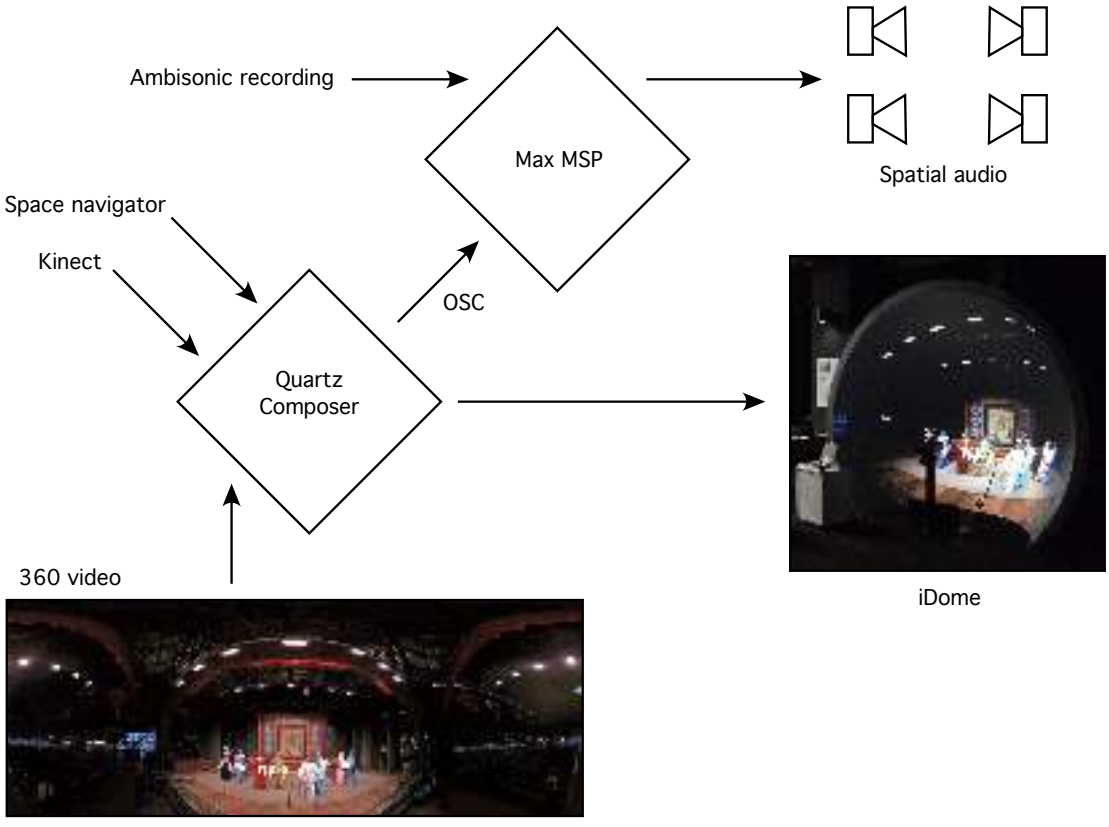
Sample frame on the dome from the Kalouka`hina show from SoftMachine.

iJiao

In collaboration with Sarah Kenderdine, ALIVE laboratories, City University, Hong Kong. Showcase of cultural heritage of China, captured as 360 degree video of various Taiping Qingjiao, also known as the Jiao festival.

"The festivals, held throughout Hong Kong, appease the ghosts and give thanks to the deities for their protection. They take place every year or every five, eight, or ten years, depending on local customs. The religious rituals involved are meant to purge a community and prepare it for a new beginning."

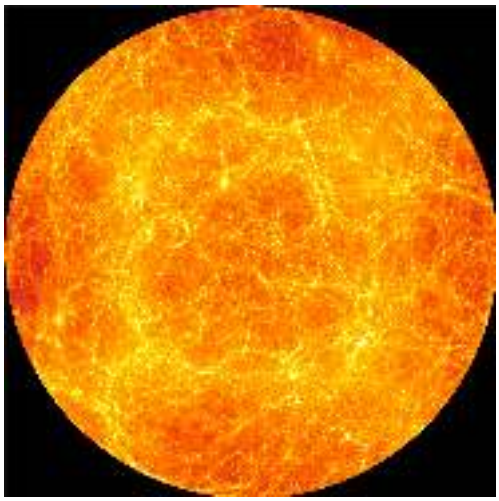
Features realtime navigation within the iDome and ambisonic audio that tracks the users navigation.



