Index

1D-II 70
2D morphing 165
2D-to-3D conversion 28
3D consortium 26
3DAV 26, 194, 204, 210, 211, 212, 214
3D display(s)
aerial image 252
aided viewing 237, 238
applications 235
autostereoscopic 28
barrier-grid design 255
colour multiplex 238
concave mirror technique 253
diffraction based 245
direction multiplex 244
electro holography 242
field-lens displays 250
free viewing 237, 242
head tracking 247
integral imaging 245
latent parallax barrier 255
lenticular imaging 247
location multiplex 240
moving-slit technique 256
multiview 28
multiview displays 248, 249, 252
occlusion based 254
parallax barriers 254
parallax combination technique 257
parallax illumination 256
polarization multiplex 239
prism mask 251
refraction based 245
retro-reflective technique 253
slanted raster 249
stereoscopic 28
taxonomy 237
time multiplex 239
virtual retinal display 241
volumetric 243
3D image warping 29–30
3D Measurements
accuracy 299, 301, 303, 306, 307, 308, 309, 310, 311, 312
ambiguity 305, 306, 307, 308
depth accuracy see 3D Measurements, accuracy
depth of field 306
divergence 303
measurement rate see 3D Measurements, speed
mixed point (problem) 303, 304, 307
spatial resolution 300, 303, 309, 310, 311
speed 301, 304, 308
3D Models
completeness 299, 300
interactivity 299, 300
time resolution 300
3D Room 65, 66
3D Sensors
active (sensors) 300, 308
continuous-wave 304
field of view 301, 305, 306, 307, 309, 310, 311
focal plane array 300, 308, 310, 311

3D Videocommunication — Algorithms, concepts and real-time systems in human centred communication
Edited by O. Schreer, P. Kauff and T. Sikora © 2005 John Wiley & Sons, Ltd
3D Sensors (continued)
  footprint, laser 303, 304
  illumination 309, 310, 311
  pulsed wave 303, 304, 305, 308
  scanner, laser 304, 305, 306, 310, 311
  shutter, fast image 300, 309
  time of flight 303, 305, 307, 308, 312
  triangulation 300, 301, 302, 310, 311, 312
3D-TV 58, 59
3D Video 55, 56, 66, 67
3D video representation 82, 84, 85, 86

AAC 207
Accommodation 222–3, 236, 264
Acoustic echo canceller (AEC) 178
ActiveLENS 324
Actor feedback 47
Adaptive filter 177
Adaptive echo canceller (AEC) 178
Advanced Video Coding 26, 34–5
Affine projection (AP) algorithm 179
AFX 209
Ambisomics 288
Anaglyph 24
Applications
  3D television 300, 311
  augmented reality see Applications, mixed reality
city modelling 305, 310
mixed reality 311
urban modelling see Applications, city Modelling
videoconferencing 300, 311
  virtual studios 310
ARToolKit 321
ARVIKA 331
Aspen movie map 158
Audience participation 12
Audio coding 207
Audiovisual position error 292f.
Augmented reality 263
Augmented virtuality 263
Autocalibration 111
AVC 203, 206

Barker, Robert 10, 11
Baseline 97, 102–3
Bazin, André 7, 19
Beamformer
  delay-and-sum (DSB) 186, 187
  minimum variance (MVB) 182
  superdirective 186, 187
Bifocal tensor 110
BIFS 205
Billboards 171
Binaural masking level difference (BMLD) 283f.
Binaural reproduction 281, 287

Binocular combination – asymmetrical 223–4
Binocular lustre 223
Binocular omni-oriented monitor (BOOM) 15
Binocular rivalry 223
Binocular stereo 115–25, 127
Binocular summation 223
Bird’s-Eye View System 60, 62
Blue-C 87
Body animation 209
Body language 80
Bundle adjustment 111

