

GPU Programming for Dome Projection

Mike Bailey

mjb@cs.oregonstate.edu

Purpose: Dome projection requires a fisheye projector lens, which necessarily distorts the image. The trick is to pre-distort the image in the other direction during the rendering process so that the projected image looks correct. This could be done in software or in multi-pass hardware, but this is slow. Instead, we are doing it in a single-pass GPU program.

```

const float PI = 3.14159265;
const float C1 = ??;
const float C2 = ??;
const float C3 = ??;
const float C4 = ??;
const float C5 = ??;

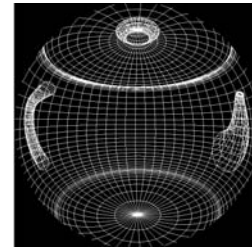
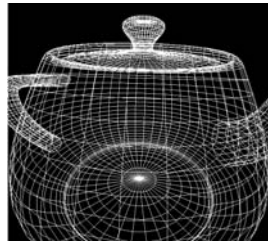
void
main( void )
{
    float phi;
    vec4 pos = gl_ModelViewMatrix * gl_Vertex;
    float rxy = length( pos.xy );

    if( rxy != 0.0 )
    {
        float phi = atan( rxy, -pos.z );
        // float lens_radius = phi / (PI/2.);
        float lens_radius = phi* (C1 + phi* (C2 + phi* (C3 + phi* (C4 + phi*C5) ) ) );
        pos.xy *= ( lens_radius / rxy );
    }

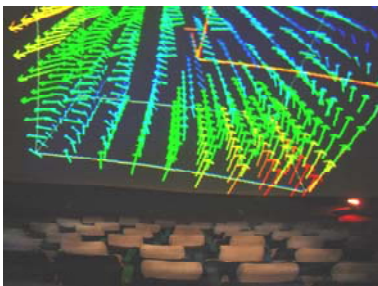
    gl_Position = gl_ProjectionMatrix * pos;
}

```

GLSL Shader Code



Teapots on a Monitor: Undistorted, Dome-distorted, Dome-distorted and Zoomed-in



Fluid flow visualization in a dome



Mars panoramic display in a dome