Final Project Proposal – Photon Mapping with Caustics

Name: Shu-Wei Hsu

Student ID: 998569417

The final project is going to apply Photon Mapping technique to render global illumination. We will add glossy objects, such as glass or glass ball, and the other interesting objects to the scene. The interesting objects are going to be created by combining objects instantiated from existing polygon object we already have in the code.

The direct illumination is done by tracing rays from the camera to each pixel of the image. It is mostly based on conventional Phong Shading without ambient colors. When the ray hits a glass objects, it is reflected and refracted by Snell's Law and Fresnel Equation.

The Photon Mapping for global illumination is separated to two phases. In Pass 1, we will generate two photon maps;: global photon map and caustic photon map, by tracing photons from the lights. We find the nearest neighbors of photon to compute radiance at a surface. In Pass 2, we trace rays from the camera for a final gathering of photons.

The indirect illumination is also done by tracing rays from the camera. Nevertheless, it use Monte-Carlo's method to integrate over the hemisphere on where it hits. On the second bounce, photons are sampled from the global photon map created in pass 1 on the second bounce. The caustics are generated by sampling

photons from the caustic photon map on the first bounce of the rays traced from camera. In the end, we will accumulate direct illumination, indirect illumination, and caustics to create a more spectacular and real picture than conventional ray tracing and path tracing as the example shown below.
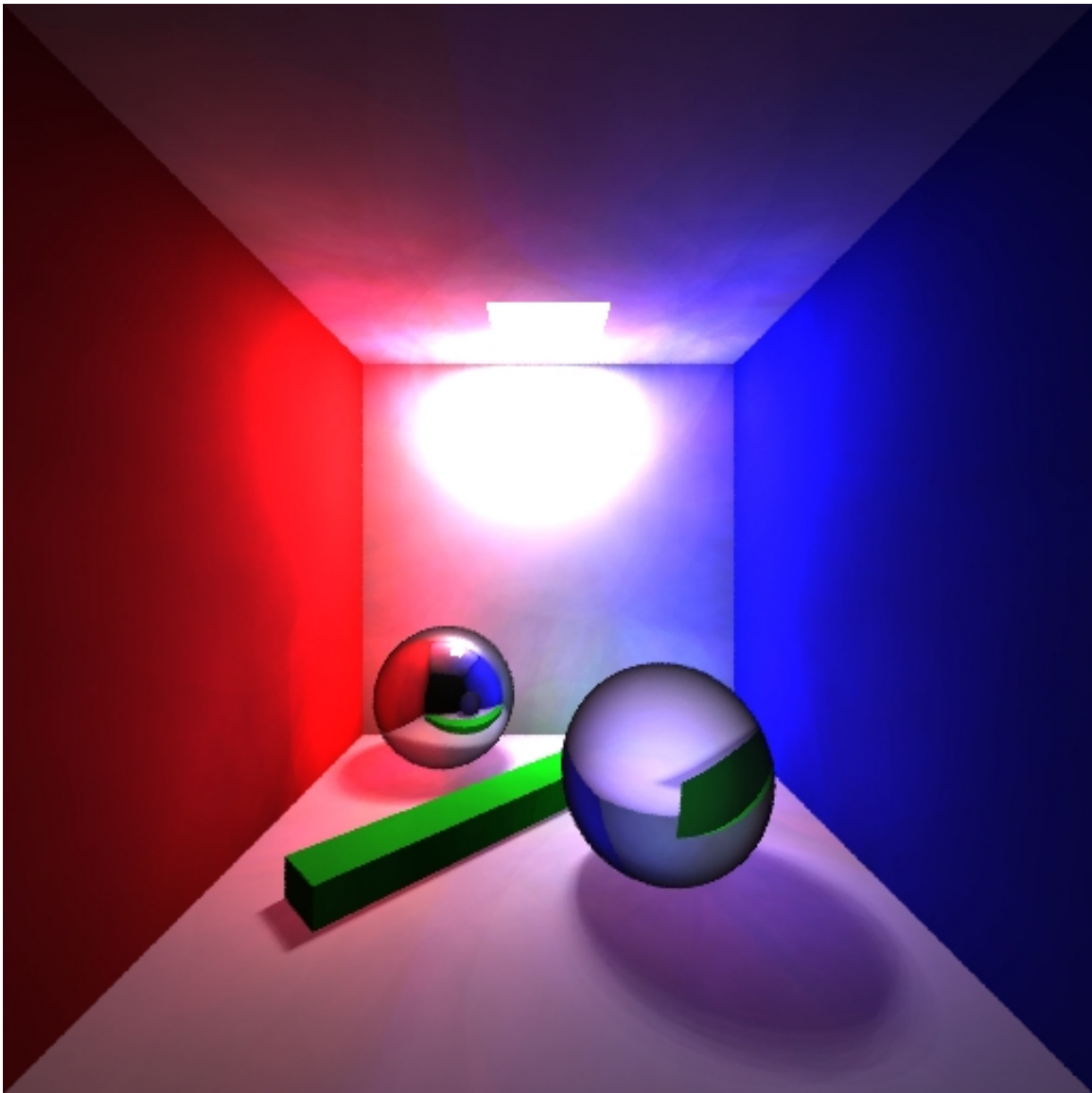
Example of Photon Mapping with caustics found online.