

# Digital experiences

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## Contents

- Visualisation: “Why”
- Displays: “How”
- Examples of projects based upon the displays mentioned
- Three current projects

## Theme 1: Visualisation

- Providing insight
- Usually involving computer graphics
- Application to many fields
  - Data
  - Science
  - Mathematics
  - Heritage
- Audience
  - Researchers and their peers
  - Stakeholders and funding bodies
  - General public, exhibitions, education

## Theme 2: Displays

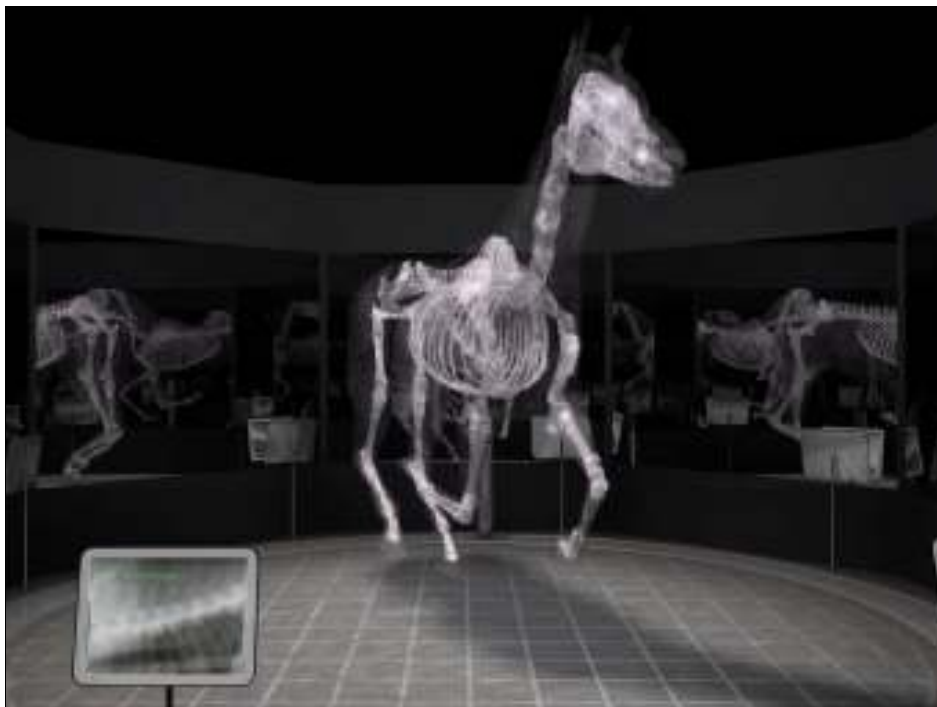
- Main way of communicating information to the brain is through the sense of vision
- Data can be communicated by other means
  - Haptics: sense of touch
  - Sonification: sense of hearing, turning data into sounds
  - Taste and smell: ?
- Displays that leverage the human visual system
  - Stereopsis: Depth perception
  - Peripheral vision: Immersion
    - Presence, the sense of “being there”
  - Acuity: Resolution (1 arc minute = 1/60 degree)

## Stereopsis - Peripheral vision - Fidelity

- Relatively easy to achieve any one of these.
- More difficult to achieve all three at once.

	Stereopsis	Peripheral	Acuity
3D walls	Green	Red	Yellow
VROOM (Virtual room)	Green	Red	Yellow
Tiled displays (Planar)	Green	Red	Green
HMD (Head Mounted Display) VR headset	Green	Yellow	Red
Light table	Red	Red	Green
iDome	Red	Green	Red
Planetarium	Red	Green	Yellow
AVIE (Advanced Visualisation and Interaction Environment)	Green	Green	Yellow
EPICylinder (Enhanced Perception and Interaction)	Green	Green	Green

