

Index

3D coordinate systems 413, 416
 3D data reconstruction 129, 136
 2D shape models 23-27, 35, 38-40
 3D skeleton 24
 3D Template Matching (TM) 61

A

AAM (Active Appearance Model) 1, 7
 absolute differences (AD) 196
 Active Attention 233, 275
 Active Shape Models (ASM) 7, 25
 active vision 284, 373-374, 378, 381-382, 384, 401-403, 405-406, 436
 AdaBoost algorithm 268-269
 airships 354-355, 357-358, 367-368
 allothetic information 304, 311, 325, 329
 Ambient Assisted Living (AAL) 257-258
 angular velocity 177, 181, 295, 335, 353-354, 363, 365
 appearance model 1, 7, 13, 15-17, 19, 21, 98, 100, 107-108, 238, 240
 artificial intelligence 1-2, 21, 56, 96, 127, 232, 251, 253-255, 278, 297-298, 300, 331, 351, 367, 402, 404, 435-436
 Artificial Neural Networks 18, 138
 augmented reinforcement learning (ARL) 292
 automatic landmark 133
 Automatic License Plate Recognition (ALPR) 63
 autonomous aerial vehicles 352
 autonomous robots 79, 96, 192-193, 195, 205-206, 230, 254, 277-279, 297-301, 335, 373, 404, 406, 409-410, 433
 AVSS 2007 dataset 106
 Axis-angle parameterization 33, 38

B

Background Subtraction 43-45, 55-58, 64-65, 99, 101, 109-111, 240, 259, 262, 279, 358, 361-362
 Bad Matched Pixels (BMP) 157
 ball recognition 342-343, 349
 behavior-based robotic navigation 266
 Berkeley DB 122
 binarized image 88-89, 91-92, 94
 BioID face database 6, 19
 Biunique Correspondence ICP (BC-ICP) 145
 blimp
 control 353, 357, 365, 367
 extraction 358
 vision systems 356
 visual odometry 363
 blob creation 339
 blobs based map scan 397
 block diagram 410-411
 bootstrap learning 281, 283, 286-287, 289, 291, 293-296
 boundary models 5
 building facility security 60, 64

C

Cartesian coordinates 79, 114-115, 122
 caveats 271, 308
 CAVIAR project 43-44
 chromatic gradient 112-113, 117-120, 122
 chromaticity 97, 112-118, 120-121, 123, 126, 128, 359
 classifiers 3, 108, 205, 261, 269, 278
 cognitive systems 229, 257, 297, 330
 Color-based Signal light Tracking in Real-time Video (CSTRV) 63, 71, 76
 color constancy 112-113, 115, 117, 122, 126-128, 298

colour maps 388-389, 395, 397, 399
 colour segmentation 160, 334, 338, 342, 350
 Combined Appearance Models 16
 computer vision 1-2, 19-21, 23, 25, 40-43, 56-58,
 60, 77, 95, 98, 107-111, 127-129, 137-138,
 140, 151-153, 169-171, 188-191, 193, 206-208,
 230-232, 234, 236, 239, 250, 255, 257-259,
 261, 268, 273, 275-280, 283, 287, 297-299,
 309, 313, 330, 351, 377, 401-404, 407-408,
 435-436
 connectionist models 372, 378, 380
 Consequence Control 237, 242-243
 corners detection 338, 340

D

Data cursor 85, 87, 89, 91-92, 94
 degree of freedom (DoF) 173
 Dichromatic Reflection Model (DRM) 113, 115
 disparity estimation algorithms 154-160, 162, 164,
 166-167
 disparity map 154-158, 161-162, 166, 171-172, 197-
 198, 200, 202-204, 208, 218
 disparity space image (DSI) 196
 Dynamic Programming (DP) 221
 Dynamic Time Warping (DTW) 221, 225

E

Economic TG (ETG) 243
 EGO (Emotionally GrOuded Architecture) 235
 eigenvalues 11-12, 15-16, 25, 180
 Emotional Control System (ECS) 236
 Euclidean coordinates 173, 176-177
 Euler angles 23-24, 27-33, 35-39, 42
 evolutionary algorithm 411, 420, 427, 433-434
 Expectation-Maximization model (EM) 141
 Extended Kalman Filter 304, 307, 310, 410