Calibration 139
Camera (projection) matrices 95, 97, 104
Camera calibration matrix 95, 101
Camera parameters 104
Camera pose 103
camera projection centre 94–5
camera tracking 41, 48
Canonical decomposition 112
Cardboard effect 228
CAVE Automatic Virtual Environment (CAVE) 15
Central perspective panorama 159
Central projection 94
Cinema – widescreen 12, 13
Cinema
  stereoscopic 24
Cinerama 11–12
Coarse-to-fine approach 119
Cocktail-party effect 80
Collineation 104
Collision detection 52
Communication 9
Communication – mediated 18–19
Communication – non-verbal 9, 18
Computer graphics coding 208
Content-based video coding 201
Convergence 236, 264
Correspondence 94, 97, 101, 105
Correspondence search 115–30
Corresponding points 97, 100, 106
Cross product 99
Cross-slit panorama 162
Cross-talk 229
CyberSphere 15, 16
DCT, discrete cosine transform 196
Depth 96
Depth-based extrapolation 167
Depth compensated warping 167
Depth cues 220–1
Depth discrimination 222, 224
Depth-image 27
Depth-image-based-rendering 167
Depth-keying 28
Depth map (RGB + depth format) 226, 228
Depth of field 236, 264
Depth perception 220–4
Depth plane curvature 227
Depth-speed ambiguity 105
DIBR 167
Diplopia 222
Directional bands 283
Disparity 115–30, 154
Disparity – binocular 221
Disparity – crossed 221
Disparity – uncrossed 221
Disparity-based interpolation 165
Disparity constraints 116
Display
  Fresnel lenticular 78
  semitransparent 77, 78
Display – 3D 219–31
Display – autostereoscopic 229, 230
Display – head-mounted (HMD) 14–15
Display – predictive 17
DWT, discrete wavelet transform 197
Echo return loss enhancement (ERLE) 178
Eight-point algorithm 101
EPI 159
Epipolar constraint 98, 104, 106
Epipolar geometry 96–100, 105
Epipolar image 143
Epipolar image analysis 143
Epipolar line 97–8, 100, 102, 104, 107–8, 143
Epipolar plane 97–8
Epipolar plane image 159
Epipole 97, 98, 101
Essential matrix 99–100, 105, 111
Euclidean stratum 111
Experience Theater 13
Extrinsic parameters 95, 99, 104
Eye contact 75, 78, 83, 85
Eye Vision 57, 58
Face animation 209
Face-to-face 76, 77, 80
Face-to-face collaboration 329
Factorization method for reconstruction 106
Factorization of E 105
Factorization of F 106
Fine-to-fine approach 119
Focal plane 94
Free Viewpoint 55, 56, 57, 59, 60, 61, 70
Free-viewpoint video 212
Frobenius norm 101
FTV 59, 60, 61, 69, 70
Fundamental matrix 99–100, 105–6, 111
Fusion 222, 323
Gaze direction 75, 79, 80
Generalized cross-correlation (GCC) 183
  phase transform (PHAT) 183
Generalized sidelobe-canceller (GSC) 186
Gestures 76, 79
Ghosting see Cross-talk
H.26x 203
Harmonic tunnelling 189
Head motion parallax 86
Head-related transfer function (HRTF) 282, 283, 287
Head tracking 47, 49
Head-up display 264
Heilig, Morton 13–14, 19
Hierarchical stereo analysis 119
High-resolution spectral estimation (HRSE) 182
Holographic optical element 78, 84
Homogeneous coordinates 95–6, 99–100
Horopter 221
Human factors 219–31
Huygens principle 288
Hybrid video coding 199
Hydra system 81
IBR 151
ICT analysis 145
Im. point 85, 86
Image-based rendering 64, 66, 67, 151, 209
Image coding 194
Image cube 143
Image cube trajectory analysis 145
Image Domain 55, 56, 57, 59
Image flipping 230
Image plane 94
IMAX 12–13
Immersion – definition of 8
Immersive media 75
In-head localization 287
Individual differences 224
Integral photography 55, 56, 57, 68, 69, 164
Intelligent welding gun 330
Interactive rendering 210
Interaural level difference (ILD) 282
Interaural time difference (ITD) 282
Interface(s)
  collaborative 329
  multimodal 331
Intrinsic parameters 95, 99, 103–4, 111–12
IP 164
ITU 194
JPEG 194, 202
JPEG 2000 202
Keystone distortion 225, 227
Laser scanner, use of 43
Lateralization 282
Layered depth-images 37, 168
LDI 168
Left–right consistency check 123
Light field 55, 56, 57, 62, 63, 64, 162
Light Field Video Camera 62, 63
Line-of-sight 77
Loss control 177
Low-frequency enhancement channel (LFE) 285
Lumigraph 55, 163
unstructured 164
MAJIC system 83
Manifold mosaicing 159
Marching cubes 136
Marching-cubes algorithm 45
Marching intersections 136
Matching measures see Similarity metrics
Matching, hybrid recursive 120–2
MC/DCT 199
MetaDESK 324
Micro-facets 171
Microphone array 175, 181
Minor(s) 109–10
Mismatches, detection of 124
Mismatches, substitution of 124
Mixed reality 237
applications 261
definition 261
Mixed reality applications
  collaborative 329
  industrial 329
  mobile 328
Mixed reality display
  articulated mobile system 276
  desktop mixed reality system 273
  FLOATS display 271
  free-viewing displays 270
  handheld mobile system 276
  head-mounted display (HMD) 265
  head-mounted projective display 269
  mobile mixed reality system 275
  occlusion handling HMD 268
  optical, see-through display 266
  super-multiview display 270
  variable accommodation display 272
  variable accommodation HMD 267
  video, see-through display 269
  virtual image overlay display 271
  virtual retinal display 267
  waveguide holographic HMD 266
Model-based 55, 56, 57, 65, 67
MONJUnoCHIE system 83
Mosaic 159–61
  concentric 161
  manifold 159
see also Panorama
Motion compensation 199
Motion estimation 199
Move-matching 322
Moving Pictures Expert Group 25
  ad hoc group on 3D audio/visual coding 26
  video coding standards 25, 26
MP3 207
MPEG 194, 203, 204–14
  MPEG-2 26, 34–5
    multiview profile 25
  MPEG-4 26, 34–5
  Multi-channel-audio reproduction 281, 284ff.
  Multi-hypothesis reconstruction 140
  Multi-linear constraints 109
  Multi-object audio reproduction 281, 287f.
  Multi-party communication 76, 79, 80
  Multi-texturing 67, 68
  Multi-view image 37
  Multimodal interaction 273
  Multiple-view constraints 109–10
  Musical noise 189
Noise estimation 188
Normalized coordinates 99–100
Normalized least-mean-square (NLMS) algorithm 178
NTII 84–6
Null-steering 186
Object-based video coding 201
Occlusion handling 124, 129
Occlusions 97
Octree 137
Omni-directional video 211
Optical axis 94
Optical centre 94
Optical interactions 40
Optical ray 95, 98
Panorama 10–11, 159
see also Mosaic
Panorama Mesdag 10
Panorama of London 10–11
Panoramic video 211
Panum’s fusional area 222
Parallax – screen 223, 226, 227, 229
Parallax 154
Perceptual audio coding 207
Perceptual realism 19
Personal interaction panel 324–5
Perspective projection 94–5
Phicon 324
Photo-consistency 140, 141, 168
Photo-hull 141
Picket fence effect 230
Pinhole camera 94–5
INDEX

