

## TracePro Optimization

# Interactively Refine Your Design to Achieve Optimal Performance

### Optimization for Streamlining the Prototyping Process

TracePro streamlines the prototype-to-manufacturing process for optical and illumination systems using its interactive optimizer. Different from traditional optimizers, TracePro offers an easy-to-use and unique capability to interactively monitor and control the process every step of the way.

### Beginning the Design Process

You start the design process by sketching the starting design, digitizing variable limits directly into the CAD sketch utility and establishing a merit function using intensity, efficiency, irradiance, radiance/luminance, color, and/or uniformity parameters. You can trace rays, then drag control points to interactively see the effect on your design as the rays update in real time.

The merit function uses weights to balance the multiple operands based on your desired targets.

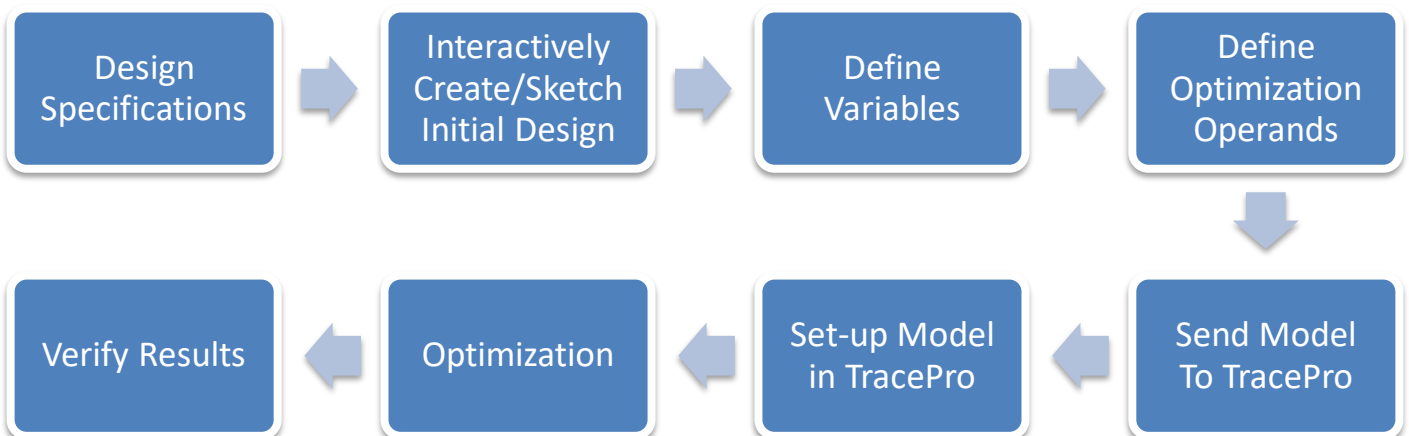
### Macro Language Capabilities

You can use TracePro's powerful macro language to control interaction with the created geometry, modify optical properties for each surface and solid object, and control positioning of solid objects. Each variable can be visually checked before, during, and after optimization.

### Optimization Methods

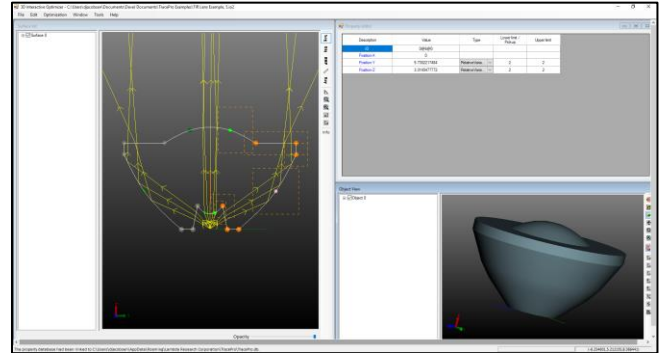
The TracePro optimizer uses the downhill simplex method, also known as the Nelder-Mead method, for optimization.

