CONTENTS

Preface *vii*
Future Contributions *ix*
Contributors *xiii*

1. Pattern Generators for Reflective Electron-Beam Lithography (REBL) **1**
Allen M. Carroll

1. Introduction 1
2. REBL and DPG Basics 3
3. Lenslet Analysis 7
4. REBL Patterning Strategy and Column Optics 9
5. Charge Draining 12
6. DPG2 Design and Realization 13
7. Example of Lithographic Results 16
8. Innovations in DPG3 19
9. Summary 21

Acknowledgments 22
References 22

2. Recent Developments in Time-of-Flight Mass Spectrometry **25**
Frank Gunzer and Jürgen Grotemeyer

1. Introduction 25
2. Recent Development in Time-of-Flight Mass Spectrometry 33
3. Outlook 65

References 66

3. A Special Voice Transform, Analytic Wavelets, and Zernike Functions **79**
Margit Pap

1. Introduction 80
2. The Hyperbolic Wavelet Transform 85
3. Multiresolution in the Hardy Space of the Unit Disk 91

4. Multiresolution in the Hardy Space of the Upper Half-plane 110
5. Connection Between the Voice Transform, Zernike Polynomials and Applications 122
Acknowledgments 131
References 131

4. The Hankel Transform in *n*-dimensions and Its Applications in Optical Propagation and Imaging 135

Colin J.R. Sheppard, Shan S. Kou, and Jiao Lin

1. Introduction 135
2. The *n*D case 138
3. The 1D Case 148
4. The 2D Case 150
5. The 3D Case: The Spherically Symmetrical Fourier Transform 154
6. The 4D Case 175
7. The Projection-Slice Theorem 176
8. Applications in Optical Diffraction and Imaging 177
9. Conclusions 180
References 181

Contents of Volumes 151–187 *185*
Index *193*

CHAPTER TWO

Recent Developments in Time-of-Flight Mass Spectrometry

Frank Gunzer , Jürgen Grotemeyer

Contents

1. Introduction 25
   - 1.1 The Concept of a Time-of-Flight Analyzer 26
   - 1.2 The Wiley-McLaren Ion Source 28
   - 1.3 The Reflectron 30
2. Recent Development in Time-of-Flight Mass Spectrometry 33
   - 2.1 Progress Regarding Instrumentation 34
   - 2.2 Scientific Applications 54
3. Outlook 65

References 66

CHAPTER THREE

A Special Voice Transform, Analytic Wavelets, and Zernike Functions

Margit Pap

Contents

1. Introduction 80
   - 1.1 Affine Wavelets and Multiresolution 80
   - 1.2 The Voice Transform 82
2. The Hyperbolic Wavelet Transform 85
   - 2.1 The Blaschke Group 85
   - 2.2 Hardy Spaces 87
   - 2.3 The Continuous Voice Transform on $H^2(\mathbb{T})$ 88
3. Multiresolution in the Hardy Space of the Unit Disk 91
   - 3.1 Construction of Multiresolution in $H^2(\mathbb{T})$ 91
   - 3.2 The Properties of the Projection Operator Corresponding to the nth Resolution Level 100
   - 3.3 Reconstruction Algorithm Using the Wavelet Base 103
   - 3.4 Discrete Orthogonality of the Hyperbolic Wavelet Basis 105
4. Multiresolution in the Hardy Space of the Upper Half-plane 110
   - 4.1 Transition to the Upper Half-plane, Motivation 110
   - 4.2 A Special Discrete Subset in the Upper Half-plane 111
   - 4.3 Multiresolution in the Hardy Space of the Upper Half-plane 112
   - 4.4 The Projection Operator Corresponding to the nth Resolution Level 117
   - 4.5 Reconstruction Algorithm 119
5. Connection Between the Voice Transform, Zernike Polynomials and Applications 122
   - 5.1 The Zernike Polynomials 122
   - 5.2 The Matrix Elements of the Representation of the Blaschke Group 123
   - 5.3 Discrete Orthogonality of Complex Zernike Functions 125
   - 5.4 Zernike Moments, Applications 129

Acknowledgments 131

References 131

CHAPTER FOUR

The Hankel Transform in *n*-dimensions and Its Applications in Optical Propagation and Imaging

Colin J.R. Sheppard , Shan S. Kou , Jiao Lin

Contents

1. Introduction 135
2. The *n*D case 138
3. The 1D Case 148
4. The 2D Case 150
5. The 3D Case: The Spherically Symmetrical Fourier Transform 154
   - 5.1 Separation of the Green function into Near- and Far-Field parts 163
   - 5.2 The Rayleigh-Sommerfeld Diffraction Integral 169
   - 5.3 The Field of a Scalar Source or Dipole 172
6. The 4D Case 175
7. The Projection-Slice Theorem 176
8. Applications in Optical Diffraction and Imaging 177
9. Conclusions 180

References 181