Plane + Parallax 164
Plenoptic function 152
Plenoptic modeling 170
Plenoptic sample 152
Point at infinity 96, 98
Point rendering 210
Point transfer 107, 109
Point transfer problem 125
Pre-visualization 42, 44, 46
Prediction 194
Presence see Telepresence
Presence – co-presence 8–9
Presence – physical 8–9
Presence – social 8–9, 18–19
Principal axis 94
Principal plane 94
Projection equation 96, 110
Projective ambiguity 105–6
Projective depths 110–11
Psychoacoustics 282ff.
Puppet theatre effect 228
Quadrifocal tensor 110
Quicktime VR 158
QVR 158
Ray-Based Image Engineering 71
Rayspace 55, 56, 57, 59, 60, 61, 63, 64, 69, 70, 164
Real camera 154
view 154
RealMeet 86
Reconstruction 94, 97, 104–6, 110–12
Rectification 99, 102
Rectifying transformation 103
Recursive least-square (RLS) algorithm 179
Registration 264
Reliability–accuracy problem 118
Rendering 56, 63, 64, 66, 67, 68
depth-image-based 29
image-based 23
Rigid displacement 105, 111–12
Round-table concept 80, 82, 83
Sampling error 45
Self calibration see Autocalibration
Sensorama 13–14
Shape-from-contour 135
Shape-from-silhouette 135, 171
Shear distortion 229
Similarity metrics 117, 126, 128
Singular value decomposition (SVD) 110
Skew-symmetric matrix 99
SHHC 208
Space-carving 140
Spatial covariance matrix (SCM) 182
Spatial perception 282ff.
cocktail party effect 283f.
direction 282
distance 283
Spatial vision 236
Special effects 43
Spectral subtraction 189
Spherical projections 211
Standardization, data 101
Steered response power (SRP) 182
Stereo correspondences 102
Stereo parameter
convergence distance 32
focal length 32
interaxial distance 32
Stereo system 99, 104
Stereoblindness 224
Stereoscope 24
Stereoscopic camera 225
Stereoscopic distance 265
Stereoscopic distortions 226–30
Stereoscopic geometry 225
Stereoscopic image production 225–6
Stereoscopic image quality 230–1
Stereoscopic television 219–31
Stratification 111
Super-sampling 46
Surface light field 56, 57, 64
Surface maps 165
Sutherland, Ivan 16
SVTE 76, 82, 84
Tangible teleconferencing 325
Teleoperation 7, 16–18
TELEPORT 83, 84
Telepresence 76, 78, 81
Telepresence – definition of 8–9
Telepresence – history of 7–20
Telepresence Wall 79
Teleprompter 77
Telerobotics 16–18
Teleteaching 78
Television
three-dimensional 23–38
Texture slicing 168
Time-difference of arrival (TDOA) 181, 182, 183
Time-parallax format 25
Time-variant filtering 179
Tracker(s)
AC 319
acoustic 317
DC 319
hybrid 323
inertial 318
inside-looking-out tracker 320
magnetic 318
Tracker(s) (continued)
  marker-based tracker 320
  markerless 322
  mechanical 317
  model-based 322
  optical 320
  outside-looking-in 320
  video-based tracker 320
Tracking 83, 85
  finger tracking 275
  gaze tracking 275
  head tracking 275
  Markerless object tracking 275
Tracking, mixed reality 315
Transfer function 177, 178, 179
Transform coding 195
Triangulation 104–6
Trifocal geometry 106, 109, 112
Trifocal plane 106
Trifocal tensor 106–10
Trifocal tensor warping 166
Trinocular stereo 125–9
Turntable 139
Two-plane parameterization see Light field
Two-view geometry 96

