

Index

- κ , 99, 113, 161, 197
- above-threshold, 111, 198
- action, 3
- activation
 - cost, 35
 - function, 34, 35, 79
- adaptation, 9, 47, 97, 150, 173
- adaptive photoreceptor, 96, 109, 163
- aliasing
 - spatial, 104, 107
 - temporal, 96, 104
- amplifier
 - inverting, 102, 203
 - transconductance, 27, 121, 122, 203
- analog integrated circuits, 5, 24, 29, 93
- aperture problem, 10, 19, 137, 183
- applications, 150
- associative memory, 31
- attention, 24, 76, 85, 173
- attractor network, 31
- autonomous system, 2, 188
- aVLSI implementation, *see* analog integrated circuits

- back-gate effect, 99
- base, 115
- Bayes
 - estimator, 22, 53
 - theorem, 53
- beetle, 15
- bias conductance, *see* conductance
- bias constraint, 47, 51, 56, 122, 178, 181, 186, 192
- BiCMOS, 114, 207

- block-partition, 20, 21
- boundary condition, 49
- brightness, 9
- brightness constancy
 - constraint, 45, 53, 99
 - equation, 14, 18, 46
- brightness gradient, 99, 144
- bump circuit, 28, 158

- candela, 8
- CCD, 8
- central difference, 105
- CMOS, 94, 116, 197
- co-content, 71
- collective computation, 5, 32
- collector, 115
- competitive process, 184
- complex cell, 184
- compression, 9, 97
- computational complexity, 58
- computational neuroscience, 5
- conductance
 - bias, 72, 121, 173
 - drain, 199
 - incremental, 71
 - input, 43
 - lateral, 43, 53
 - leak, 36, 38, 56
 - output, 137, 192
 - passive, 71, 73
 - smoothness, 61, 77
- confidence, 40
- connectivity, 37
- constraint optimization, *see* constraint satisfaction

- constraint satisfaction, 31, 32, 91, 152, 186
- contrast dependence, 178
- convergence, 38
- convex, 38, 54, 192
- convexity, *see* convex
- correlation method, *see* methods
- correspondence problem, 11, 14
- cortical area
 - MST, 18, 76, 185
 - MT, 13, 18, 22, 76, 183, 186
 - V1, 13, 22, 183
- cost function, 31, 33, 47
- current mirror, 102, 109
 - cascode, 122, 126
- current source, 122

- data term, 43
- delay element, 15, 154
- delay line, 27
- design rules, 124
- device mismatch, 142
- differential amplifier, *see* amplifier
- differential encoding, 109
- differential pair, 111
 - strong inversion, 201
 - weak inversion, 199
- differentiator
 - clamped-capacitor, 100
 - grounded-capacitor, 100
 - hysteretic, 102, 110, 162
- diffusion length, 63, 171
- diffusion network, 43
- diode, 112
 - Shockley equation, 113
- doping, 124
- dynamic range, 9, 96

- Early
 - effect, 198
 - voltage, 123, 199, 207
- ecological approach, 7
- efficiency, 2, 151
- ego-motion, 16, 184
- eigenvalue, 39, 49
- emitter, 115
- Euclidean distance, 32, 46

- feature extraction, 14, 30
- feedback, 57, 97, 109, 120, 147, 173
- fill-factor, 105, 124
- filter
 - oriented, 15
 - Gabor, 15
 - band-pass, 99
- flicker noise, 25, 99, 150
- fluid dynamics, 46
- fMRI, 183
- focal-plane, 94, 157
- focus of contraction, 16
- focus of expansion, 16, 152
- follower
 - unity-gain, 121

- gain
 - activation, 35
 - amplifier, 205
 - response, 131
 - self-excitation limit, 40, 41
- gain-field, 40
- Gestalt psychology, 178
- Gilbert multiplier, *see* multiplier
- goal-keeper, 1, 177
- gradient descent, 36, 55, 87, 189
- gradient-based, *see* methods
- grating
 - sinewave, 129, 178
 - squarewave, 129

- Hamming distance, 32
- Hebbian learning, 31
- Hessian, 39, 48, 193
- honeybee, 151
- Hopfield networks, 31
- HRes circuit, *see* saturating resistance
- human-machine interface, 152
- hybrid systems, 152, 157
- hysteresis, 42, 83, 88, 91, 154

- ideality factor, 113
- ill-conditioned, 14
- ill-posed, 13, 47, 191
- illusion, 9
- image constancy, 15

