

CONTENTS

<i>Preface</i>	<i>vii</i>
<i>Future Contributions</i>	<i>ix</i>
<i>Contributors</i>	<i>xiii</i>
1. Homeomorphic Manifold Analysis (HMA): Untangling Complex Manifolds	1
Ahmed Elgammal	
1. Introduction	2
2. Motivating Scenarios	6
3. Framework Overview	13
4. Manifold Factorization	16
5. Inference	25
6. Applications of Homomorphism on 1-D Manifolds	30
7. Applications of Homomorphism on 2-D Manifolds	44
8. Applications to Complex Motion Manifolds	59
9. Bibliographical Notices	69
10. Conclusions	75
Acknowledgments	77
References	77
2. Spin-Polarized Scanning Electron Microscopy	83
Teruo Kohashi	
1. Introduction	84
2. Principles	86
3. Device Configuration and Sample Preparation	96
4. Examples of Spin-SEM Measurements	106
5. Conclusions	121
Acknowledgments	122
References	122
<i>Contents of Volumes 151–186</i>	<i>127</i>
<i>Index</i>	<i>133</i>

Homeomorphic Manifold Analysis (HMA): Untangling Complex Manifolds

Ahmed Elgammal

Contents

1. Introduction	2
2. Motivating Scenarios	6
2.1 Case Example I: Modeling the View-Object Manifold	6
2.2 Case Example II: Modeling the Visual Manifold of Biological Motion	8
2.3 Biological Motivation	11
3. Framework Overview	13
4. Manifold Factorization	16
4.1 Style Setting	16
4.2 Manifold Parameterization	17
4.3 Style Factorization	18
4.3.1 <i>One-Style-Factor Model</i>	18
4.3.2 <i>Multifactor Model</i>	19
4.4 Content Manifold Embedding	21
4.4.1 <i>Nonlinear Dimensionality Reduction from Visual Data</i>	22
4.4.2 <i>Topological Conceptual Manifold Embedding</i>	24
5. Inference	25
5.1 Solving for One Style Factor	26
5.1.1 <i>Iterative Solution</i>	26
5.1.2 <i>Sampling-based Solution</i>	28
5.2 Solving for Multiple Style Factors Given a Whole Sequence	28
5.3 Solving for Body Configuration and Style Factors from a Single Image	29
6. Applications of Homomorphism on 1-D Manifolds	30
6.1 A Single-Style-Factor Model for Gait	31
6.1.1 <i>Style-Dependent Shape Interpolation</i>	32
6.1.2 <i>Style-Preserving Posture-Preserving Reconstruction</i>	33
6.1.3 <i>Shape and Gait Synthesis</i>	34
6.2 A Multifactor Model for Gait	37
6.3 A Multifactor Model for Facial Expression Analysis	41

6.3.1 <i>Facial Expression Synthesis and Recognition</i>	42
7. Applications of Homomorphism on 2-D Manifolds	44
7.1 The Topology of the Joint Configuration-viewpoint Manifold	46
7.2 Graphical Model	49
7.3 Torus Manifold Geometry	50
7.4 Embedding Points on the Torus	50
7.5 Generalization to the Full-View Sphere	51
7.6 Deforming the Torus	52
7.6.1 <i>Torus to Visual Manifold</i>	52
7.6.2 <i>Torus to Kinematic Manifold</i>	53
7.6.3 <i>Modeling Shape Style Variations</i>	53
7.7 Bayesian Tracking on the Torus	54
7.7.1 <i>Dynamic Model</i>	55
7.8 Experimental Results	56
8. Applications to Complex Motion Manifolds	59
8.1 Learning Configuration-viewpoint, and Shape Manifolds	62
8.2 Parameterizing the View Manifold	64
8.2.1 <i>Parameterizing the Configuration Manifold</i>	64
8.2.2 <i>Parameterizing the Shape Space</i>	65
8.3 Simultaneous Tracking on the Three Manifolds Using Particle Filtering	65
8.4 Examples: Pose and View Estimation from General Motion Manifolds	66
8.4.1 <i>Catch/Throw Motion</i>	66
8.4.2 <i>Ballet Motion</i>	67
8.4.3 <i>Aerobic Dancing Sequence</i>	69
9. Bibliographical Notices	69
9.1 Factorized Models: Linear, Bilinear, and Multilinear Models	69
9.2 Manifold Learning	72
9.3 Manifold-based Models of Human Motion	74
10. Conclusions	75
Acknowledgments	77
References	77

Spin-Polarized Scanning Electron Microscopy

Teruo Kohashi

Contents

1. Introduction	84
2. Principles	86
2.1 Principle of Magnetic Domain Observation	86
2.2 Principle of Spin-Polarization Detection	88
2.2.1 <i>Mott Polarimeter</i>	88
2.2.2 <i>Detection of All Three Spin-Polarization Components</i>	92
3. Device Configuration and Sample Preparation	96
3.1 Chamber Configuration	96
3.2 Sample Preparation	98
3.3 Electron Gun	99
3.4 Secondary Electron Optics	100
3.5 Spin Detectors	101
3.5.1 <i>Classical Mott Detector</i>	101
3.5.2 <i>Compact Mott Detector</i>	104
3.5.3 <i>Diffuse Scattering Detector</i>	104
3.5.4 <i>LEED Detector</i>	105
3.6 Signal-Analyzing System	105
4. Examples of Spin-SEM Measurements	106
4.1 Co Single Crystal	106
4.2 HDD Recorded Bits	108
4.3 Nd ₂ Fe ₁₄ B Magnet	113
4.3.1 <i>Magnetization in Boundary Phase of Sintered Magnet</i>	113
4.3.2 <i>Magnetization Process in the Fine Powders of NdFeB Magnet</i>	115
4.4 Other Examples of Spin-SEM Measurements	120
5. Conclusions	121
Acknowledgments	122
References	122