

Ray Tracing for Light Pipe Applications

Part 3 of 3 Part Series



Title

- *Ray Tracing for Light Pipe Applications*

Purpose

- *Introduction to ray tracing technology*
- *Overview of ray tracing process*
- *Advantages provided by ray tracing technology*
- *Overview of custom tooling*

Content

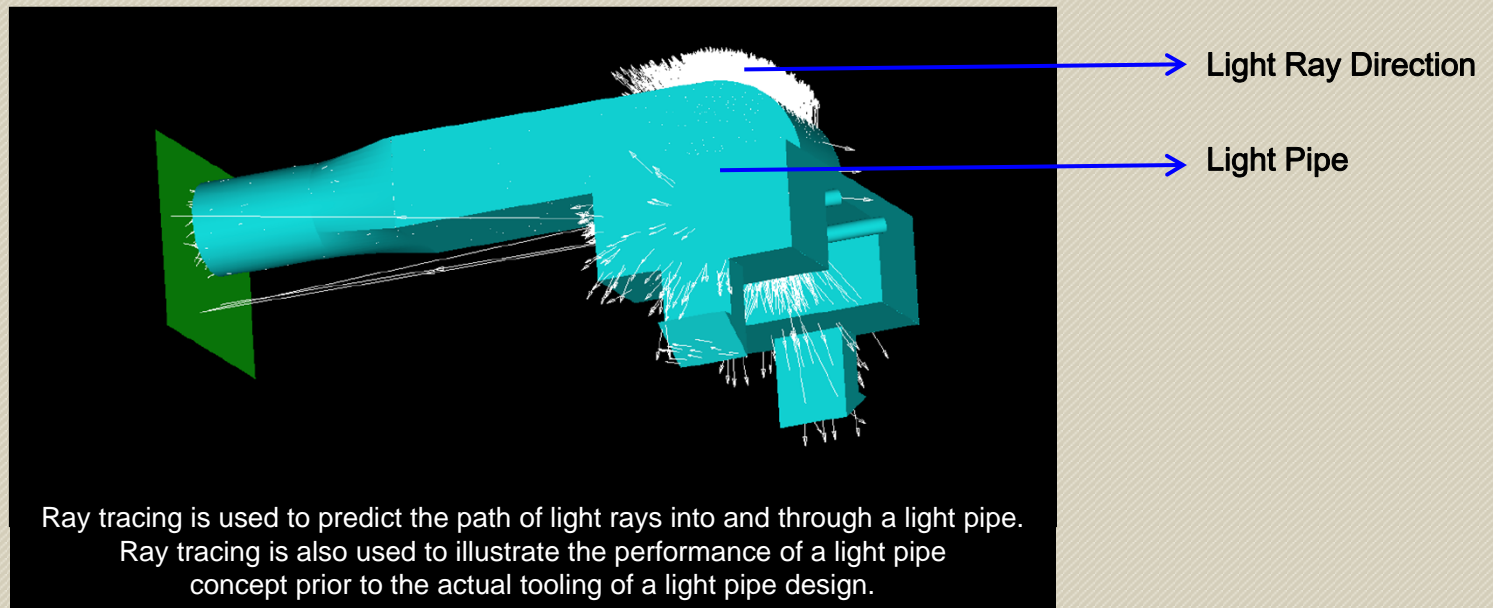
- *8 Pages*

Learning Time

- *5 Minutes*

Welcome to the Lumex training module on ray tracing for light pipe applications. This is the third module in our three-part series on light pipe technology. The objective of this training module is to discuss the process of ray tracing and highlight the key benefits this cutting edge technology can provide for light pipe applications.

