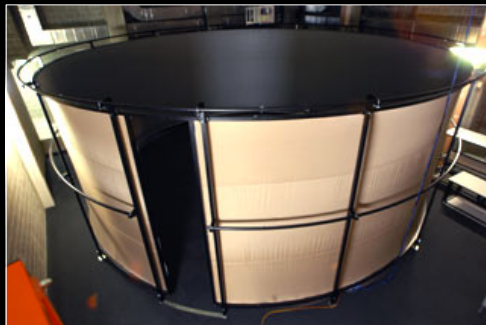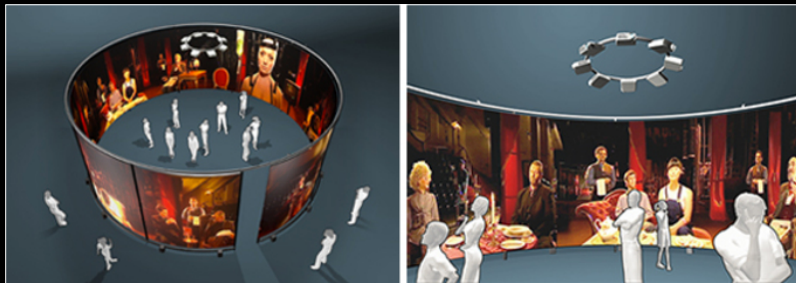# Alternative technologies: introduction

Paul Bourke

Contents

- Rationale: leveraging the human visual system

- Display hardware in this laboratory: iDome, stereoscopic screen, tiled display

- Filming: Fisheye camera/lens, LadyBug camera

- Technology fashion. Current flavour of the month are HMDs and 360 video.

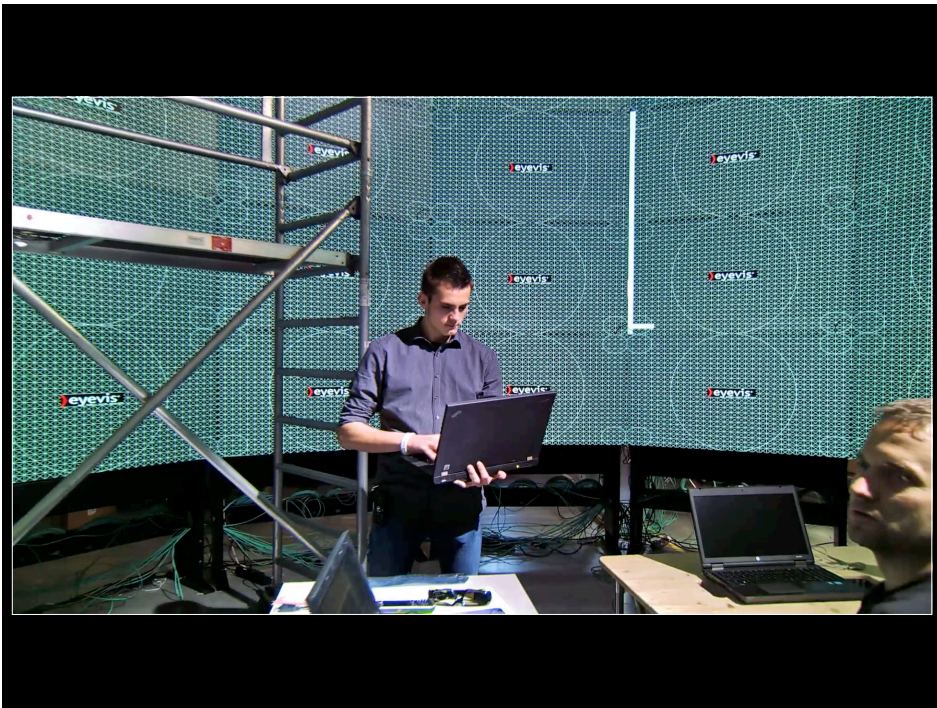### (Applied Visualisation Immersive Environment)

CAVE-2

Monash

University of the Sunshine Coast

Rationale

- Information is (largely) conveyed to the human brain through our eyes.

- Makes sense that there should be experiential advantages if one uses the capabilities of the human visual system.

- Three capabilities not normally fully engaged when watching a standard display are

- **1. Stereopsis.**
  For example, the sense of depth when watching 3D movies.