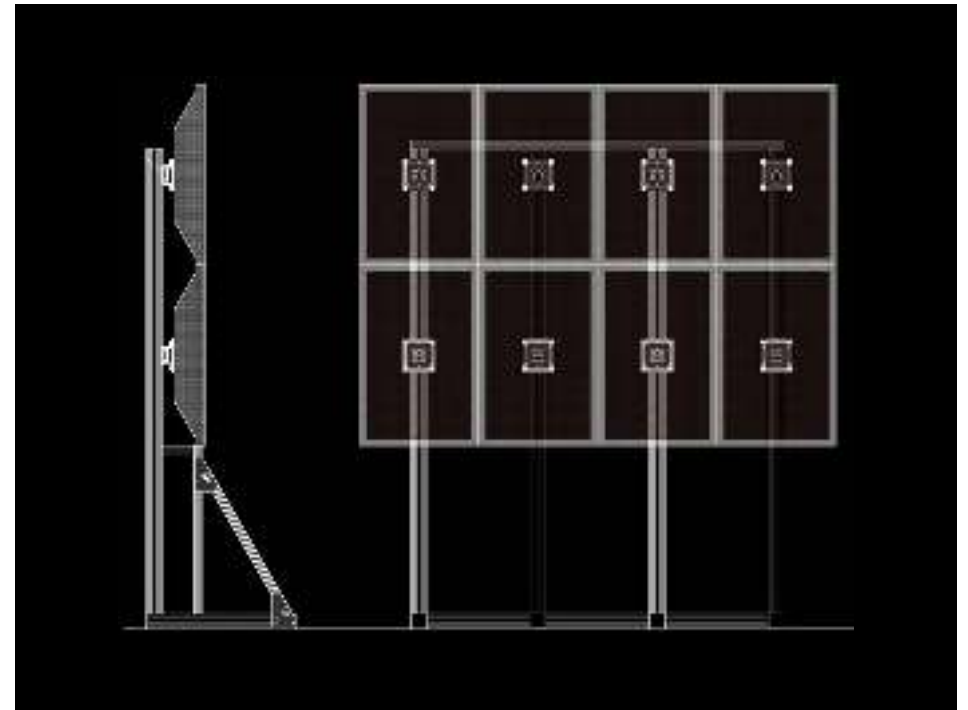
## Virtual Room (VROOM)



Movie

## Tiled displays

- At a certain point the only way to higher fidelity is to tile image generators together.
- One option is multiple projectors. Alignment and blending is a pain.
- Another is to tile display panels. Main issue are the bezels.





## HMDs

- Head Mounted Displays, today called VR displays.
- Can be tethered to a computer - more compute power.
- Or cable free - run on a mobile device.
- Stereoscopic + natural panning + natural tracking for realtime computer generated content.
- Stereoscopic + natural panning for filmed content.
- Current issues revolve around resolution (very low) and latency.



Movie



Movie





Movie

## Light table

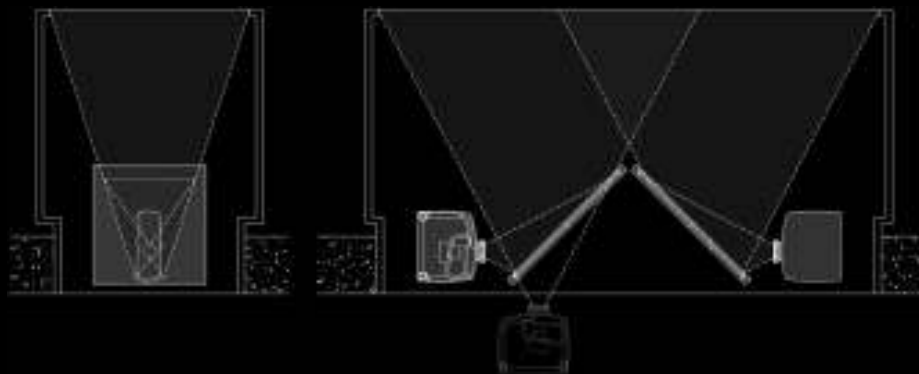
- Can offer high fidelity.
- Often touch enabled.



