Everything you need to know about “fulldome”, and some more

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Contents

3D -> 2D image mappings (projections)

Dome environments

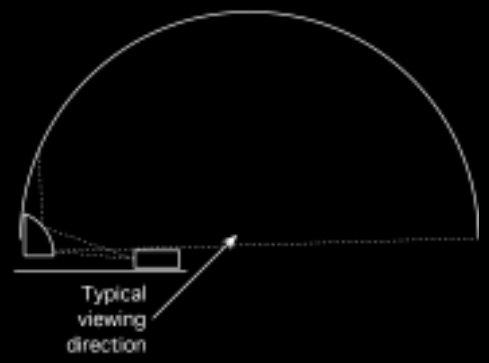
Content creation

Personal History

- Employment theme has been visualisation: Architectural, Brain Science, Astrophysics, Geoscience and more recently Archaeology and Heritage.
- The main sense for communicating data with the brain is through vision.
- Might as well leverage the capabilities of the human visual system
  - Stereopsis (depth perception due to having two offset eyes)
  - Visual fidelity (acuitity and dynamic range)
  - Peripheral vision (almost 180 degrees horizontally, 120 degrees vertically)
- Lead to building various display systems to support one or more of these.
- Dome proved particularly valuable when researchers would benefit from being inside their data.

Spherical mirror

Side (cross section) view

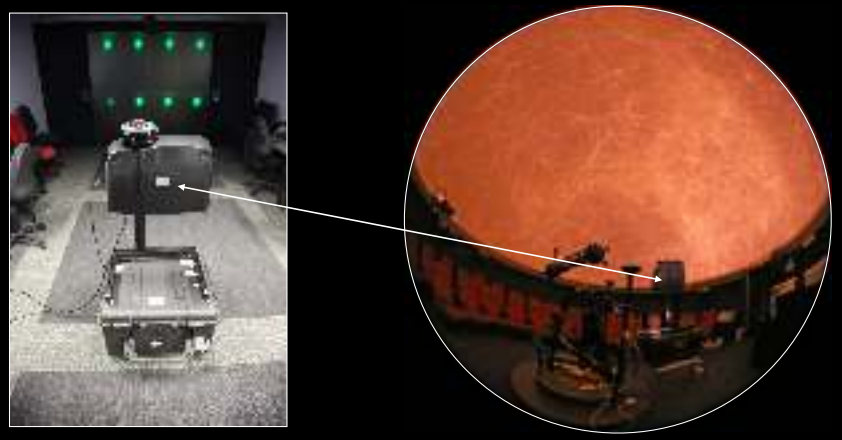


Dome projection systems

- Spherical mirror. Single projector + first surface mirror.
- Fisheye lens. Lenses typically customised for a particular projector.
- Dual partial fisheye lenses. Each projector doing half the dome.
- Multiple projectors. Typically 5 or more.

Roughly increasing cost, resolution, complexity and brightness

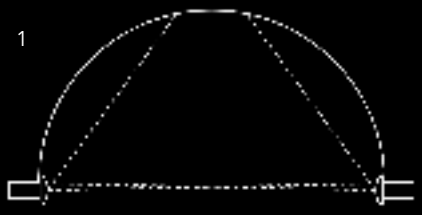
Fisheye Lens Projection



Dual Projector

- Two scenarios
  (1) Projectors located on the rim of the dome with partial fisheye lenses.
  (2) Projectors in the center with partial fisheye lenses.
- (1) is lower resolution than (2) for the same resolution projectors.
  (2) occupies the center, the best seats in the house.
- (2) is often acceptable for planetariums since they often already have a mechanical star projector in the center of the dome.