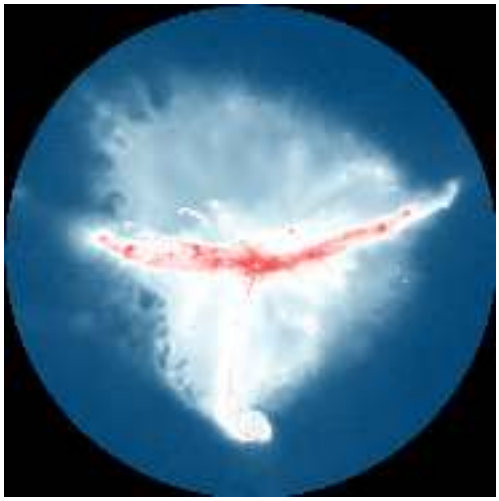
Astrophysics simulation visualisations

In collaboration with Alan Duffy (International Centre for Radio Astronomy), and Rob Crain (Leinden Observatory, The Netherlands).

Three simulations, each run on supercomputers have been rendered out in fisheye format for visualisation within a hemispherical dome. Note these are all time varying animations, only stills can be shown here. These simulations are also key to the Dark Matter production mentioned above.



COSMOS: Simulation within a cubic region of the Universe just after the big bang. 600 million light years on each side of the cube. Shows dark matter collapsing over 14 billion years of cosmic time, forming filaments and collapsing halos of the Cosmic Web.