F

face detection 17, 38, 110, 236, 259, 261, 267-271,
 275, 278-280, 404
 face recognition 1-7, 12, 17-18, 20-21, 40, 238, 259,
 276, 278, 296, 407
 workflow 5, 17
 feasibility problem 182-183
 feature registration model 147
 feature vector 3-6, 21, 202
 field of view (FOV) 176-177
 focus of attention 232, 258, 273, 375, 378, 382-383,
 386, 391-392, 403-405, 409, 411, 417

foreground (FG) 45-46
 fovea 384-387, 389, 395-396, 405
 FPR (False Positive Rate) 49
 fuzzy logic 195, 207-208, 336, 344, 351-352, 354-
 355, 357-358, 365-370
 fuzzy obstacle analysis 198, 200, 205

G

gait recognition 64-68, 75-76
 Gaussian mixture models 288
 gaze control 373-374, 381, 401-402, 404-405, 407-
 408, 410, 416-417, 419, 433
 Genetic Algorithms 140, 150-151, 357
 Geometrically Exact Dynamic Splines (GEDS) 79
 Gesture Recognition 2, 19-21, 108-109, 129, 133-
 135, 137, 221, 223, 225, 228-230, 253, 403
 Gesture Representation 212, 220
 gimbal lock problem 27, 31, 33, 38-39
 goal recognition 342-343
 graphic processing units (GPU) 194
 grid based map 312
 ground truth 44, 49, 51, 55-56, 58, 157, 170, 186-
 187, 325
 Growing Neural Gas networks (GNG) 129
 guided search 377, 379, 404-405

H

Haar-like features 110, 261, 269, 278
 hand gesture recognition systems 129, 133
 Hidden Markov Model (HMM) 64
 Hidden Markov Models (HMMs) 220-221
 Hierarchical Behaviour Module 335
 hierarchical planning 281, 283, 286, 289, 291, 293-
 296, 299
 homeland security 60
 horizon line 337, 342-343
 horizontal field of view (HFOV) 198
 Human Motion Capture (HMC) 216
 humanoid robots 112, 207, 212, 227-230, 252, 254,
 266, 270, 279, 283, 300
 human-robot interaction (HRI) 231, 282, 297
 Human Visual System (HVS) 156
 Hungarian method 305, 321-324, 327, 329

I

idiothetic information 304, 311
 illumination 14, 18, 80, 98-99, 112-118, 126, 128,
 147, 153, 155, 159, 277, 284, 288-289, 300
 image compression 129, 133-135, 138

Index

image contours representation 129
image processing 2, 56-57, 62, 66, 109-110, 127-130, 133, 137, 153, 169, 171, 186, 270, 278, 310, 348, 350-351, 353, 356, 367, 370, 392, 412
image segmentation 23, 25, 38, 45, 56-58, 110, 112-114, 119-120, 123, 126, 169, 297, 351, 392
independent component analysis (ICA) 145, 259
interior models 5
isoluminance line 64-66, 68, 76
Iterative Closest Point (ICP) 140, 142, 145

J

joint attention 234, 252-255, 261, 268, 278

K

Kalman filter 98, 100, 104-105, 107, 111, 240, 304, 307, 310, 410
Kinect 24, 141-142, 147, 284, 407
KLT tracker 98-101, 103, 107, 111
blobs 102

L

Laplacian of Gaussian (LoG) 196
laser range finder 294, 314
linear matrix inequality (LMI) 175
Linked Multi-Component Robotic System (L-MCRS) 78
linking element 78, 81, 83-85, 90-94
localization 21, 94, 141, 152-153, 173, 257-259, 261-264, 266-267, 273-274, 276-277, 279, 286, 289, 294-295, 301, 303-304, 307, 309-310, 327, 330-331, 333-334, 340-341, 347, 349-351, 353-355, 357, 366, 406-411, 420-421, 424-429, 432-435

