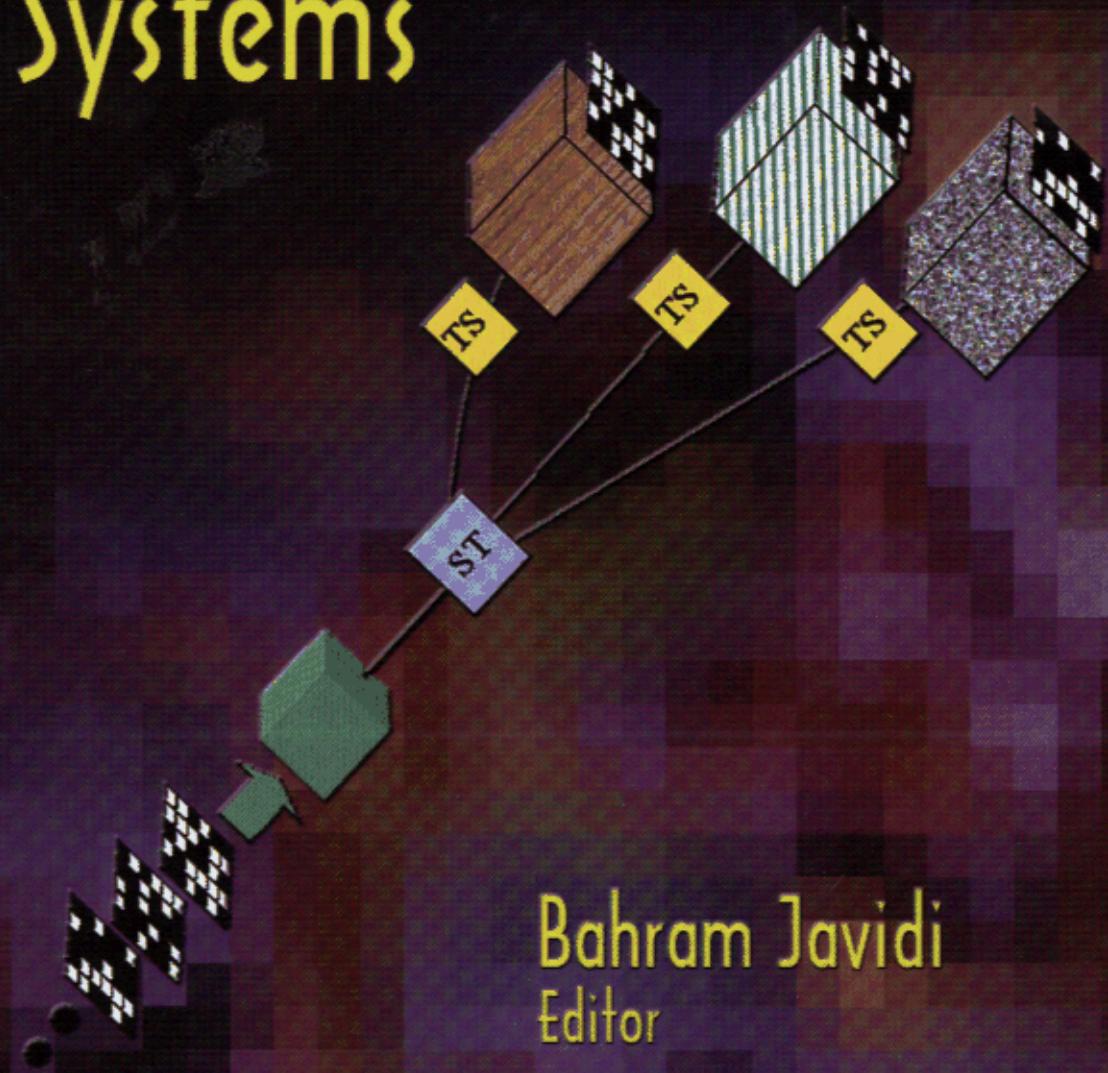


Smart Imaging Systems



Bahram Javidi
Editor

Contents

Preface / xi

Chapter 1. Analysis of Dualband FLIR Imagery for Automatic Target Detection / 1

Lipchen Alex Chan, Sandor Z. Der, and Nasser M. Nasrabadi

- 1.1 Introduction / 2
- 1.2 Eigentargets / 5
- 1.3 Multilayer perceptron / 11
- 1.4 Experimental results / 13
- 1.5 Conclusions / 24
- Acknowledgment / 25
- References / 25