1



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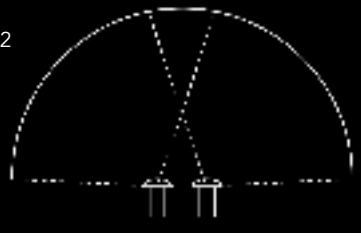
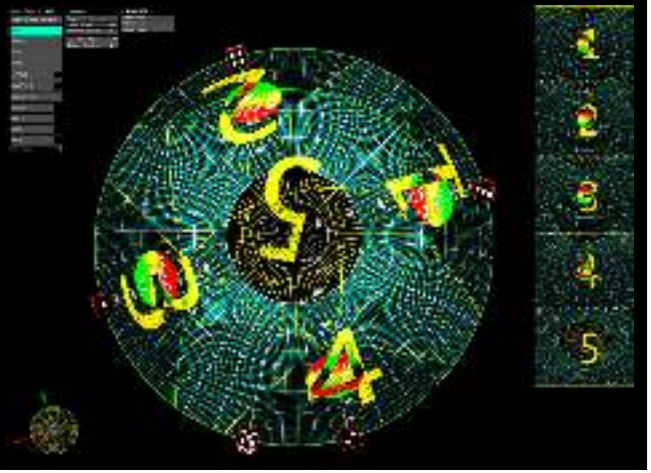
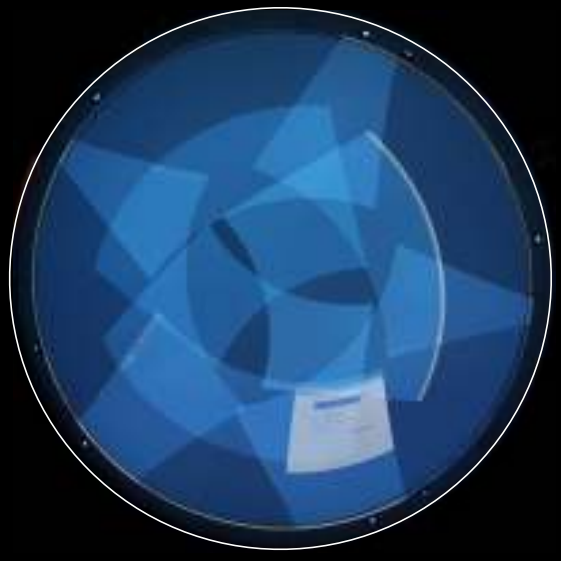


Multiple (>2) Projectors

- The scalable option but at the expense of complexity.
- Projectors almost always around the rim of the dome.
- Requires a geometry correction and blending solution.



Example of 8 projectors. Image shows OS before geometry correction and blending has been applied.



- For 2 or more projectors the content will typically be
  - diced into parts
  - geometry corrected
  - blending mask applied
- Note this may be performed as a preprocessing task or in realtime.

Fisheye

Section for one projector

Section of fisheye

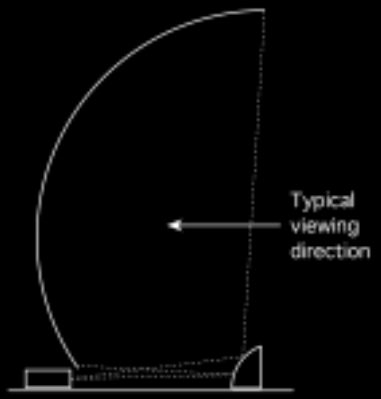
Geometry corrected

Edge blending added

Dome Orientation

Dome Orientation - 45 degrees

Dome Orientation - iDome



Dome Sizes

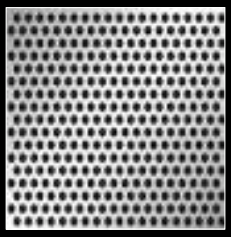
- Range from a few meters up to 40m diameter.
- Solid and inflatables can go up to 40m diameter.

1.5m Visionstation

36m Inflatable

Dome Surfaces

- Most large domes are perforated steel/aluminium mesh.
  - The hole to solid ratio of the mesh controls reflectivity.
  - Sound absorbing material behind the dome helps acoustically.
- Inflatables are normally a cloth material.
- Some smaller domes are fibreglass and even wood.



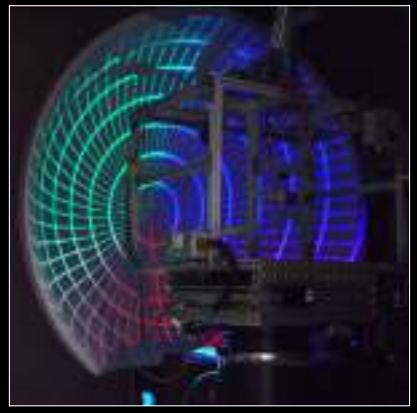
Positive pressure inflatable

Positive pressure skin inflatable

Negative pressure skin

Fibreglass

Weird and Fun Stuff



Hang glider simulator

Control room in mining application

End of part 2