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.
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;
}

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

Dome:
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Flow Visualization in the Dome
Mars Panoram in the Dome
Large Lines and Polygons Need to be Tessellated

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

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