Reflection Space Image Based Environment Mapping

Kyung yul Kevin Lim, Myron Liu

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1 Abstract

We implement Reflection Space Image Based Rendering as described by Cabral et al.[**?**]. The goal is to generate a scene in which the user can rotate around the object lit by an HDR environment map, and observe view dependent BRDF changes in real time. Possible extensions would be to implement environment maps prefiltering with spherical harmonics for comparison [**?**].

2 Milestone Report

Our focus so far has been to setup the architecture from which we can interact with our shaded geometry in a 3D viewer. This is now fully setup and we can interact with our camera to move around the world and add objects to our scene easily.

Right now we are working primarily on shading a perfectly reflective sphere. We have built a GLSL shader for grabbing the camera position per vertex, and along with the position and normal, compute the reflection direction in spherical coordinates (θ, ϕ). We use RADIANCE HDR maps that are already in latitude longitude panoramic format from USC's High-Resolution Light Probe Image Gallery which makes the conversion straightforward. This step of rendering a perfectly reflective sphere is highly relevant to the paper. Since the prefiltered radiance maps are stored as sphere maps, for materials that are primarily reflective, we can simply capture orthographic images of our rendered sphere from the twelve icosahedral viewpoints.

Regarding shading diffuse surfaces, we have set up a shader for integrating the environment map over a hemisphere oriented along the surface normal. We naively shaded the sphere using a uniform light source, but soon, we will swap this out for light coming in from every direction, as is the case with environment maps. Once we can successfully perform the integration, the prefiltering for perfectly diffuse surfaces follows. We could insert twelve oriented planes, and record the color of each. If we are not mistaken, for perfectly diffuse materials, the sphere map isn't actually necessary, since the appearance across such a plane is constant on its surface.

Our next steps are to implement the prefiltering of the environment maps in each direction of the icosahedron which will be headed by Kevin, and continue working on the shader so that we can calculate the warp direction based on the material BRDF and interpolate between the prefiltered maps through spherical barycentric coordinates which will be headed by Myron.

3 Results

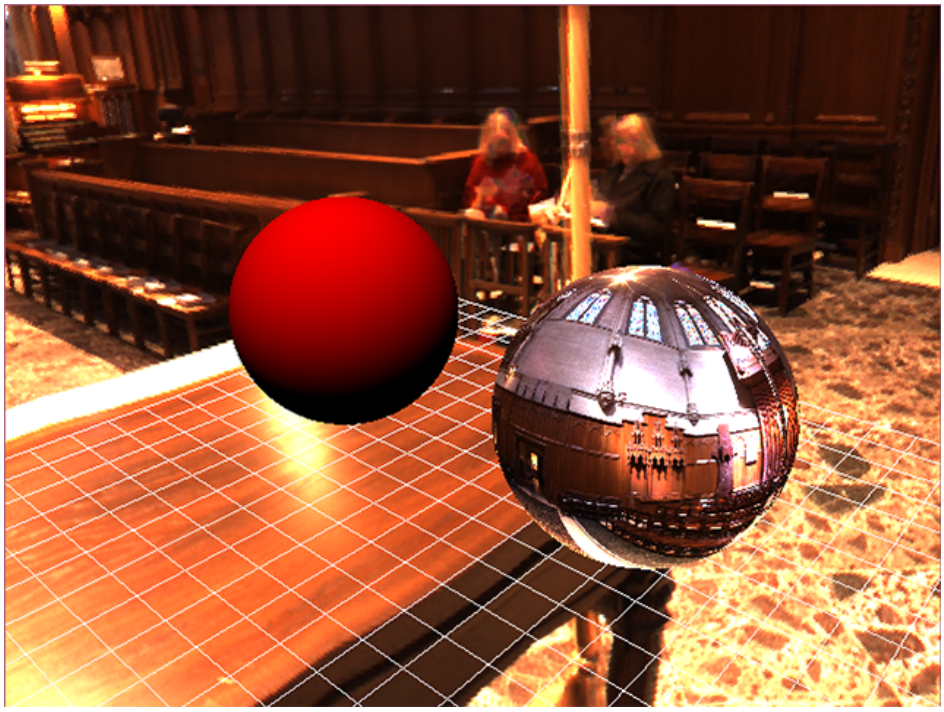

Figure 1: A diffuse sphere and a fully mirrored sphere