**background——Geometric optics**

Modern theories of light treat it as both a wave and a particle.Here are the rules of geometric optics:

Light is a flow of photons with wavelengths. We'll call these flows “light rays.”

Light rays travel in straight lines in free space.

Light rays do not interfere with each other as they cross.

Light rays travel from the light sources to the eye, but the physics is invariant under path reversal

**definition**

A ray tracing program mathematically determines and replicates the path of rays from an image, but in the opposite direction (from the eye back to the origin).

Each ray is represented by a mathematical equation that defines the ray's spatial path as a function of time, and each ray is assigned a color based on the pigment or color of the target in the scene that the ray passes through before reaching the screen. Every pixel on the screen corresponds to every ray of light that can be traced back to the source at every moment.

Each ray's path consists of polylines that almost always contain reflection, refraction, and shadow effects from the origin to the scene.

**Technical schematic**

The light is emitted from the direction of the human eye, transmitted on the surface of the green sphere, and through refraction, a part of the light is projected on the red triangle, and a natural shadow is generated at the same time.

First determine each pixel, then go to each object to see if the object covers the corresponding pixel.

**Ray casting**

the process in a ray tracing algorithm that shoots one or more rays from the camera (eye position) through each pixel in an image plane, and then tests to see if the rays intersect any primitives (triangles) in the scene. If a ray passing through a pixel and out into the 3D scene hits a primitive, then the distance along the ray from the origin (camera or eye point) to the primitive is determined, and the color data from the primitive contributes to the final color of the pixel. The ray may also bounce and hit other objects and pick up color and lighting information from them.