M

map learning 303, 310, 331
mapping 13-14, 131-132, 141, 153, 173, 176, 215-216, 222, 227, 230, 260, 276, 286, 288, 291, 294, 298, 303-304, 307, 309-310, 314, 318, 327, 330-331, 352-353, 355, 368, 378, 407
Mean Relative Error (MRE) 163
mean shape models 13
mobile robots 79, 95-97, 140, 142, 192, 194, 205-207, 260, 281, 286, 291, 295-296, 299-301, 308, 317-318, 329-331, 333, 351, 435
monitorization 80-81, 83
motion detection 58, 99, 107, 127, 240

multiscale pyramid 377-378, 381
Multi-scale Structural Similarity index (MS-SSIM) 162

N

Naoqi 337, 348
Nao robot 112-113, 122, 126, 334, 383, 385, 388, 394-395, 397, 425, 427, 429
NAO robot 112-113, 122, 126, 334, 383, 385, 388, 394-395, 397, 425, 427, 429
NAVIS (Neural Active Vision) 382
neuroscience 1-2, 21, 251, 253, 372, 402-403, 435
NOMADA robot 224
nonlinear systems 175, 178, 187-191
nonocc 157-159, 161, 172
normalisation 382, 384, 388-391, 395-400
novel probabilistic framework 281, 283

O

object recognition 2, 7, 23, 25, 62, 109, 229, 283-284, 288, 290, 296, 299-300, 308, 335, 350, 379, 402, 404, 406-409
object tracking 98-100, 107-111, 138, 140, 262, 274, 278, 280, 383, 406, 416
contour-based 99, 109
correspondence-based 99
transformation-based 99
obstacle avoidance 97, 173, 193-195, 199, 201, 205-207, 209, 331
occlusion 98-101, 103-104, 106-109, 111, 155, 158, 160, 170-171, 218, 259, 414, 418, 426
occupancy probability 312
odometry 147, 294, 304, 309-310, 323, 325-327, 329, 343, 363, 370, 409-410, 412-414, 425, 428
Optical Flow 43-44, 47, 55-56, 58, 127-128, 216, 356, 404, 408-409
Orthogonality 158

P

partially observable Markov decision processes (POMDPs) 262, 281, 284, 289
Passive Attention 233
Perceptual Anchoring Module 335
pipeline 79, 81-83, 86, 90, 93-94, 97
pitch 269-271, 363
planar patches 147-148, 150
planning algorithms 284, 286, 291
Point Distribution Model (PDM) 25
PowerBot 141-142, 150

principal component analysis (PCA) 25, 259
 Principal Component Analysis (PCA) 25, 259
 Procrustes Analysis 7-11, 23-27, 35, 38-42
 continuous 24, 26, 35, 38-39
 generalized 25, 35
 proportional integral derivative (PID) 357
 proto-objects 376
 PUMA 185-186

Q

Q-Learning algorithm 80
 quaternions 23-24, 27, 29, 31, 33-36, 38-41

R

race creation 423
 railroad security 61, 68
 Random Sample Consensus (RANSAC) 153
 Rao-Blackwellized particle filter 307, 326
 real-time 7, 56-57, 62-63, 68, 71, 75-77, 79, 95, 105,
 107-109, 126-127, 129, 159, 171, 173-174,
 188, 194, 197, 206, 228-230, 253-254, 261,
 266, 277, 280, 286, 297, 308-311, 330-331,
 336, 367, 373, 405
 Receiver Operating Characteristics (ROC) 158
 Region of Interest (ROI) 71, 73-74, 358
 Reinforcement Learning (RL) 79, 291
 Response Emission 237, 242, 244, 246
 RGB color histogram 98, 100, 103, 107
 road safety 61, 63, 68, 74
 RoboCup 300, 333, 335, 338-339, 344, 347, 349-
 351, 385, 392, 395-398, 400, 405
 robot exploration 303
 robot learning by imitation (RLbI) 213
 robot navigation 95, 195, 205-207, 209, 233, 257,
 259-260, 265-266, 276, 278, 331, 351, 408
 Robot Operating System (ROS) 294
 roll angles 271
 Root Means Square error 150
 rotation group 23, 26-27, 36, 39

