Dome Projection using a Vertex Shader

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Dome Projection – Becoming more Common

It’s only a matter of time until it becomes a routine visualization tool

Programming a Dome display is easier when only a single projector is used

A fisheye lens distorts the image so that it spreads out across the dome. The trick is pre-distorting the image in the other direction so that it looks correct after being projected

Dome Distortion

Move the teapot so it surrounds the audience
Dome Projection:

Viewing Volume = (-1,-1) to (1,1)

The edge of the circle represents the edge of the dome projection = your left, right, bottom, top as you are sitting in the theater.

Dome Vertex Shader:

const float PI = 3.14159265;
void main()
{
  vec4 pos = gl_ModelViewMatrix * gl_Vertex;
  float lenxy = length( pos.xy );
  float phi = atan( lenxy , -pos.z );
  pos.xy = ( phi / (PI/2.) ) * ( pos.xy / lenxy );
  gl_Position = gl_ProjectionMatrix * pos;
}

God's-eye View: As the eye sees it:

From the side:

Note: ( pos.xy / lenxy ) = ( cosΘ,sinΘ )

Cartesian: Dome:

Dome:
Large Lines and Polygons Need to be Tessellated

Note: This edge does not pass through the flow vectors!

Bounding Box edges were not tessellated. Straight lines on the monitor produced curved lines on the dome.

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