

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

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3D -> 2D image mappings (projections)

Dome environments

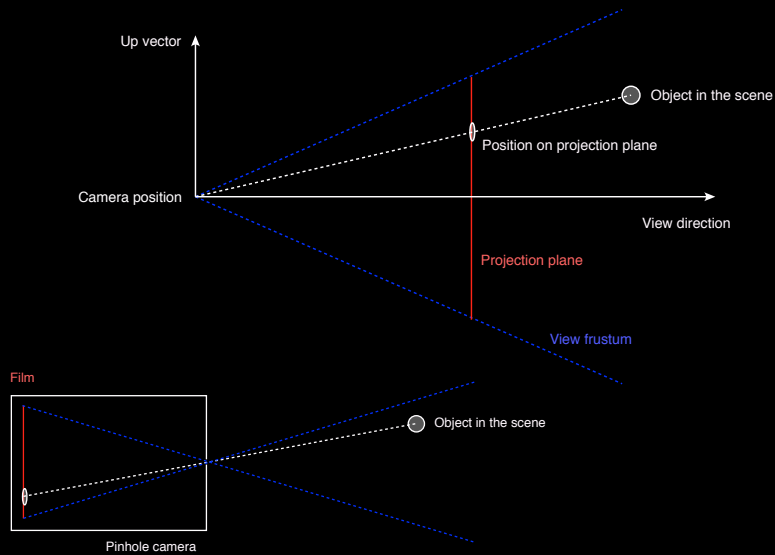
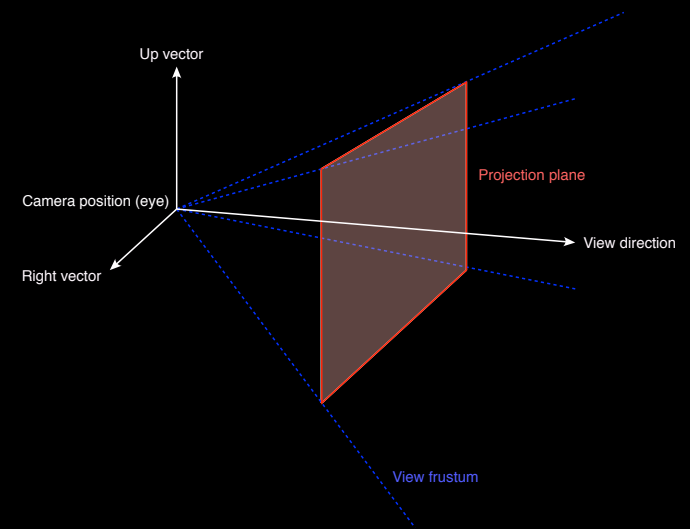
Content creation

3D -> 2D image mappings (projections)