S

saliency 382, 409-411, 414, 416-420, 433
 saliency map 235, 238-239, 377, 380-386, 390-397,
 400-401, 405
 SARS (Social Robot Architecture) 235
 scale-invariant feature transformation (SIFT) 259
 Scale-Invariant Feature Transform (SIFT) 153
 scanline 204
 SCAN (Signal Channelling Attentional Network)
 380

security applications 18, 60
 segmentation 7, 21, 23, 25, 38, 41, 43-49, 51, 55-58,
 71-72, 78, 80, 83, 106, 109-110, 112-114, 117,
 119-120, 122-124, 126-128, 130, 137, 147,
 152, 160-161, 169, 208, 220-221, 226, 229,
 283, 288, 297, 304, 323, 327-329, 332, 334-
 335, 337-338, 341-342, 350-351, 392, 400, 403
 selective tuning 253, 377-379, 381, 404, 436
 Self-organizing models (SOM) 129
 sensor technology 281
 shared attention (SA) 233
 Sigma-Z-Error measure (SZE) 160
 Simultaneous Localization and Mapping (SLAM)
 141, 153, 286, 330, 353
 full 306-307
 online 306-307
 probabilistic 306
 vision-based 308-310
 Simultaneous Localization And Mapping (SLAM)
 141, 153, 286, 330, 353
 single-input single-output (SISO) 175
 skeletonization 92
 SO(3) 23, 26-29, 36, 38-39, 42
 social gestures 211-213, 215, 222-224
 social robot 211-217, 224, 227, 229-232, 235, 251,
 278-279
 Sonar Sensor 314
 spherical coordinates 30, 32, 34, 36-37, 112-116
 spline models 79
 Standard Platform League (SPL) 333, 350
 Statistical Shape Model (SSM) 7, 22
 stereo algorithm 169, 195, 198
 stereovision 60, 64-68, 75, 207
 Stimulus Perception 237-238, 242, 251
 Structure and Motion from Motion (SaMfM) 176
 structure from motion (SfM) 173
 sum of absolute differences (SAD) 194
 Support Vector Machines (SVN) 18
 support vector machine (SVM) 192-193
 surveillance systems 57, 108-109, 129, 133, 135,
 407

T

Team Communication Module 336
 temporal cost 43, 51
 Temporal Differencing 43-44, 46, 55, 58
 temporal information 43-44
 test-bed 155, 157-161, 164-167, 172
 ThinkingCap 334-336, 350
 three dimensional data sets 140

thresholding 64-65, 88, 92, 312, 314, 338, 351, 358-360, 370, 412
 topological maps 312-313, 331
 topology learning 130-131
 TPR (True Positive Rate) 49
 transformation models 5
 traversability 192-193, 195-200, 205-209
 Trimmed ICP (TrICP) 145

U

uniformly ultimately bounded (UUB) 175
 uniform rotations 24, 26-27, 31, 33, 36-39
 uniform sampling 23-24, 27, 29, 31-33, 35, 37-39
 unit of selection 376-377
 unit vectors 27-29, 31-35, 37, 39
 unknown input observer (UIO) 174

V

v-disparity 193, 195, 201-205, 207-208
 vector quantisation 131
 Vehicle Identification Number (VIN) 63, 74

Vehicle Mounted Recording Systems (VMRS) 62
 video sequences 8, 43-44, 55, 98, 106, 232, 255, 379
 vision-based learning 283-284
 vision-based localization 257, 263, 408, 410
 Vision-based Monitoring System is for Detecting Red signal crossing (VMSDR) 76
 vision flowchart 337, 339, 341
 visual attention
 saliency-based 377, 381, 385
 Visual Hull (VH) 64
 visual memory 406-408, 410-414, 416, 418-422, 425-426, 428, 433-436
 attentive 406, 408, 425-426
 Voronoi diagram 305, 312-313, 321

W

watershed 112-113, 119-122, 126-128

Y

yaw 269-272, 363