Gem & Diamond Rendering
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The goal of my end of the semester project for CS 779 is to accurately render photorealistic gems. I choose to do this project for a few reasons. First off, I'm taking a class about gems and precious stones this semester and I saw quite the correlation between the physics of gems to the physics of light we've learned so far. Secondly, I think the idea of attempting to render gems accurately is an intriguing subject, due to the complicated geometry involved in the shapes of gemstones. Being able to render gemstones accurately would allow extensions such as the ability to include jewelry on people. Finally, I wanted to attempt to extend my ray tracer to include many of the functions such as reflection, refraction, dispersion, absorption, etc that I will need to implement to accurately render gemstones, mainly because I think ray-tracers are really interesting tools, and the more functions it can perform, the better the overall results in producing any image. I will modify my existing ray tracer to make it recursive since from what I've researched so far, a recursive ray tracer handles multiple reflective and transmitted rays easier.

There has been limited prior work done to render gems as far as I could find. I've only seen one paper directly focusing on this subject and it was done by a professor at Purdue University named Dr. Yinlong Sun. In his paper he rendered diamonds using Fresnel Reflection, Volume Absorption, and Dispersion, all three techniques of which I plan to implement. I will use this paper during my research as a guide to some of the operations I will be implementing in my project. In the paper, only Diamonds, specifically of the Brilliant Cut shape were rendered. Many other cuts of gemstones exist, and I plan to attempt to model and render other cuts, as well as the Brilliant Cut to start off. Depending on the amount of time I have, I plan to render other

types of gems, such as rubies and emeralds, all of which have different refractive indexes and

critical angles. I may also attempt to render a gem involving sub-surface scattering properties

depending on if I can find an applicable gem with such properties and whether time permits.