- Perspective
- Cylindrical
- Equirectangular (spherical)
- Cubemaps
- Fisheye



Perspective Projection



60 degree horizontal field of view



120 degree horizontal field of view



140 degree horizontal field of view

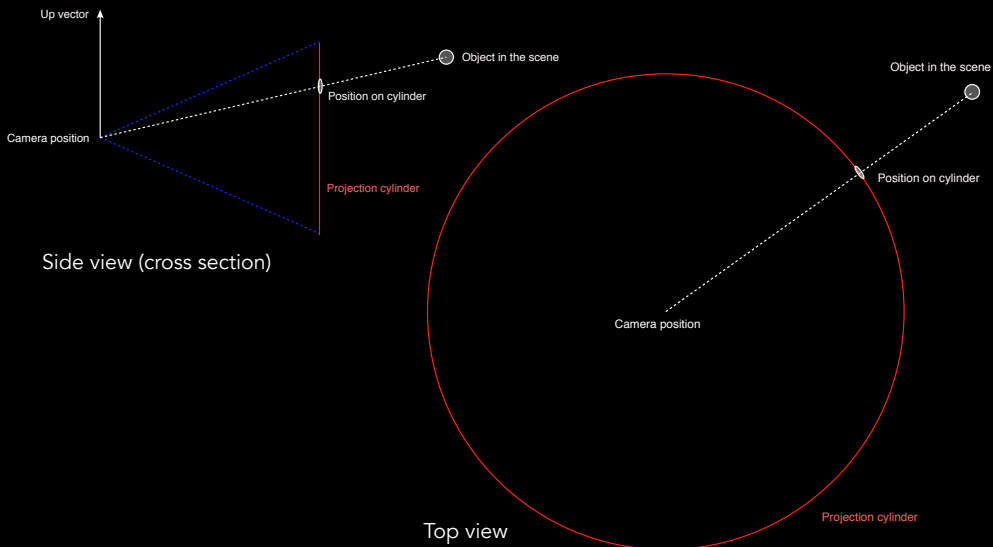


160 degree horizontal field of view

Cylindrical Projection



45 degrees vertically



90 degrees vertically

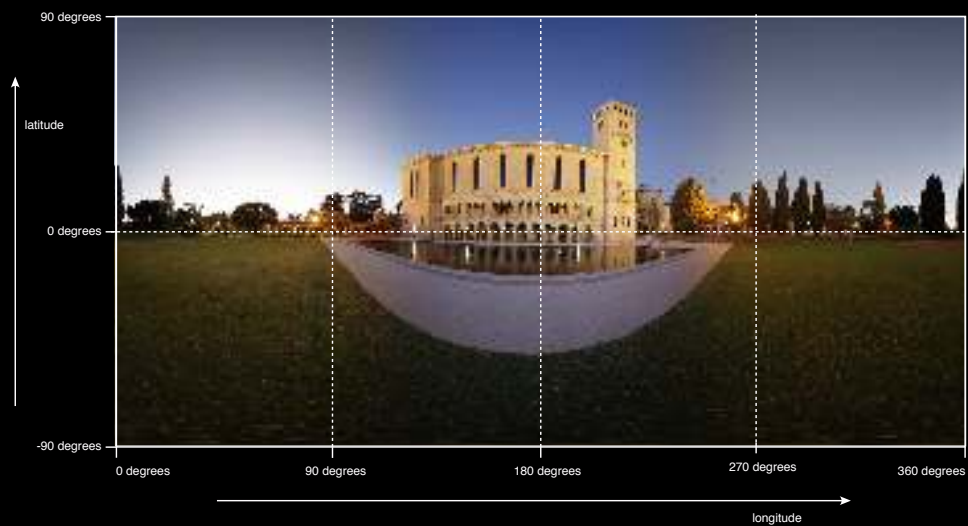


120 degrees vertically

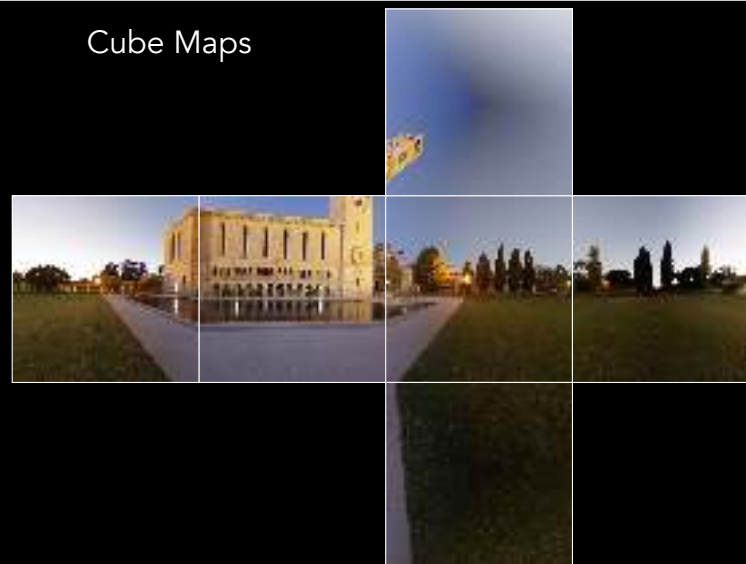
Equirectangular Projections



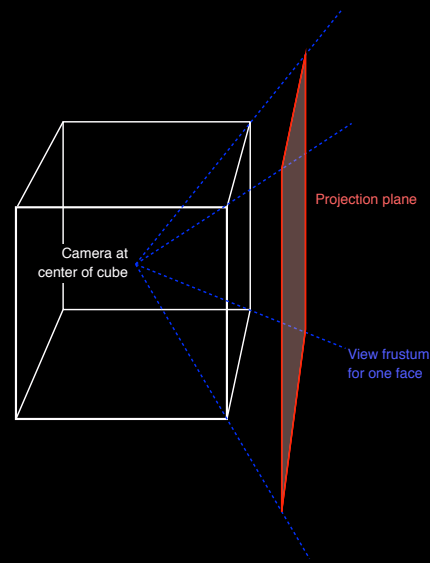
360x180 degrees



Cube Maps



- Cube maps are 6 square view frustums through the vertices of each cube face.
- Each view frustum is 90 degrees horizontally and vertically.