The downhill simplex method is a local optimizer that converges to the local minimum solution closest to the starting point. During an optimization, you have complete control of the process and can monitor the interim solutions. You can stop the optimizer and change the initial starting parameters, then re-start the optimization. This allows you to control the process and test for better solutions in less time.

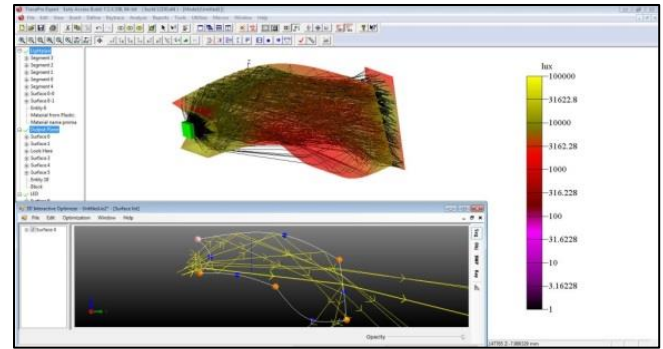


**TracePro's Interactive Optimizer is a highly intuitive tool easily mastered by any optical or design engineer. The main functions of the tool include:**

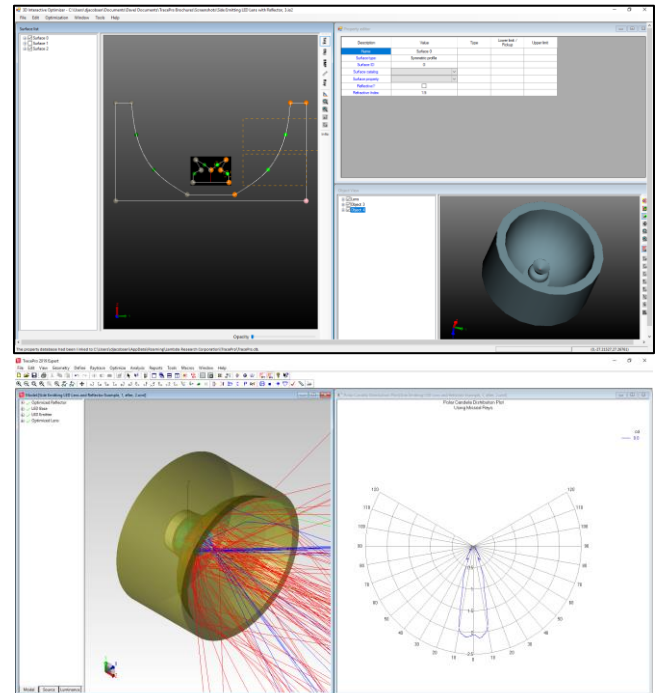
- Surface List**  
 Includes available surface types used to create objects, such as planar, b-spline (free, X, Y, XY), parametrized (biconic surface), freeform, 2D profile (asymmetric, symmetric, elliptical), user-defined path (2D, 3D), and reflector.
- Object View**  
 Lists the types of objects including lens, extruded, radially symmetric, sweep, biaxial, reflector, TIR lens, freeform lens, or advanced sweep. establishes initial parameters that can be adjusted in the Property Editor.
- Property Editor**  
 Varies depending on the selection, generally includes origin, tilt center and angle (X, Y, Z), tilt then shift, thickness, material type, surface properties, draft angle, and refractive index. You can also define sliders to interactively adjust properties.
- Optimization Operands**  
 Utilizes operands to specify multiple values on which to optimize, including flux, color space (CIE u'v', CIE xy), irradiance distribution, irradiance profile, intensity, candela profile, uniformity, beam width, spot size, luminance, photorealistic rendering, user-defined, or you can write a Scheme macro program to define an operand.
- Optimization Variables**  
 Almost any design parameter can be made a variable for optimization. Variables can be relative or absolute.



**Figure 1:** Profile of a TIR lens with interactive rays traced.



**Figure 2:** 3D Optimization - complex non-symmetric designs are supported with the 3D optimizer.



**Figure 3:** Optimized LED optical luminaire with optimization parameters.