Dome Projection using a Vertex Shader

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Dome Projection – Becoming more Common

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)

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 = uModelViewMatrix * aVertex;
    float lenxy = length( pos.xy );
    float phi = atan( lenxy , -pos.z );
    pos.xy = ( phi / (PI/2. ) ) * ( pos.xy / lenxy );
    gl_Position = uProjectionMatrix * pos;
}

Note: (pos.xy / lenxy) = (cos\Theta, sin\Theta)
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.

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

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