Ultimate Display 16
Unstructured lumigraph 164
User interface(s)
  gesture-based 325
  tangible 324

VDTM 164, 169
Video coding 194
Video coding standards 203
Video tunnel 77, 78
Videoconferencing 9, 18, 75, 76
  commercial 80
  immersive 76, 85
  products 78
  seller 76

semi-immersive 86
Vieth–Müller circle 221
View
  real 154
  virtual 154
View-dependent geometry 169
View-dependent multi-texturing 210
View-dependent texture mapping 164, 169
View maps 165
View synthesis
  artifacts 32–4
  stereoscopic 30–2
Virtual
  camera 154
  view 154
Virtual environment (VE) 14–16
Virtual reality (VR) see Virtual environment (VE)
Virtual studio 41
VIRTUE 85, 86
Visual discomfort 223, 226–30
Visual fatigue 265, 268
Visual hull 135
Visual hull computation 44–6
Visualization 264
Voice activity detection (VAD) 177, 188, 189
Volumetric model 171
Voxel 134, 171
Voxel colouring 140
VRML 205

Waller Flexible Gunnery Trainer 12
Waller, Fred 11, 12
Warping surface 169
Wave field synthesis (WFS) 288ff.
Weak calibration 102, 105–6, 111
Wiener filter 189
Windows, adaptive 118

X-slits 162
Zero-parallax setting 30