Creating More Realistic Lens Effects

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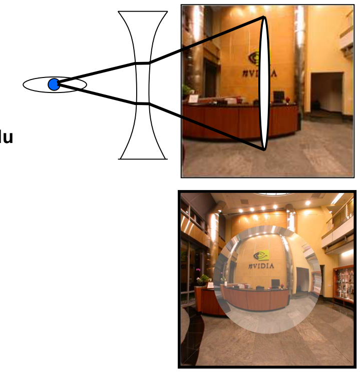
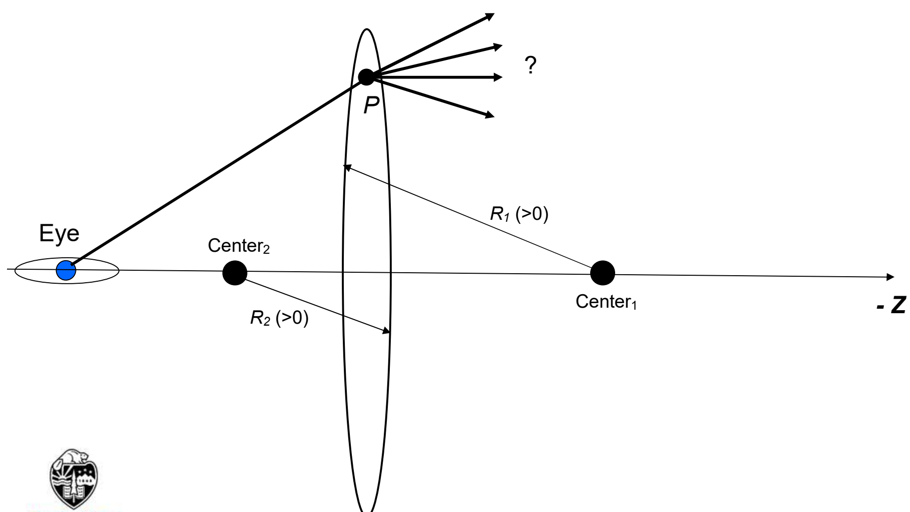
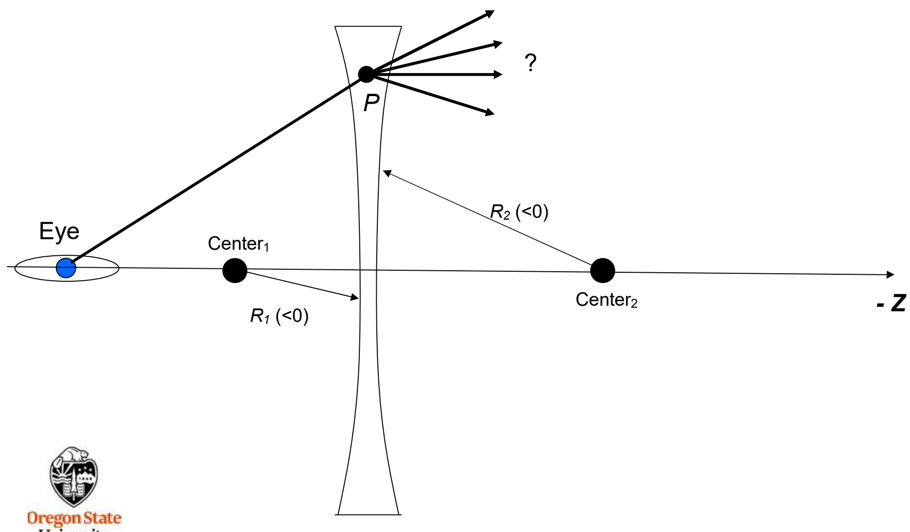


