Dome Projection using a Vertex Shader

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Dome Projection – Becoming more Common

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 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 / 2.0)) * (pos.xy / lenxy);
    gl_Position = gl_ProjectionMatrix * pos;
}
```

Note: \( \frac{\text{pos.x}}{\text{lenxy}} = \cos(\theta), \frac{\text{pos.y}}{\text{lenxy}} = \sin(\theta) \)

Dome Vertex Shader:

Cartesian:  Dome:

Dome:

Dome:
Flow Visualization 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. Straight lines on the monitor produced curved lines on the dome.

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Mars Panoram in the Dome