INDEX

Acquiring approach 194–197
Adaptive mathematical
morphology 138–140
Adaptive-resonance-theory
network 334–337
Adaptive-resonance-theory 2
network 337–341
Additive watermarking 450
Alternating sequential filters 89
Apex point 254
Arithmetic operations 51
Asymmetrical closing 279
Automatic extraction of filaments 496–515

Base point 254
Baseline detection 416
Bayes classifier 310–312
Big Bear Solar Observatory
(BBSO) 496
Binary tree 221
Bit plane slicing 45
Block classification 400–407
Block segmentation 398
Blur 59–61
compression blur 59
Gaussian blur 59
motion blur 59
Blur-minimum morphological
edge operator 87
Boundary extraction 76

Chain codes 224
backward 209
difference chain code 226
forward 209
Character classification 407–420
Character preclassification 414–415
Circle detection algorithm 276

Closing 68, 69
Combinational watermarking 463
Component labeling 122–123
Connected components 77
Contour representation 223
Contrast stretching 44
Convex hull 78
Convolution 20
Corner detection algorithm 278–285
Corona mass ejection 521
Correlation 21
Cosine transform 32–34
Covert communication 478
Crack code 224
CSG representation 260

Decomposition of the Euclidean distance
structuring element 190–192
De Morgan’s laws 348
Derivative filter 56, 132
Deriving approach 198–203
Dilation 64–66
binary dilation 64–66
greyscale dilation 73
Directional-downhill generation 255
Directional-uphill generation 254
Distance function 180
Distance transformation 182
chessboard 182
city-block 182
Euclidean 184–188
Document processing system 397–398

Edge linking 137–146
Edge operators 130–137
Erosion 66–68
binary erosion 66–68
greyscale erosion 74
Eye and mouth extraction algorithm 369

Face recognition 355–392
Facial action units 378–386
Facial expression recognition 386
Facial feature extraction 362–370
Feature reduction 293–301
  feature space 297–299
  input space 293–297
Filament 496
Flare 516
Formal language 261
Fourier descriptor 269–271
Fourier transform 23–30
  discrete Fourier transform 26–28
  fast Fourier transform 28–30
Fully parallel thinning algorithm 235–244
Functional link net preprocessor 339
Fuzzy geometry 346
Fuzzy morphological filters 109–114
Fuzzy sets 346–349
Fuzzy typographical analysis 414–417
Fuzzy unsupervised character classification 427

GA-based breaking algorithm 485–489
  crossover 484
  fitness function 483
  mutation 484
  reproduction 484
Gabor filter 377
Gaussian filter 53
Genetic algorithm based steganography 482–485
Geometric face model 378
Gravitation external force field 128
Gray scale transformation 41, 42
Greedy algorithm 129

Hierarchical-based fragile watermark 460
Hierarchical classification 436
Hierarchical features 274
High-boost filter 57
High-pass filter 56
Histogram equalization 45–49
Histogram specification 49–51
Hit-or-miss transformation 69–70
Hough transform 286–288

Image quality measures 59–61
  average distance 60

image fidelity 60
L2 Euclidean distance 60
least mean square error 61
N cross-correlation 60
normal mean square error 61
peak mean square error 61
peak signal to noise ratio 61
structure content 60
Interactive Data Language (IDL) 519
Iterative thinning algorithm 234

Japanese female facial expression (JAFFE) database 388

Lagrange function 314
Laplace transform 17–22
Laplacian of Gaussian filter 57
Large Angle and Spectrometric Coronagraph (LASCO) 517
Linear discriminate analysis 291–293
Linear maximum margin classifier 313
Linear soft margin classifier 315
Logo identification 411

Matching algorithm 434
Mathematical morphology 63–114
Maxima tracking algorithm 259
Medial axis transformation 244–251
Median filter 55
Mid-crack code 227–233
Moment invariants 271–272
Morphological edge operator 85–88
Morphological filters 88–114
Multilayer perceptron 327
Multiplicative watermarking 453

Neural network classifier 320
Nonlinear classifier 316
Normalized correlation 468

One-time pad communication 479
Opening 68
Order-statistic soft morphological filters 99–101

Piecewise linear transformation 42–45
Prewittt operators 57, 133
Principal component analysis 289–291
Programmable logic neural networks 321
Pruning 84
Pyramid neural network 323
Quadtree 221
Quadrature mirror filters 36
Radial basis function 316
Recursive morphological filters 90–94
Recursive order-statistic soft morphological filters 104–106
Recursive soft morphological filters 102–104
Redundant embedding approach 461
Region filling 77
Regulated morphological operators 106–108
Ridge point 253
Roberts cross gradient operators 56, 133
Rotational morphology 205
Rounding error problem 456
Rule-based character recognition system 407
Run-length coding 219–220
Safe-point 236
Seeded region growing 146–158
Segmentation 119–175
Shape number 274–275
Shape signature 227
Sharpening filter 55–58
Shell descriptors 412
Shortest path planning 183–216
Signal-to-noise ratio 468
Significant points 276–277
Similarity Measure 427–428
Skeletonization 82–84, 233
Smoothing filter 52–55
Snake model 123–130
Sobel operators 57, 133
Soft morphological filters 94–99
Solar and Heliospheric Observatory (SOHO) 496
Solar corona mass ejections detection 521–531
Solar flare detection 515–521
Spread spectrum approach 460
Statistical fuzzy model 430–434
Steganalysis 474
frequency-domain steganalytic system 474
Spatial-domain steganalytic system 485
Steganography 474–494
linguistic steganography 477
open codes 477
semagrams 477
technical steganography 476
Steganography Software 480–482
EzStego 481
Jsteg-Jpeg 481
S-tools 481
StegoDos 481
Substitution watermarking 448, 452
Sunspots 505
Support vector machine (SVM) 313–317
SVM networks 317–319
Thickening 81
Thinning 80, 233
Thresholding 120–122
Top-down region dividing approach 158–173
Top surface 71
Trivial uphill generation 253
Typographical Structure Analysis 414
Two-scan based algorithm 200
Umbra 71
Unsupervised clustering algorithm 307–310
Vector quantization 455
Visual steganalytic system 486
VQ counterfeiting attack algorithm 459
Watermarking 444–471
blind 445
fragile 446
frequency domain 447
imperceptible 446
non-blind 445
perceptible 446
private 446
public 446
robust 446
spatial domain 447
Wavelet transform 34–38
Haar wavelets 35
Wong’s watermarking extraction algorithm 459
Wong’s watermarking insertion algorithm 459
Z-transform 30–32