Convex Lens Definitions



Concave Lens Definitions



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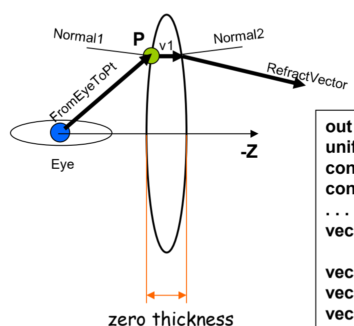
lens.vert – Setup for a Cube Map Texture




```
out vec3         vRefractVector;
uniform float  uR1, uR2;
const float     ETA = 0.66;
const vec3      EYE = vec3( 0., 0., 0. );
. . .
vec3 P = vec3( gl_ModelViewMatrix * gl_Vertex );

vec3 FromEyeToPt = normalize( P - EYE  );       // vector from eye to pt
vec3 Center1 = vec3( 0., 0., P.z - uR1 );
vec3 Normal1;
if( uR1 >= 0. )
        Normal1 = normalize( P - Center1 );
else
        Normal1 = normalize( Center1 - P );

vec3 v1 = refract( FromEyeToPt, Normal1, ETA );   // eta = in/out
v1 = normalize( v1 );
vec3 Center2 = vec3( 0., 0., P.z + uR2 );
vec3 Normal2;
if( uR2 >= 0. )
        Normal2 = normalize( Center2 - P );
else
        Normal2 = normalize( P - Center2 );

vRefractVector = refract( v1, Normal2, 1./ETA );   // 1./eta = out/in

gl_Position = gl_ModelViewProjectionMatrix * gl_Vertex;
```

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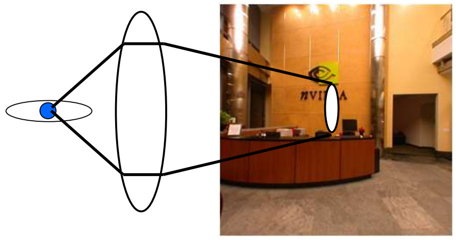
Convex Lenses (R1>0, R2>0)



Magnifying glasses and zoom lenses work this way

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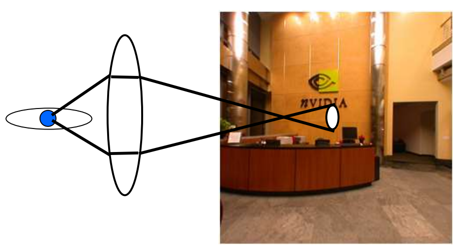
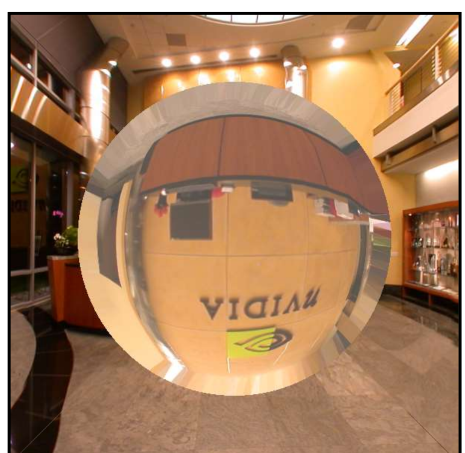
Convex Lenses (R1>0, R2>0)





Some telescopes work this way

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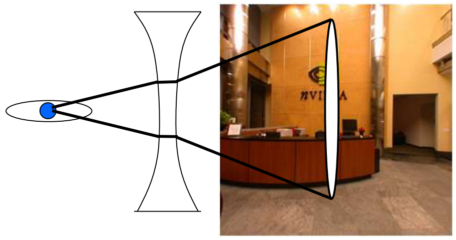
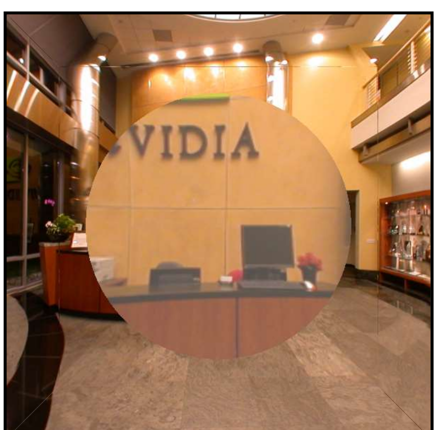
Concave Lenses (R1<0,R2<0)



Fisheye lenses work this way



Convex

Concave