- **2. Peripheral vision.**
  Our eyes detect motion out to almost 180 degrees. Engaging peripheral vision is largely credited to a sense of "being there". Known as "removing the frame" when comparing to flat rectangular screens.

- **3. Visual acuity.**
  Human visual system is about 1 arc minute. This is equivalent to a full HD panel, 1m wide about 3m away.

Display hardware in this laboratory

- Three display technologies available.

- **iDome: engages peripheral vision.**
  - 180 degrees horizontally and from +90 degrees to -45 degrees below the horizon.
  - If you are interested in this medium then recommend a visit to the SciTech dome.

- **Stereoscopic projector.**
  - 1400x1050 pixel resolution.
  - Can be driven with either active stereo or side-by-side stereo.

- **Tiled display.**
  - Each panel is full HD so about 6000 pixels by 2000 pixels.
  - While there are bezils (frames of a window) tiling panels is currently the only way to get high pixel counts at a large physical scale, and higher brightness than projectors.
  - This display is 3x2 but you've seen larger arrays in shopping centers, airports, etc.

- How does one capture video for these displays?

Filming - Stereoscopic

- Requires two cameras or video cameras.

- Ideally achieve human eye separation of 65mm.

- Due to the interest in stereoscopic production over the last 6 years, most VFX and compositing software now has support.

- Very difficult to produce good quality stereoscopic content, even the large production houses often get it wrong.

A rich history

- Stereoscopic 3D filming is not new. First known film was in 1922, stereoscopic photography dates back to the 1850s.

- In the mid 1950s pretty much every movie house was producing stereoscopic movies as red-blue anaglyph.

- iMax started producing stereoscopic 3D in the mid 1980s.

- People like myself in the data visualisation process have been using stereoscopic displays our whole life.

- The latest popularity from 2010-2015 saw the development of 3D capable TVs and home cinema.
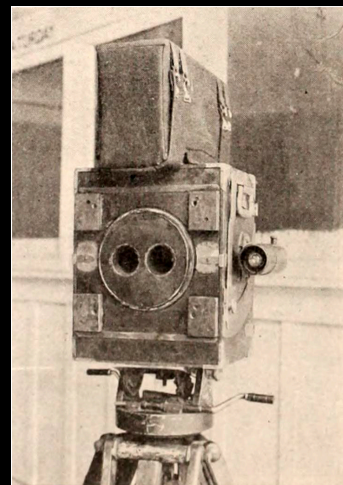
Fairall Camera rig (1922)

Left eye   Right eye

Frank Hurley, 1905

Filming - iDome

- Two options
  - Camera with a fisheye lens.
  - 360 video camera

- We have the LadyBug-3 camera, captures 360 degrees horizontally and about 150 degrees vertically.

- When capturing 360 one can then navigate within the video.

- No longer does the director "direct", the viewer is able to freely explore.

- Some interesting challenges for storytelling.

