iCinema
centre for interactive cinema research

Omni Directional Capture Systems and Playback Environments

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Introduction

While advances in digital technology have revolutionised the field of cinema and multimedia, for a number of theoretical and technical reasons, the domain of immersive high-resolution digital video recording using global capture systems, has yet to take advantage of these developments. The promise of fully immersive high-resolution digital capture proposed by this system is twofold;

Firstly, its unprecedented field of view opens up the process of documentation to global information capture and representational flexibility implied by such a recording system. Video imaging is currently held captive to older pictorial paradigms of visualisation dominated by the picture plane and the frame. The entrenched role of the frame in conventional cinema places severe limits on the immersive quality of the information recorded and on the ability to generate large and seamless informational spaces to navigate.

Secondly, high-resolution digital capture resolves information at a specification equivalent to conventional large format film cameras, but with the advantages of enhanced portability, offering far longer recording times, immediate access to the recorded data, non-linear interactive capabilities, and much lower overall production, post-production and presentation costs.

Technical Outcome

The result of the project is a high performance three-component framework. Each component can be applied on a case-by-case basis, individually responding to the specific visualisation requirements and contextual conditions. The components can also be used in sequence, moving from rapid prototyping, through pre-visualisation, to final recording. And they can be used in conjunction with each other, each providing unique operational and representational features that are later combined in post-production.

System	Field of View	Frame rate	Resolution
Roundshot	360° x 60°	-	12000 x 2000
Ladybug	360° x 120°	30fps, 8bit, compressed	3500 x 1250
Spherecam Cylindrical	360° x 60°	30 fps, 10bit uncompressed	8700 x 1000
Spherecam Spherical	360° x 120°	30 fps, 10bit uncompressed	5300 x 2000
AVIE	360° x 35°	60 fps, 8bit compressed	8000 x 1000
iDome	180° x 112°	30fps, 8bit, compressed	1920 x 1080

Capture and play back system comparison chart

Component 1, Roundshot

This component comprises a singular large format film based stereo panoramic still camera – the ROUNDSHOT Super 220VRS. Its images offer resolutions of over 40 Megapixels, required for situations where there is a wealth of very fine detail that needs to be represented.


*Roundshot panorama, Hampi India*

Component 2, Ladybug

This component comprises a portable and compact medium-resolution 5 Megapixel spherical video camera – the Point Grey Research Ladybug. The Ladybug enables rapid prototyping to be executed in the field or in situations where only a small portable device would be serviceable.and much lower overall production, post-production and presentation costs.
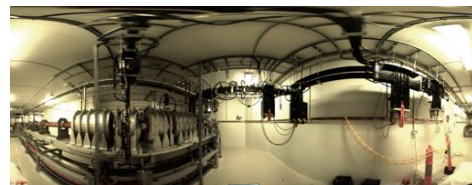
Ladybug Video still, Synchrotron, Melbourne. Equirectangular projection
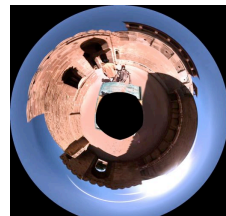
Ladybug Video still, Nagur India. 360° Polar projection.
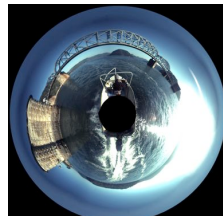
Ladybug Video still, Hawkesbury River. 360° Polar projection.

Component 3, Spherecam

This component comprises a custom integrated high-resolution spherical digital video cluster. A world first that has an unprecedented 24 Megapixel panoramic and/or spherical recording capability. It comprised of an omni-directional multi-camera head, mounting plates, tripod, and an Ambisonic microphone and recording racks. Its latest generation CCD color cameras allow the capturing of ultra-high resolution panoramic or spherical omni-directional images in full video/cinematic frame rates. Image sensing, capturing and recording are all in the digital domain, ensuring the best possible image quality. The raw uncompressed data from up to twelve cameras is streamed through capture boards directly onto hard disk arrays (5.4 Terabytes) within the computers located in the recording racks, able to store up to 160 min (12 cameras, 10 bit, 30 fps).

Spherecam configurations, 8x4 (above) 12x0, 8x1, stereo pair.

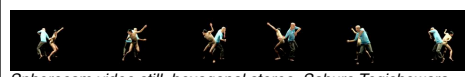*Spherecam video still, spherical calibration.*

Spherecam video still, partial spherical.

Spherecam video still, cylindrical.

*Spherecam video still, cylindrical. The Wooster Project.*

Spherecam video still, hexagonal stereo. Saburo Tegishewara.

Playback Environment, AVIE

**Advanced Visualisation and Interaction Environment**

AVIE consists of a 360 degree stereoscopic immersive interactive visualisation environment with motion and shape tracking systems and a multi-channel audio system. It is a set of state-of-the-art resources that enables the development and study of applications in the fields of immersive visualisation, immersive sonification, and human interaction design. It is located in iCinema's Scientia Facility.
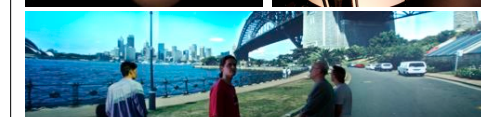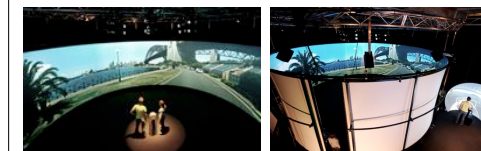
iCinema AVIE

Playback Environment, iDome

iDOME is a proprietary hardware/software platform developed by the iCinema Centre that offers a cost-effective and compact immersive visualisation environment for panoramic and spherical representations, video and/or computer generated. Ideally suited for museological applications, it is configured as a three to five meter fiberglass hemisphere that stands vertically in front of the viewer, with a projector, computer, surround audio equipment and user interface.
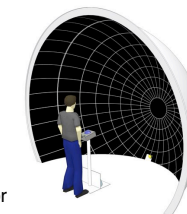
iDome installations, UNSW Scientia and Powerhouse Museum