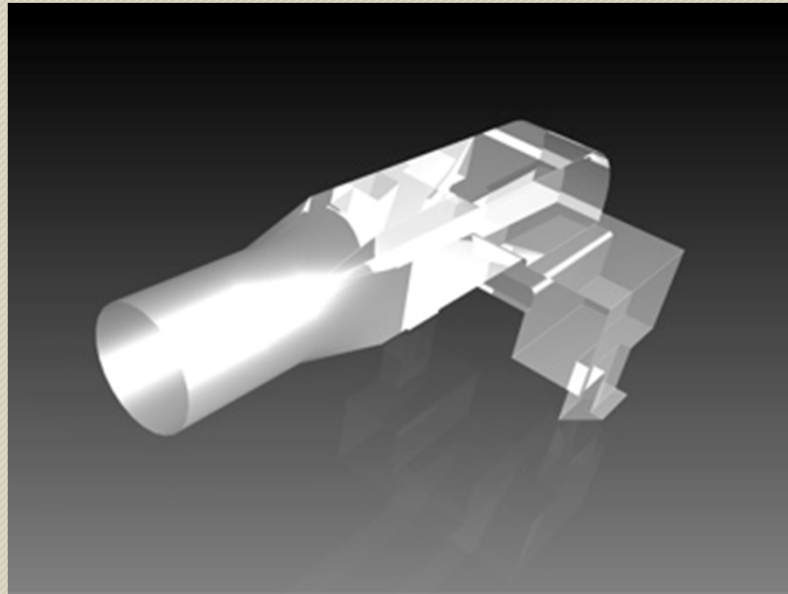
Introduction to Ray Tracing



Ray tracing is a method of calculating the path of light through a light pipe through a virtual model Lumex uses state-of-the-art ray trace software with precise 3D CAD/CAM models for optimal light transmittance to ensure proper light pipe design. This advanced technology system helps to predict the direction of the light traveling through a light pipe, thereby eliminating costly and time-consuming steps and ultimately ensuring the most efficient design for a product.

Ray Tracing Process

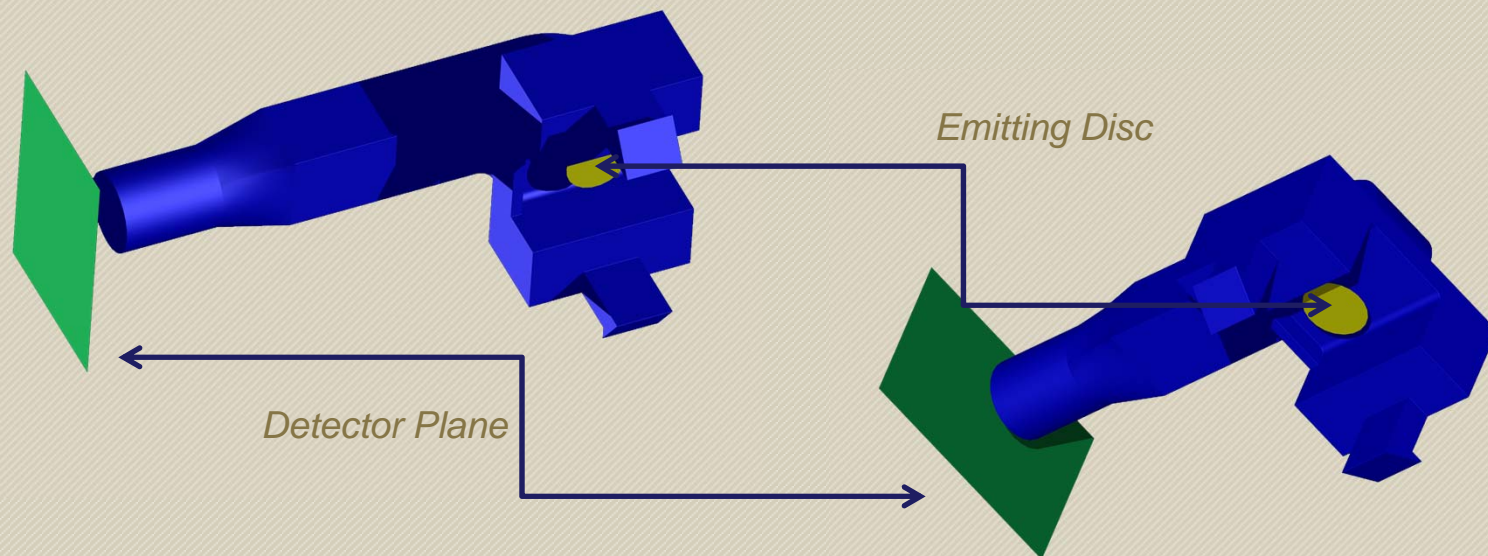
Step 1



To ensure optimal light transmittance, ray tracing is completed in a three step process. First, a three dimensional model, representing an original design concept of a light pipe is created using 3D CAD software to scale. This model is an accumulation of the physical dynamic of a specific light pipe application (including any bends, angles and material for light transmission).