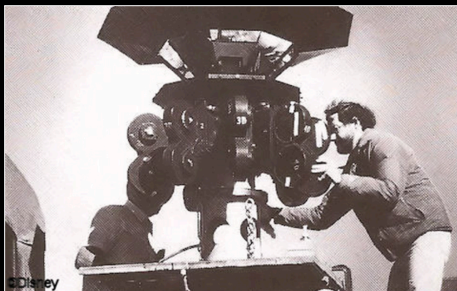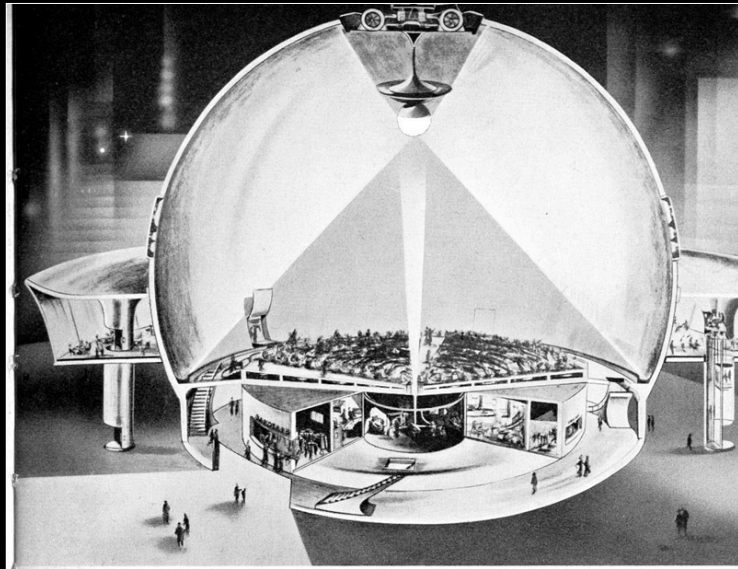- My use of the LadyBug has predominantly been to record cultural practices.
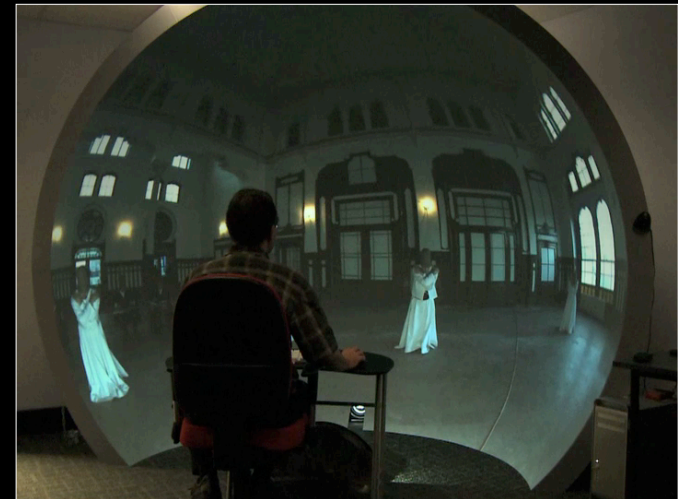
A rich history

- 360 filming was an active area of film making back in the 1960s.

- Indeed the camera here used folded optics which is an improvement on almost all the camera rigs being built today.

Circlorama camera #2 (Disney)

Hamburg 1957

Technology fashions

- From 2010-2015 most technology writers were predicting stereoscopic 3D was going to be ubiquitous. Didn't happen. The new television in the stores from the major suppliers for the 2016/2017 Christmas season were no longer 3D capable.

  This allows one to tell compelling stories using a technology still seen as novel.

- In the background there has been a steady rise in recording and display resolution. 4K television and cameras are the norm, and there are 8K versions appearing in the market.

  I can understand 4K but unsure what the driver is for 8K?

- The current flavour of the month are head mounted displays: GearVR, Vive, and a whole range of others.
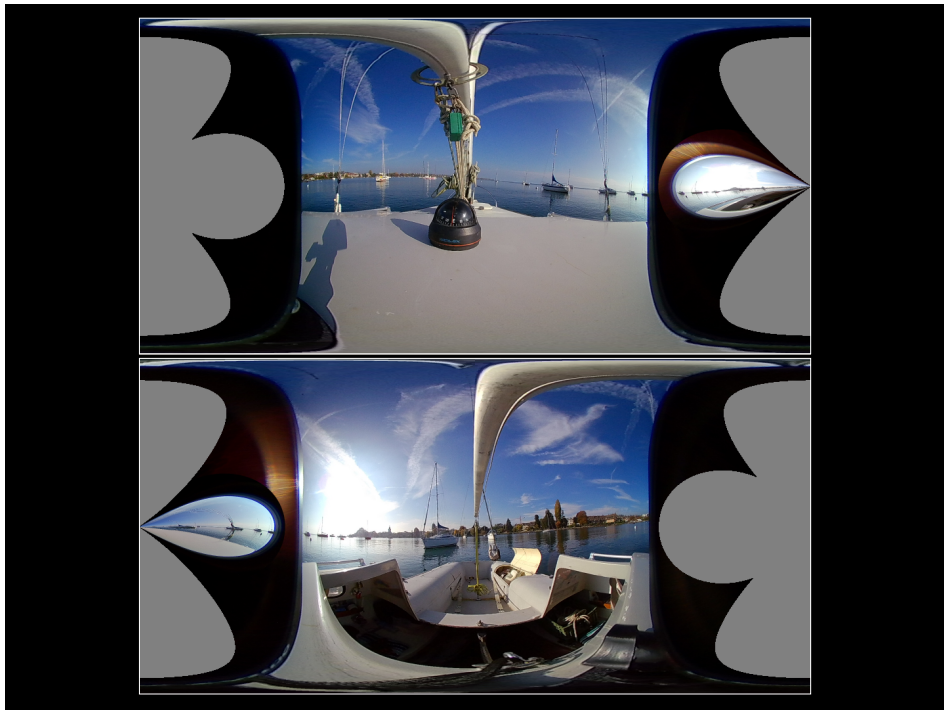
  Will they become ubiquitous?

