Dome Projection using a Vertex Shader

Mike Bailey
mjb@cs.oregonstate.edu
Oregon State University

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/2.0)) * (pos.xy / lenxy);
}

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.
- Bounding Box edges were tessellated. Curved lines on the monitor produced straight lines on the dome.