The Eikonal+ Front End

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Abstract

This is the draft manual for the `Eikonal+` front end

1 Eikonal+ capabilities

1.1 Optical system limitations

The following limits apply to systems designed in the front end and in the back end.

Number of configurations in a lens system	5	(from 0 to 4)
Number of optimization parameters	199	
Number of targeted aberrations	199	
Actual number of constraints	117	
Number of surfaces in each configuration	100	(from 0 to 99)
Number of field points in each configuration	15	(from 0 to 14)
Number of groups in each configuration	10	
Number of design wavelengths in each configuration	3	

2 Commands

2.1 Getting help with the back end

The back end will supply a brief help string. The syntax is 'HELP KEYWORD', where KEYWORD is a search term or command name.

2.2 Command syntax

Optional parameters are enclosed in square brackets `[ ]`, and required parameters are enclosed in angle brackets `<>`.

For more information about commands that are not listed here, refer to the Back End Manual.

`clear screen`

Usage: `clear screen`. Clears the graphical window where the lens is rendered.

`cls`

Clears the text input at the bottom of the main window. This can be used if the prompt is lost at the bottom of the text input. See also `clear screen`.

`dir`
Usage: `dir` Prints a listing of the current working directory.

`e`
Usage: `e`. Restarts the back end (after a crash or intentionally shutting it down. See command `x`.

`lens`
Usage: `lens`. Redraws the lens system in 3D, including rays. Do not confuse this with the back end command `$lens`.

`$lens`
Usage: `$lens`. Redraws the lens system in 2D, including rays. Do not confuse this with the front end command `lens`.

`date`
Usage: `date`. Prints the current system date.

`time`
Usage: `time`. Prints the current system time.

`x`
Usage: `x`. Shuts down the back end. See command `e`.

3 Graphical controls

Refresh button
Redraws the lens system with sample ray tracing.

4 Ray tracing

For ray tracing evaluation of lens systems, rays are traced from selected off-axis object points to center points of different types of grids at the entrance pupil. Besides, there is a coordinate system associated with each optical sur-

face and a ray is defined by a position vector and a direction vector (direction cosines).

STANDARD COORDINATES (default): In this coordinate system, the grids or patterns are all plane and perpendicular to the optical axis and the scale (coordinates) are linear on that plane. In systems with finite conjugates evaluation is not symmetrical, i.e. not the same whether rays are traced from long conjugate or from short conjugate.

The position vector of the ray lies on the polar tangent plane to the surface; therefore, very steep rays may become indeterminate.

CANONICAL COORDINATES: In this coordinate system, the grids or patterns lie on spherical surfaces with center at the object point, and the scale (coordinates) is proportional to the sine of the angle of the ray with the bisector of the upper and lower rim rays. In systems with finite conjugates evaluation is symmetrical to the extent that the system is isoplanatic and the results are the same no matter from what side the rays are traced.

The position vector of the ray is the vector perpendicular to the ray from the pole or vertex of the surface. Rays never become indeterminate.

This coordinate system is RECOMMENDED when evaluation is started from the SHORT conjugate and/or rays may be very steep (as in extremely wide angle lenses).

This system was proposed by H.H.Hopkins in the Japanese Journal of Applied Physics, Vol. 4, Supplement I, 1965.

A1, A2, A3, CY, CZ, SP, TR, AS, DM, FS, XT, YT, ZT, YD, ZD

5 Troubleshooting

The back end will supply a brief help string. The syntax is 'HELP KEYWORD', where KEYWORD is a search term or command name.

Back end crash

The front end can relaunch the back end in the event of a crash. At the text input prompt, type `e` to relaunch the back end. The lens system will be in the same state it was before the command that caused the crash.

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