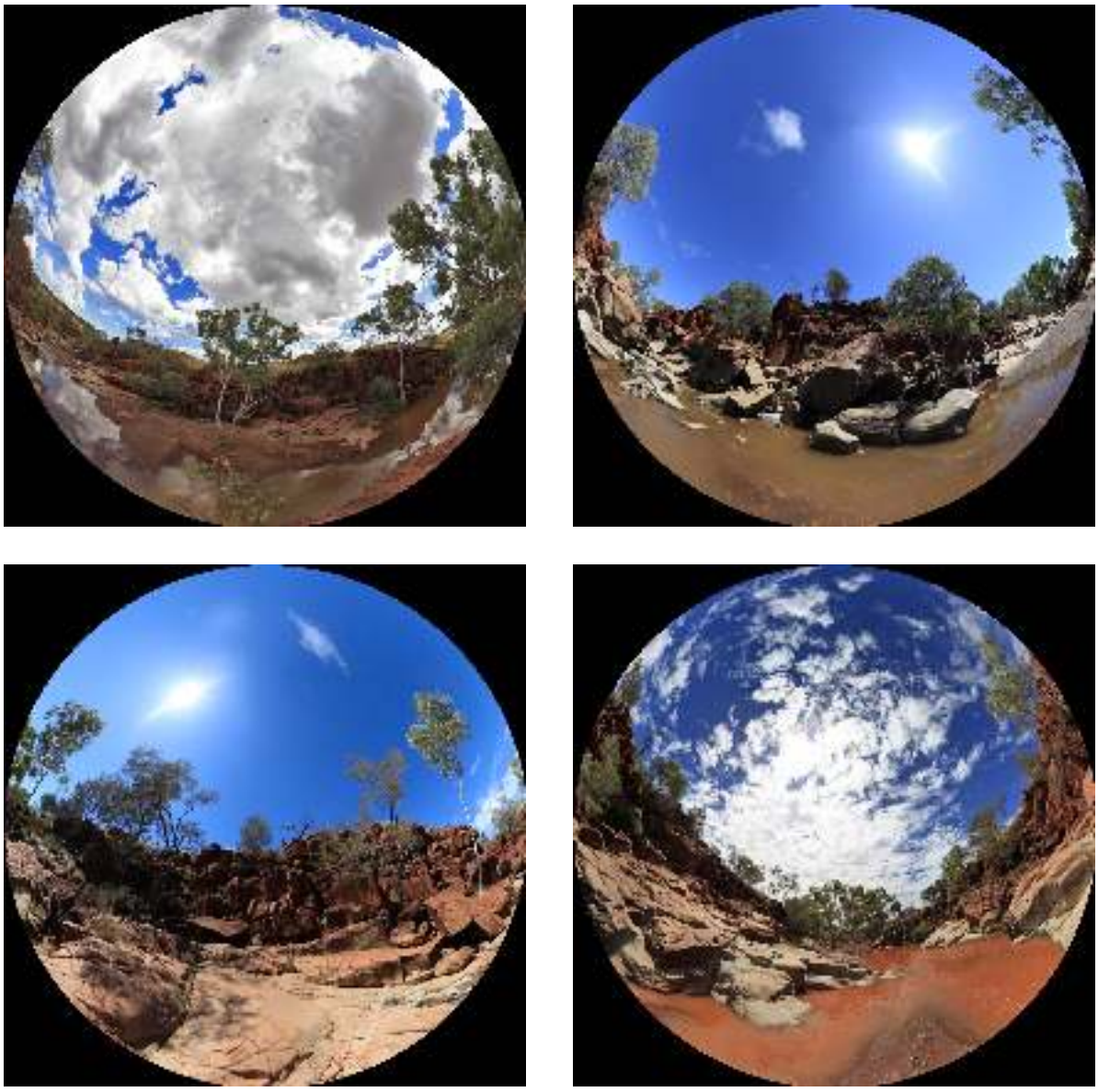


GIMIC: Simulation of the formation of a dwarf galaxy, similar to the Large Magellenic Cloud. A violent process, dark matter forms along filaments along which gas flows in the central disk where star formation occurs.

KINETIC: Simulation of the formation of a spiral galaxy similar to our own milky way but about half the current age. The gas follows dark matter along the filaments. Each of the small satellite galaxies are about the same mass as the GIMIC galaxy.

Indigenous rock art

As part of a project with archaeology UWA and BHP Billiton, a site rich in indigenous rock art has been surveyed using traditional methods but also images were captured using more novel high resolution techniques. These include gigapan photography, 3D reconstruction from multiple photographs, and fisheye/spherical image capture. The site is located about 1.5 hours drive north of Newman in the Pilbara, a total of 250 rock art specimens were documented during the exercise and the whole site is recorded as 360 spherical panoramas.



These will form part of a story for a dome within an indigenous visitor centre.

This was the first exercise with the new 8-15mm zoomable fisheye lens from Canon. A fairly unique lens which captures a full 180 fisheye filling the height of a fullframe sensor or zoomed into a 180 horizontal FOV filling the width of the sensor, or zoomed even further for the equivalent of an ultra-wide angle lens.

Indian sacred architecture

As an initial exploration and as part of a bid for a project on sacred Indian architecture, a number of temples have been photographed using both fisheye and full spherical (360x180) panoramas. Access has been granted to a selected number of sites for which "tourist" entry is not normally provided. This work was carried out during the above mentioned trip to Manipal, the second stage will occur in April/May in the Bangalore region.

Moodabidri (1000 pillar temple)

Krishna Gita Mahadwara

The fisheye images shown here are captured for a sweet spot 40 degrees up from the spring line. A matching set intended for the final installation are captured with the intent of viewing in a horizontal dome, that is, the sweet spot being at the top of the dome.

Endeavour returns to Fremantle

In October 2011 the Endeavour replica returned to Fremantle where it was originally built. This offered a unique opportunity to create an immersive iDome experience for an exhibition in Fremantle. The LadyBug 3 camera (see red camera in the center of the image below) captured 360 degree video of various activities carried out onboard on the ship during its sail into the Fremantle harbour.

A typical frame from the video is shown below. The unique characteristic of this type of capture is that one can navigate interactively, in real time, within the dome while the video plays.

Sample frame in the iDome.