Movie

Pausiris

- Goal was a seamless display, no panel bezels.
- Based upon two blended high definition projectors.



Projection system



Movie

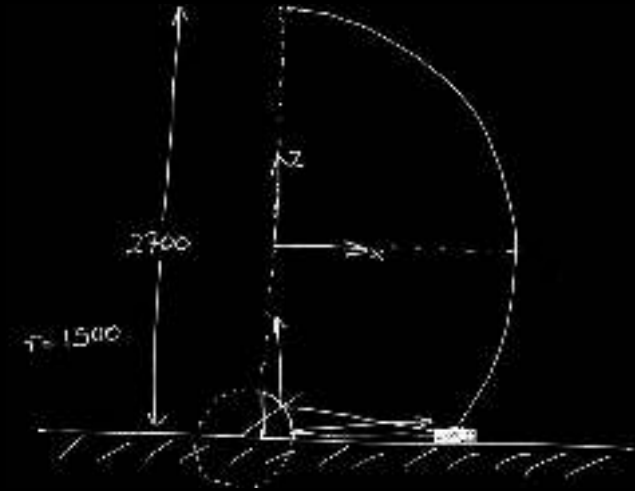
## MONA: Museum of Old and New Art



Underground water filled crypt

## iDome

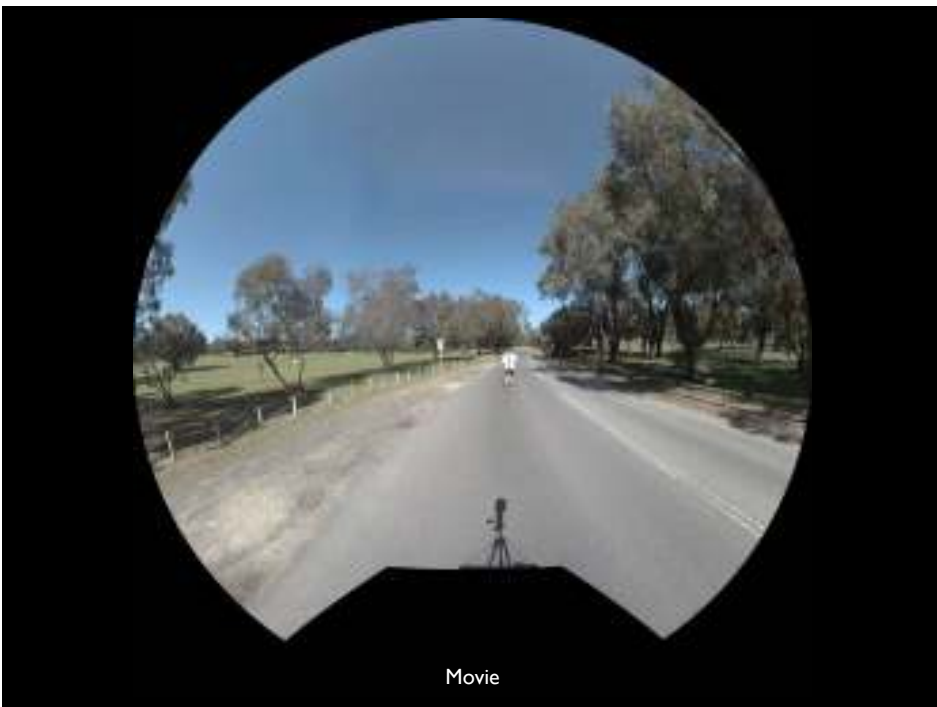
- “Invented” in 2002, iCinema (dome) and myself (projection)
- 180 degree horizontal field of view, 135 vertical field of view