Chapter 2. Optimal Polarimetric Classification of Synthetic Aperture Radar (SAR) Targets / 27

Firooz Sadjadi

- 2.1 Introduction / 28
- 2.2 Polarization diversity / 28
- 2.3 Databases and preliminary experiments / 30
- 2.4 Optimum polarimetric selection / 37
- 2.5 Summary / 42
- References / 43

Chapter 3. Image Security by Digital Holography / 45

Enrique Tajahuerce, Osamu Matoba, and Bahram Javidi

- 3.1 Introduction / 45
- 3.2 Optical encryption with random phase masks: basic theory / 47
- 3.3 Encryption with digital holography / 49
- 3.4 Conclusions / 64
- Acknowledgments / 64
- References / 64

Chapter 4. Agile Sensing Using Laser-based Systems / 69

Edward A. Watson, Paul F. McManamon, and Duane D. Smith

- 4.1 Introduction / 70
- 4.2 Motivation for agile sensing systems / 71

- 4.3 Agile, laser-based sensing system parameters / 76
- 4.4 Sensor component requirements / 83
- References / 88

Chapter 5. Description and Applications of a CMOS Digital Vision Chip Using General Purpose Processing Elements / 91

Masatoshi Ishikawa

- 5.1 Introduction / 92
- 5.2 Difference from competitive devices or systems / 94
- 5.3 What is the goal? / 96
- 5.4 Architecture and detail circuits / 97
- 5.5 Chip fabrication / 101
- 5.6 Scalability and future direction / 102
- 5.7 Software / 103
- 5.8 Vision chip system / 104
- 5.9 Vision chip algorithm / 104
- 5.10 Applications / 105
- References / 108

Chapter 6. Data Compression and Correlation Filtering: A Seamless Approach to Pattern Recognition / 111

Abhijit Mahalanobis and Cindy Daniell

- 6.1 Integrated implementation / 113
- 6.2 Joint optimization / 116
- 6.3 Wavelet coefficients for pattern recognition / 122
- 6.4 Separable correlation filters / 125
- Acknowledgments / 130
- References / 130

Chapter 7. Recent Progress in Electro-Optical Three-Dimensional Correlators / 133

Joseph Rosen and Youzhi Li

- 7.1 Introduction / 133
- 7.2 Three-dimensional correlators / 134
- 7.3 Holograms recorded without interference / 152
- 7.4 Conclusions / 157
- Acknowledgment / 157
- References / 157

Chapter 8. Robust Image Recognition in the Presence of Noise with Unknown Power Spectrum / 159

Nasser Towghi, Luting Pan, and Bahram Javidi

- 8.1 Introduction / 159
- 8.2 Analysis / 161

- 8.3 Analytic estimates of SNR of nonlinear filters / 162
- 8.4 Robustness of SNR_k with respect to variations in bandwidth / 166
- 8.5 Computer simulations / 170
- 8.6 Summary / 181
- References / 181

Chapter 9. Neural Network-based Image Preprocessor / 183

Michele Banish, Heggere Ranganath, James C. Kirsch, and Brian K. Jones

- 9.1 Introduction / 184
- 9.2 Camera with embedded sensing and region of interest processor / 185
- 9.3 Definition of a neural network and how the pulse coupled neural network (PCNN) is special / 189
- 9.4 Medical application of the PCNN algorithm / 196
- 9.5 Summary / 204
- References / 205

Chapter 10. Image Processing for Intelligent Transportation Systems:

Application to Road Sign Recognition / 207

Elisabet Pérez and Bahram Javidi

- 10.1 Introduction / 208
- 10.2 Principles of pattern recognition / 209
- 10.3 Filtering techniques for distortion-tolerant systems / 212
- 10.4 Scale-invariant road sign recognition system / 214
- 10.5 Illumination-invariant system / 228
- 10.6 Analysis of a video sequence / 228
- 10.7 Summary / 228
- Acknowledgments / 230
- References / 230

Chapter 11. Interface between Ultrafast Optics and Optical Storage for Ultrafast Data Communication and Processing / 233

Osamu Matoba and Bahram Javidi

- 11.1 Introduction / 234
- 11.2 Ultrafast data communications / 234
- 11.3 Numerical results / 248
- 11.4 Discussion / 249
- 11.5 Conclusion / 251
- References / 251

Index / 253