

Trace.js User Documentation

Version 0.0.1

Prologue: What is a Ray Tracer?

Ray tracing is a technique used in computer graphics typically used to draw three-dimensional scenes. At a high-level it works by shooting geometric rays from a virtual camera into a scene of objects you want to draw. If one of the rays intersects an object, it calculates the light at that intersection point and outputs a color to the final image. It then continues to bounce rays throughout the scene until all the pixels in the final image are colored.

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Quick Reference

This section provides a list of available operations in Trace.js that can be used to specify a scene.

1. **BRDFs** - The *Bidirectional Reflectance Distribution Functions*. These describe how light is reflected or scattered on a given material.
2. **Camera** - Provides the user with a virtual camera to view the scene. Options include two-dimensional (2D) orthographic projection, and three-dimensional (3D) perspective projection. The 3D camera is referred to as a pinhole camera for brevity.
3. **Geometric Objects** - Objects that the user can place directly in scene. These currently include Planes, Spheres, Triangles, and a Torus.
4. **Lights** - Provides the user with virtual lights to light the scene. Options include:
 - a. Directional Lights - These light the scene uniformly in every direction no matter where they are placed.
 - b. Point Lights - These light the scene in a specific direction specified by the user.
 - c. Ambient Light - This is extra light added to the scene that is used if the user wants to brighten the scene a little.
5. **Materials** - These are the materials specified by the user that the Geometric Objects are made out of. Options include Matte (a chalk-like material), Phong (a plastic-like material), and Reflective (a reflective material).
6. **Samplers** - Allows the user to specify how many rays are traced for each pixel. This allows for elimination of Anti-Aliasing artifacts (typically referred to as jaggies), which makes for a smoother image overall. Trace.js implements Regular and Multi-Jittered sampling. Outlining how these techniques work is outside the scope of this document.

7. **Tracers** - Provides the user with a choice of ray-tracing technique. Currently we support Ray Casting (non-recursive ray propagation) and Whitted Ray Tracing (recursive ray propagation).

Tutorial

This section includes a full walkthrough for using our application.

TODO: This should be completed after application is finished. Will include images and detailed text.