Movie

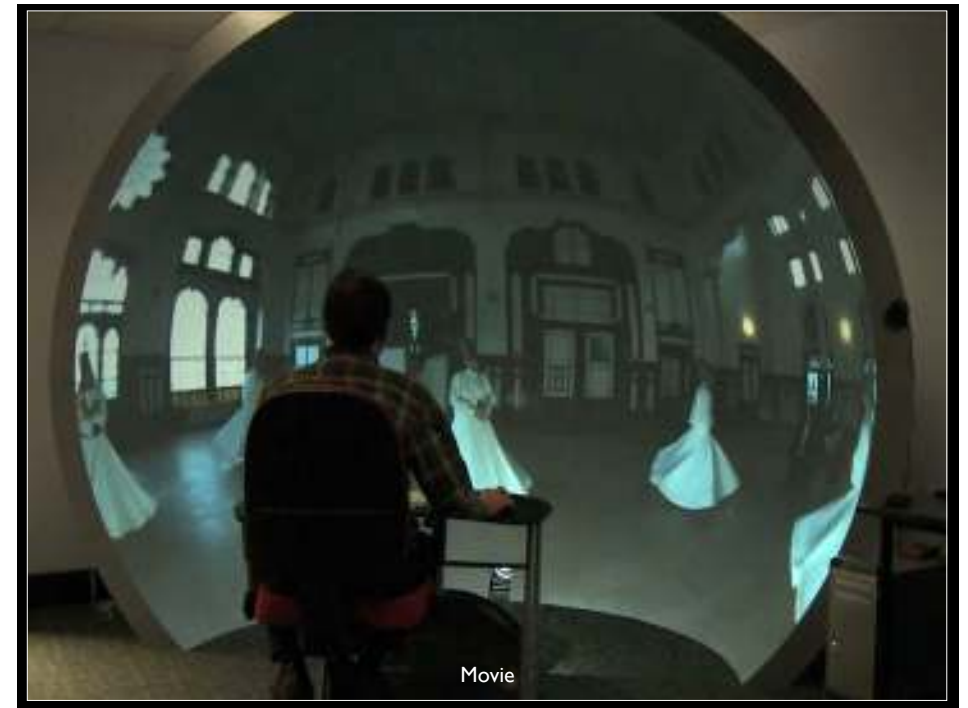


Movie



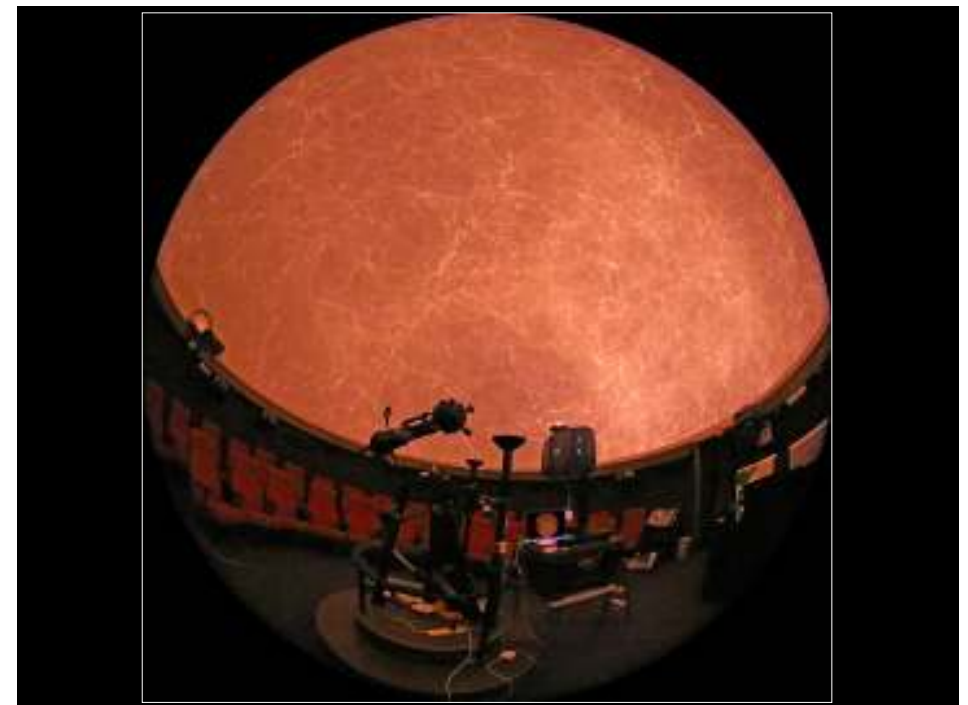