- Augmented reality?

  Stands much more chance of widespread use but some significant technology barriers.
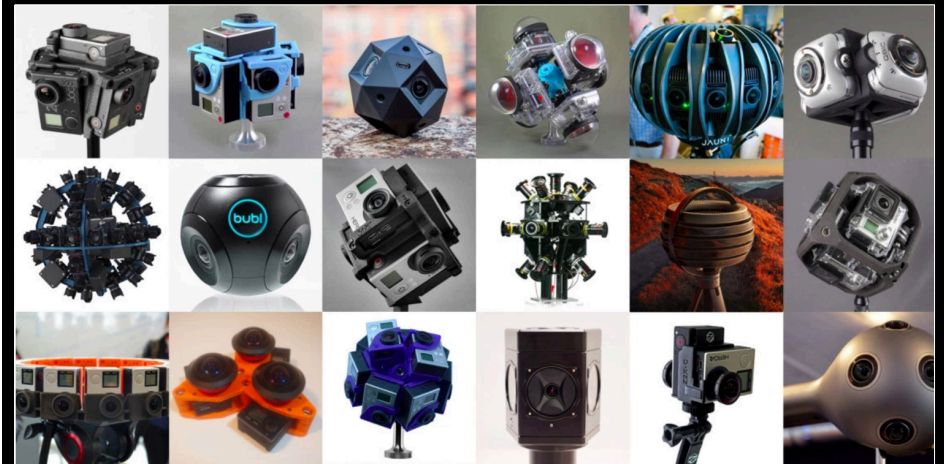
360 video - 2 cameras

- There are a huge range of products in the market place for capturing 360 video.

- Most accessible are two lens rigs.

- Rely on a fisheye lens capturing greater than 180 degrees.
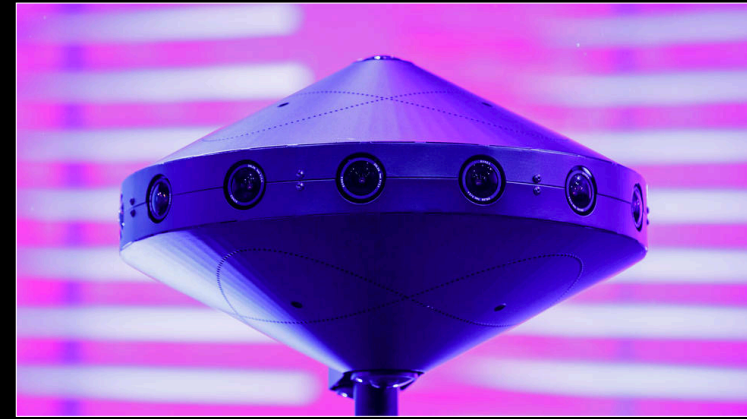
360 video - multiple cameras

360 video - multiple cameras
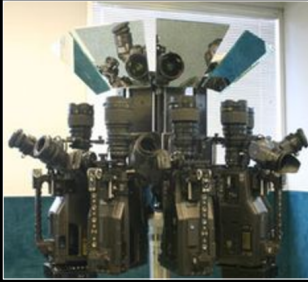

360 video - stereoscopic

- This is generally achieved by having lots of cameras.

360 video

- All of these multiple cameras have a fundamental parallax issue which means they cannot be perfectly stitched and blended.

- There is a solution involving folded optics, some bespoke rigs have been built.

360 video

- By no means a solved problem.

- The current multiple camera solutions have fundamental parallax issues.

- The folded light path cameras are not yet readily available.

- But there is (currently) a huge appetite for 360 video content for the head mounted display market.

- Supported on YouTube, Vimeo and others.

- **Currently people are still dealing with the technology, huge opportunity for complelling stories to be told.**