# Real Time Physics Simulation of Marbles in a Bowl with GPU Ray Tracing

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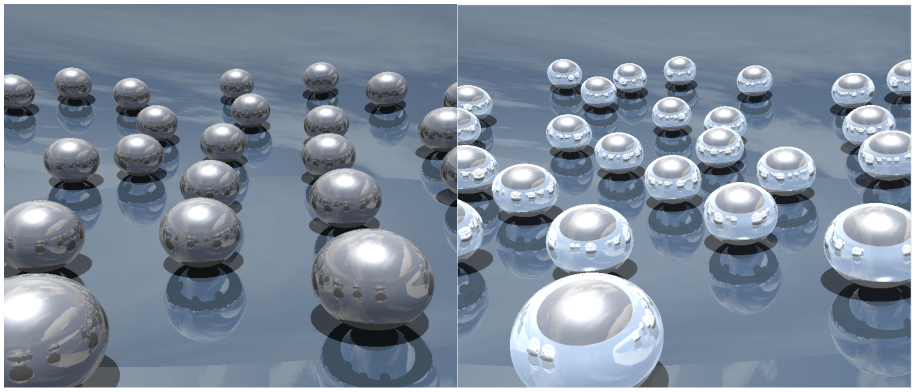
## Abstract

Ray tracing is a rendering technique which generates images based on the predicted path of light. The technique generates stunningly realistic images which display a variety of optical effects such as reflection, refraction, shadows, specular highlights, etc. However, a single high quality ray traced image can take hours to produce without any parallelization. In our project, we accelerate the process of ray tracing by utilizing a GPU fragment shader to perform all the recursive light calculations in parallel. Even though the physics calculations are still on the CPU, the program simulates a variety of physics phenomena in 30 fps. The user has options to change the physics settings such as gravity and friction, as well as many optical features such as reflectiveness, ambient light, and diffuse colors.

Figure 1: Images Taken from the Simulation



(a) 0% Reflectiveness (b) 100% Reflectiveness