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New Computation Methods for Geometrical Optics

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To my former advisor

Kornel F. Ehmann

To my wife

Chiung-Jung Huang

and

In memory of my past wife

Su-Chin Wang

Preface

The traditional geometrical optics is based on raytracing only. It is very difficult, if possible, to compute the first- and second-order derivatives of a ray and optical path length with respect to system variables, since they are recursive functions. Consequently, current commercial software packages use a finite difference approximation methodology to estimate these derivatives for use in optical design and analysis. Furthermore, previous publications of geometrical optics use vector notation, which is comparatively awkward for computations for non-axially symmetrical systems. In order to circumvent these limitations, this book employs homogeneous coordinate notation to compute the first- and second-order derivative matrices of various optical quantities. It will be one of the important mathematical tools for automatic optical design.

This book is dedicated to Department of Mechanical Engineering, National Cheng Kung University in Taiwan. It is almost impossible to complete this book without its wonderful environment. My special thanks are also delivered to National Science Council of Taiwan for its financial supports every year.

Taiwan

PD Lin

Contents

1 Homogeneous Coordinate Notation	1
1.1 Set, Sequence, and Matrix Notations	1
1.2 Vectors	2
1.3 Coordinate Transformation Matrix	4
1.4 Translation and Rotation Matrices	6
1.5 Specification of a Pose Matrix	12
1.6 Inverse Transformation Matrix	13
1.7 RPY Angle Solutions	14
1.8 Jacobian and Hessian Matrices	15
References	16
2 Skew-Ray Tracing at Boundary Surfaces	17
2.1 Source Ray	17
2.2 Skew-Ray Tracing at a Spherical Boundary Surface	19
2.3 Skew-Ray Tracing at a Flat Boundary Surface	29
2.4 Skew-Ray Tracing at General Aspherical Surfaces	37
2.5 Unit Normal Vector at Incidence Point on a Refractive/or Reflective Boundary Surfaces	45
References	48
3 Modeling an Optical System	49
3.1 Stops, Aperture, and Various Rays in an Axis-Symmetrical System	49
3.2 Axis-Symmetrical Optical Systems	52
3.3 Non-Axially Symmetrical Optical Systems	64
3.4 Evaluating the Spot Diagram by Raytracing	72
3.5 Determination of PSF by Raytracing	73
3.6 Estimation of MTF by Raytracing	74
3.7 Determining Linear Equations of Position Sensitive Detector (PSD) for Small Motion Measurement Systems	82
References	86

4 Paraxial Optics for Axis-Symmetrical Systems	87
4.1 Convention of Paraxial Optics	87
4.2 Reflecting and Refracting Matrices of Paraxial Optics	88
4.2.1 Reflecting and Refracting Matrices at a Flat Boundary Surface	89
4.2.2 Reflecting and Refracting Matrices at a Spherical Boundary Surface	91
4.3 Paraxial Optics for Axis-Symmetrical Optical Systems	94
4.4 Cardinal Planes and Cardinal Points of an Optical System	95
4.5 Determination of Focal Points for a Thick Lens	98
4.6 Determination of the Focal Length of Curved Mirrors	100
4.7 Image Position in an Optical System Using Cardinal Points	102
4.8 Lateral Magnification	104
4.9 Longitudinal Magnification	104
4.10 Focal Lengths of Two-Element Systems Surrounded by Air	105
4.11 The Optical Invariant in Paraxial Optics	108
4.11.1 The Invariant and Magnification	109
4.11.2 Image Height for Object at Infinity	110
4.11.3 Data of a Third Ray from Two Traced Rays	111
4.11.4 Focal Length Determination	112
References	113
5 The Jacobian Matrix of a Ray with Respect to System Variable Vector	115
5.1 The First-Order Derivative of a Merit Function	115
5.2 The Jacobian Matrix of Ray \bar{R}_i with Respect to Incoming Ray \bar{R}_{i-1} at a Flat Boundary Surface	118
5.3 The Jacobian Matrix of Ray \bar{R}_i with Respect to Incoming Ray \bar{R}_{i-1} at a Spherical Boundary Surface	124
5.4 The Jacobian Matrix of Ray \bar{R}_i with Respect to Boundary Variable Vector \bar{X}_i at a Flat Boundary Surface	131
5.5 The Jacobian Matrix of Ray \bar{R}_i with Respect to Boundary Variable Vector \bar{X}_i at a Spherical Boundary Surface	135
5.6 The Jacobian Matrix of Ray \bar{R}_i with Respect to System Variable Vector \bar{X}_{sys}	139
5.7 The Jacobian Matrix Between Boundary Variable Vector \bar{X}_i and System Variable Vector \bar{X}_{sys}	142
5.8 The Hessian Matrix Between Boundary Variable Vector \bar{X}_i and System Variable Vector \bar{X}_{sys}	150
Appendix A	153
Appendix B	155
Appendix C	156
Appendix D	158
References	161

6	Point Spread Function and Modulation Transfer Function	163
6.1	Jacobian Matrix Between In-plane Coordinates (x_n, z_n) of the Image Plane and the Polar Coordinates (α_0, β_0) of a Source Ray.	164
6.2	The Point Spread Function Based on Irradiance Method.	165
6.3	The Spot Diagram Based on Irradiance Method.	169
6.4	Theory of MTF for Any Arbitrary Direction of OBDF.	170
6.5	MTF for any Arbitrary Direction of OBDF from Ray-Counting and Irradiance Methods	173
6.5.1	Ray-Counting Method	173
6.5.2	Irradiance Method	174
	Appendix A.	181
	Appendix B.	181
	Appendix C.	182
	Appendix D.	183
	References	186
7	Optical Path Length and Its Jacobian Matrix with Respect to System Variable Vector	187
7.1	The Jacobian Matrix of OPL_i Between $(i-1)$ th and i th Boundary Surfaces	187
7.1.1	The Jacobian Matrix of OPL_i with Respect to its Incoming Ray \bar{R}_{i-1}	188
7.1.2	The Jacobian Matrix of OPL_i with Respect to Boundary Variable Vector \bar{X}_i	189
7.2	The Jacobian Matrix of OPL between any Two Incidence Points.	190
7.3	Computation of Wavefront Aberration	195
7.4	The Merit Function Based on Wavefront Aberration	201
	References	202
8	The Wavefront Shape, Irradiance, and Caustic Surface in an Optical System	203
8.1	The Hessian Matrix of the Ray \bar{R}_i with Respect to its Incoming Ray \bar{R}_{i-1} at a Flat Boundary Surface.	204
8.2	The Hessian Matrix of the Ray \bar{R}_i with Respect to Its Incoming Ray \bar{R}_{i-1} at a Spherical Boundary Surface	206
8.3	Computation of Hessian Matrix $\partial^2 \bar{R}_i / \partial \bar{X}_0^2$	208
8.4	The Hessian Matrix of OPL_i with Respect to the Variable Vector \bar{X}_0	212
8.5	Change of Wavefront Aberration due to Translation of Source Point	214

8.6	Wavefront Shape, Irradiance, and Caustic Surface along a Ray Path	218
	Appendix	
A	229
	Appendix	
B	230
	References	237
Curriculum Vitae	239