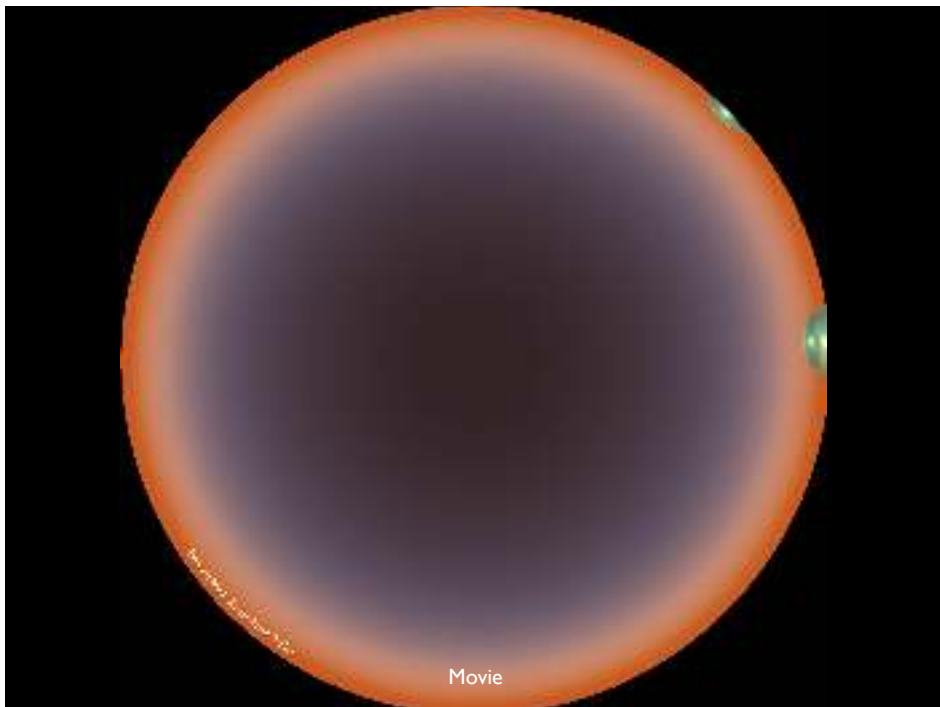
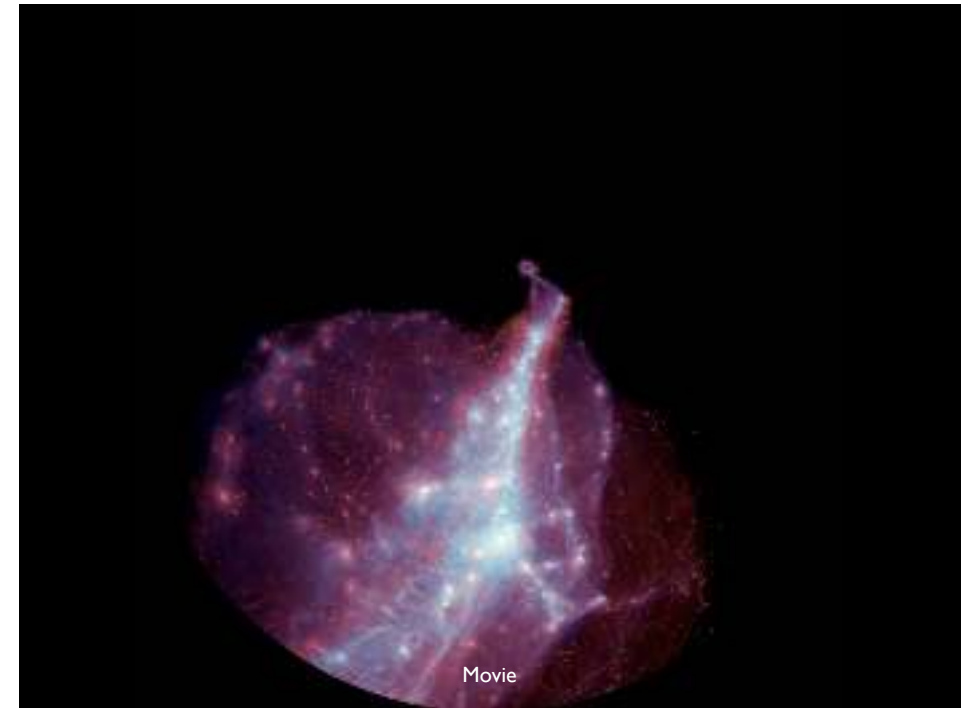




