Disco Ball Lighting!

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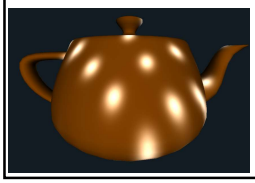

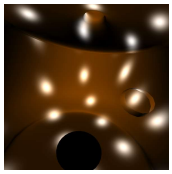

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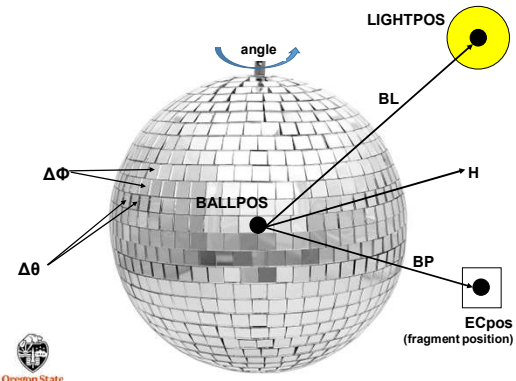

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disco.glib

```
##OpenGL GLIB

Perspective 90
LookAt 0 0 1  0 0 0  0 1 0

Vertex      disco.vert
Fragment disco.frag
Program  Disco Program  Disco                          \
                uNumFacets <5 15 50>                   \
                uPower <1000. 5000. 50000.>

Color 1.   0.5   0.
Teapot
```

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disco.vert

```
#version 330 compatibility

out vec3  vECpos;
out vec4  vColor;
out float   vLightIntensity;

const vec3 LIGHTPOS = vec3( 2., 0., 0. );

void
main( )
{
	vECpos = ( gl_ModelViewMatrix * gl_Vertex ).xyz;

	vec3 tnorm = normalize( vec3( gl_NormalMatrix * gl_Normal ) );
	vLightIntensity  = dot( normalize(LIGHTPOS - vECpos), tnorm );
	vLightIntensity = abs( vLightIntensity );

	vColor = gl_Color;

	gl_Position = gl_ModelViewProjectionMatrix * gl_Vertex;
}
```

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disco.frag, I

```
#version 330 compatibility

in vec3  vECpos;
in vec4  vColor;
in float   vLightIntensity;

uniform int    uNumFacets;
uniform float uPower;
uniform float Timer;		// built-in to glman

const float PI = 3.14159265;
const vec3 BALLPOS       = vec3( 0., 2., 0. );
const vec3 LIGHTPOS      = vec3( 2., 0., 0. );
const vec3 LIGHTCOLOR = vec3( 1., 1., 1. );

void
main( void )
{
	int numTheta = uNumFacets;		// # in longitude direction
	int numPhi    = uNumFacets;		// # in latitude direction
	float dtheta = 2. * PI / float(numTheta);
	float dphi   =       PI / float(numPhi);
		// spherical coord angles between the facets
	vec3 BP = normalize( vECpos - BALLPOS );		// vector from ball center to the
							// point we care about
	float angle = radians(Timer*360.);			// ball rotation angle
	float c = cos( angle );
	float s = sin( angle );
	vec3 bp;
	bp.x =  c*BP.x + s*BP.z;
	bp.y =  BP.y;
	bp.z = -s*BP.x + c*BP.z;				// but, rotate the vector, not the ball
```

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disco.frag, II

```
	vec3 BL = normalize( LIGHTPOS - BALLPOS );		// vector from the ball center
								// to the light
	vec3  H = normalize( BL + bp  );
		// vector halfway between BL and bp – if a facet aligns with this angle,
		// the point we care about will get a lot of light
	float xz    = length( H.xz );
	float phi   = atan( H.y, xz );
	float theta = atan( H.z, H.x );		// turn the H vector into spherical coordinates

	int itheta = int( floor(  ( theta + dtheta/2. ) / dtheta  ) );
	int iphi   = int( floor(  ( phi   + dphi/2.  )   / dphi    ) );

	float theta0 = dtheta * float(itheta);
	float phi0   = dphi    * float(iphi);		// figure out what the closest facet to H is

	vec3 N0;
	N0.y = sin(phi0);
	xz   = cos(phi0);
	N0.x = xz*cos(theta0);
	N0.z = xz*sin(theta0);			// N0 is the discrete facet normal vector

	float d = max( dot( N0, H ), 0. );	// like the cone angle on a spotlight
	const float DMIN = 0.990;		// acos(0.990) is about 8 degrees
	if( d < DMIN )
		d = 0.;
	d = pow( d, uPower );			// specular brightness

	gl_FragColor = vec4( vColor.rgb*vLightIntensity  +  d * LIGHTCOLOR, 1. ) ;
			// diffuse + specular
}
```

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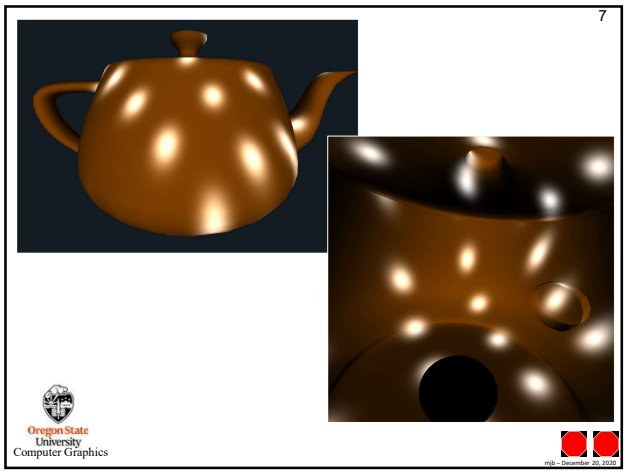
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