Dome Projection using a Vertex Shader

I believe that 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 in the projector 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.

One Night at the Reuben H. Fleet Science Center in San Diego...
**Dome Distortion**

Move the teapot so it surrounds the audience

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**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:**

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

Note: \( \text{(pos.xy / lenxy)} = (\cos\Theta, \sin\Theta) \)
Dome Vertex Shader:

Flow Visualization in the Dome

Mars Panoram in the Dome

Large Lines and Polygons Need to be Tessellated

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

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Bounding Box edges were not tessellated. Curved lines on the monitor produced straight lines on the dome.

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