## Planetarium

- Traditionally planetariums were only able to show stars and constellations.
- Used dedicated optical projection.
- The modern planetarium is more like an immersive digital theatre.
- May have between 1 and 12 digital projectors.  
All seamlessly (hopefully) blended together.





## AVIE

- 360 degree cylindrical display
- 10m diameter, 3+m high (depends on installation)
- Stereoscopic 3D enabled, special type of stereoscopic panorama.
- Supports 10 people easily, all looking in different directions
  - Compare isolation of HMDs to socialisation in AVIE







Left eye

Cylindrical panorama

Movie



Left eye

Movie



Left eye



Left eye

Movie

## EPICyinder

- Enhanced Perception and Interaction Cylinder
- University of New South Wales
- Targeting and funded for medical research
- Specifications
  - Almost 120 MPixels in 3D
  - Almost 360 degrees horizontally, 50 degrees vertically
  - 6.5m diameter, 3m high
  - 56 HD resolution panels, 28+1 node graphics cluster
  - 32+1 channel audio system
  - 12 camera head and device tracking in 3D
- This, to the best of our knowledge is the highest resolution, stereo capable, immersive display in the world.





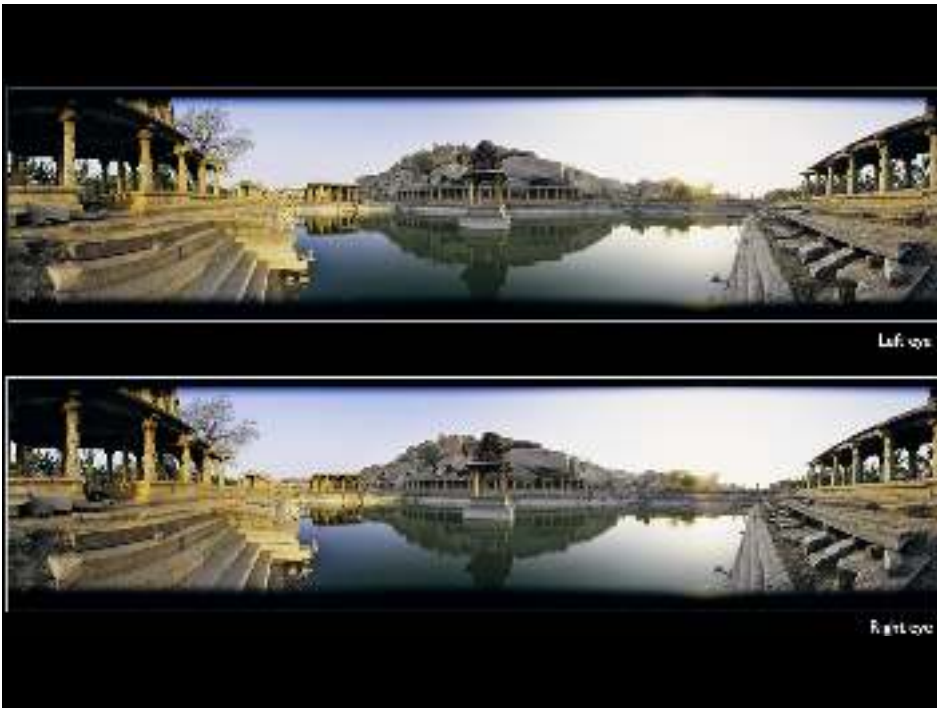


## Current projects

- Ultra high resolution stereoscopic panorama camera
- Atlas of Maritime Buddhism
- Parallax free 360 video camera

## Ultra high resolution stereo panorama camera





## Atlas of Maritime Buddhism

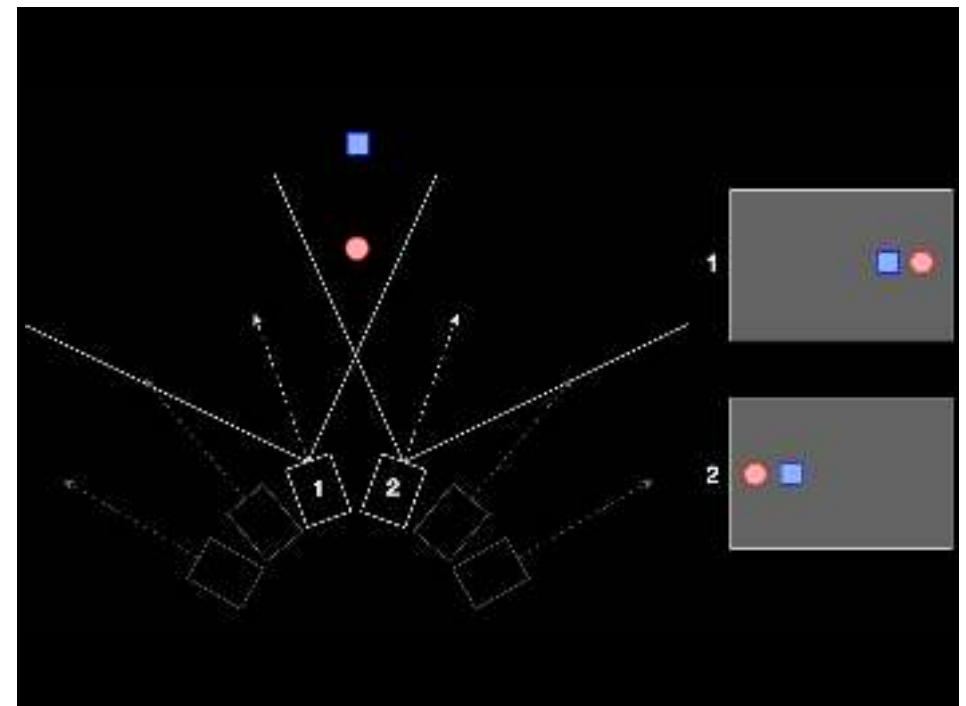
- Capturing high quality stereo panoramas and 3D models
- Will eventually tour to ACM (Asian Civilisation Museum), Singapore.
- Will be based around an AVIE cylindrical display system.
- Documents the spread of Buddhism along the maritime silk road.
- Create 3D models by only taking photographs.





## Worlds first zero parallax error camera

- 360 video is in high demand for experiences in VR headsets
- Every single 360 video camera available has a fundamental problem.
- Parallax error makes it impossible to create a perfect blend between the camera views.



Questions?