Ray Tracing Process

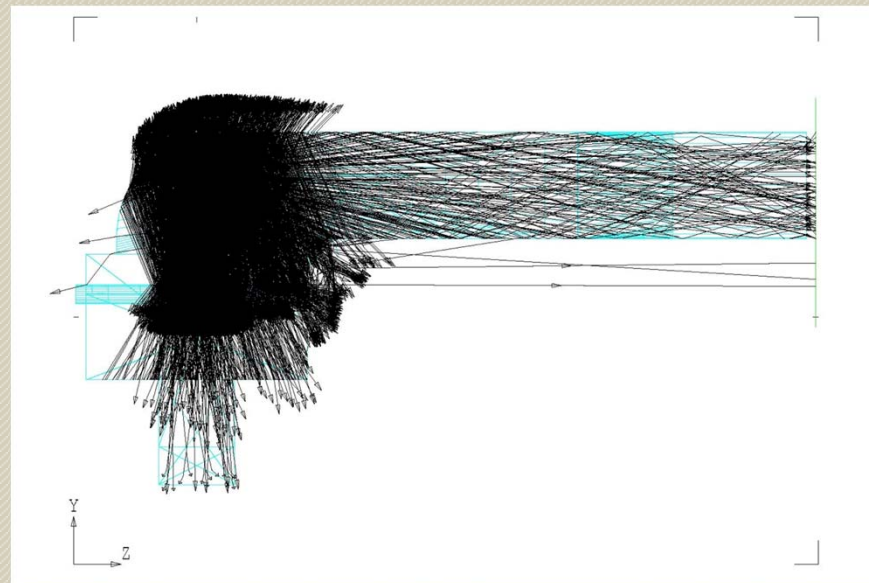
Step 2



Next, an artificial LED is created, called an emitting disc, within the ray tracing program. The emitting disc simulates the intensity and the viewing angle of an LED, which is placed on the surface of a light pipe model. The detector plane is created in front of a surface where the light is intended to exit. The combination of these two planes in the ray trace program determines the amount of light transfer from LED to the emitting surface of a light pipe.

Ray Tracing Process

Step 3



With a precise 3D model and proper LED viewing angle, it is then possible to run the design through Lumex's cutting-edge ray tracing technology to test the exact light output in terms of both uniformity and brightness. By measuring this light output via ray tracing, adjustments can be made to ensure that the most efficient light transmission path is identified and tested before any time or expenses are spent on tooling.

Advantages of Ray Tracing

- ✓ Ensures most efficient possible design through precise product modeling
- ✓ Speeds time to market, by eliminating trial & error development
- ✓ Saves costs on trial tooling

Ray tracing provides several key advantages for light pipe applications. First, precise product modeling ensures the most efficient possible design – providing maximum light transmissions and minimal light loss. Second, because ray tracing calculates optimal design for efficient performance before product tooling even takes place, time wasted on trial and error development is eliminated. This speeds time to market, enabling products to be developed up to 35% faster than is possible with traditional product design techniques. Also, the ability to ensure optimal design prior to product tooling, reducing expense on re-tooling and can generate up to 40% cost savings. Clearly, ray tracing provides key performances, speed and cost benefits for light pipe applications.

Custom Tooling



Custom tooling can ultimately be more cost efficient than standard products



Custom tooling can be completed in as little as one month's time

Once ray tracing has uncovered the most efficient possible design for a light pipe application, the product is ready to be tooled. Though a wide variety of standard light pipe technologies are available, many customers prefer to have custom tooling created to create a custom product that exactly meets their specific performance requirements. Recent technology developments have made custom tooling much easier and more cost effective to complete. Custom tooling can often be completed in about one month's time and pricing can often range for as little as \$3,000 to \$10,000 depending on design complexity. For more information on Lumex's TransBrite™ Light Pipe Technology, contact one of our Technical Design Specialists at (800) 278-5666.