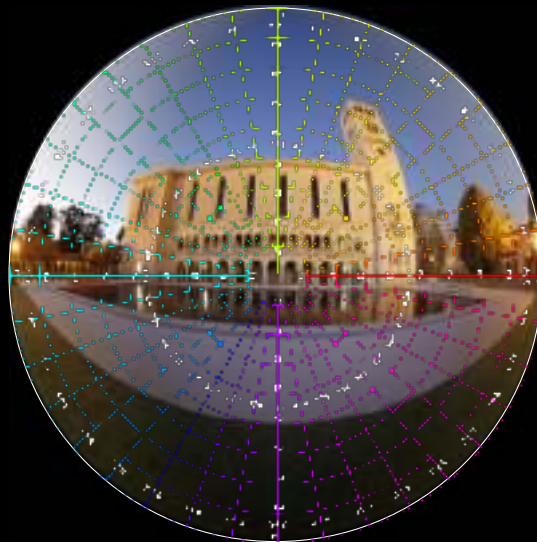
Fisheye

180 degrees horizontally and vertically

(Actually 180 degrees through any axis passing through the center)



- Lines of longitude extend radially from the north pole.
- Lines of latitude (3D) create equal radius lines in the fisheye (2D).
- Put another way, there is a linear relationship between the distance from the centre of the fisheye to the age of the corresponding 3D vector.



- A fisheye is not limited to 180 degrees although that is the most common type of dome shape: a hemisphere.



180 degrees



220 degrees

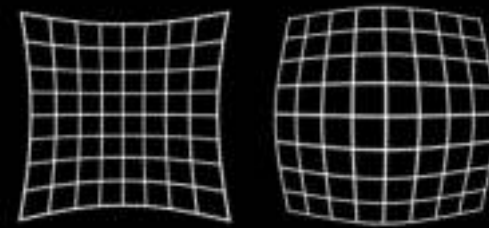
"Distortion"

- One is tempted to refer to the curved nature of what we expect to be straight lines as a "distortion".
- Same applies to the spreading of objects towards the poles in an equirectangular projection.

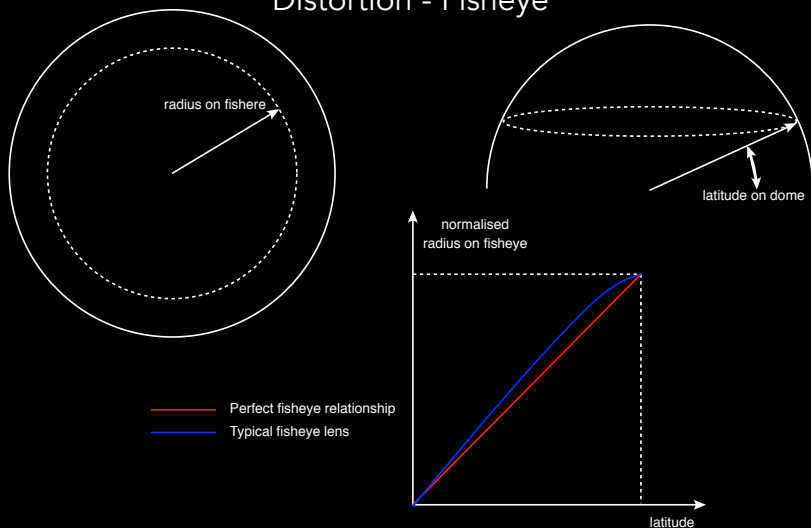


Distortion - Perspective

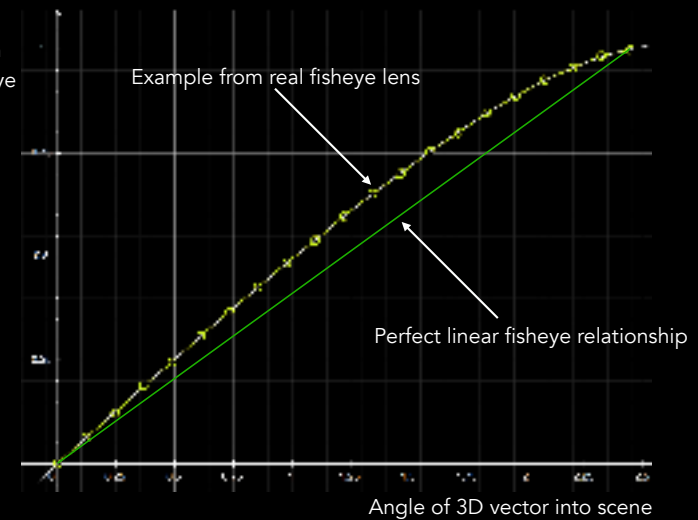
- Real lenses are not perfect pinhole cameras.
- The result is what is often called pincushion or barrel distortion.
- This is a form of distortion and given the right mathematical formulation can be corrected for.



Distortion - Fisheye



Normalised distance from center of fisheye image



Distortion Correction



Fisheye off camera



Perfect fisheye relationship

End of part 1