- image sequence, 65
 - tape-rolls, 65, 83, 88, 140, 196
 - Rubik's cube, 67, 196
 - Yosemite, 69, 196
 - Humberg taxi, 68, 196
- imager, 7
- insect motion vision, 15, 18, 25, 28
- intensity, 8
- interpretation, 4, 10
- intersection-of-constraints, 19, 63, 137, 140, 180, 188
- inversion
 - moderate, 202
 - strong, 198
 - weak, 94, 197
- inverter, *see* amplifier
- IOC, *see* intersection-of-constraints
- junction
 - base-emitter, 114
 - leakage, 123
- Kalman filter, 22
- kernel
 - attention, 91
 - neighborhood, 81, 87
- kinetic energy, 47
- Kirchhoff, 4, 10
- Lagrange function, 191
- Lagrange multiplier, 33
- lattice, 54
- layout, 124
- light flicker, 150
- light-source, 1
- likelihood, 53
- line process, 75, 77, 158, 165
- loop gain, 87
- lumen, 8
- luminance, 8
- Lyapunov function, 37, 57
- macaque monkey, 13, 18, 183
- MAP, *see* maximum a posteriori
- maximum a posteriori, 54
- membrane model, 47
- methods
 - correlation-based, 15, 25, 28
 - gradient-based, 14, 26
 - motion energy, 15, 28
- microprocessor, 2, 151, 168
- mismatch, 124
 - gain, 145
- Moore's law, 94
- motion
 - component, 180, 183
 - global, 16
 - local, 18
 - image, 7, 16
 - pattern, 179, 183
 - translational, 16
 - transparent, 10
 - visual, 1, 13
- motion coherence, 79
 - theory, 51
- motion constraint equation, 14
- motion discontinuity, 20, 21, 77, 164
- motion energy, 28, 184
- motion field, 10
- motion integration, 149
- motion segmentation, 21, 28, 77, 84
- motion segmentation chip, 157, 208
- motion selection chip, 167, 208
- motion sequence, 152
- MPEG, 20
- MST, *see* cortical area
- MT, *see* cortical area
- multiplier
 - Gilbert, 111
 - wide-linear-range, 109, 112, 126
- nearest neighbor, 43
- network
 - direction selective, 154
 - motion discontinuity, 157
 - motion selective, 85
 - multi-layer, 75
 - recurrent, 5, 75
 - resistive, 42, 172
 - sequence classification, 154
- network dynamics, 37
- neural computation, 5

- neural system, 5
- neuro-inspired, 6
- neuromorphic, 6
- neuron, 6, 18, 183
 - encoding, 186
 - population, 188
- noise, 150
- normal flow, *see* optical flow
- normalisation, 188
- Nyquist frequency, 106, 133

- observer, 7
- occlusion, 13, 76
- optical flow, 12
 - global, 60
 - network, 56
 - normal, 21, 27, 60, 140, 145
 - piece-wise smooth, 21, 165
 - smooth, 21, 60
- optical illusion, 9
- optimization, 5, 23, 24, 31, 191
 - non-stationary, 57
 - unconstrained, 33, 37, 47

- pass transistor, 160
- passive conductances, 71
- PCB, *see* printed circuit board
- Pentium-4 processor, 96
- perception, 3
 - bias, 179
 - dynamics, 182
- phase, 15
- phase-dependent, 108, 143
- phase-independent, 108
- phase shift, 108
- photocurrent, 97
- photodiode, 97, 105, 125
- photoreceptor, *see* adaptive
 - photoreceptor
- phototransduction, 46, 95
- physiology, 22, 187
- pin-hole, 8
- pixel, 8, 18
- plaid pattern, 179
 - type-1, 179
 - type-2, 179
- posterior, 33

- power
 - consumption, 120
 - dissipated, 57
- probability distribution, 52
- presmoothing, 195
- prior, 24, 47, 53
- primary visual cortex, *see* cortical area
- printed circuit board, 151, 152
- processing speed, 147
- programming, 33
- psychology, 12, 177

- quasi-stationary, 58

- radiance, 8
- region of support, 20, 21, 60
- regularization, 44, 46
- resistive fuse, 28, 72
- retina
 - electronic, 6, 93
 - human, 96
 - rabbit, 15, 27
 - silicon, 6
- retinotopic
- robots, 151
 - flying, 151
- rotating drum, 129

- sampling, 104
- saturating resistance
 - HRes, 72, 123, 171
 - tiny-tanh, 72
- saturation, 121
- scanner, 127
- selective attention, 76
- self-excitation, 40, 82
- semi-definite, 39, 193
- shift register, 127, 128
- shunting, 172
- signal-to-noise ratio, 40, 42, 46
- simple cell, 184
- SMD, *see* surface-mounted device
- smooth optical flow chip, 94, 127, 151, 178, 185, 208
- smoothness, 43, 59, 140
- smoothness constraint, 46, 51, 123
- SNR, *see* signal-to-noise ratio

- spatial sampling, 104
- SRAM, 167
- stability
 - global asymptotic, 75
 - multi-stable, 72
- steady-state, 55, 158
- string model, 42, 50
- sub-threshold, 94, 104, 112, 197
- super-linear, 113, 119
- supervisor, 45
- surface-mounted device, 151
- syntactic constraint, 33, 34
- system-on-chip, 94

- temporal differentiator, *see* differentiator
- time-constant, 142, 147
- threshold
 - adaptive, 81
 - voltage, 198
- time-of-travel, 24, 27
- top-down, 24, 91
- trackball, 25
- tracking, 173
- transconductance, 118, 147, 200, 203
 - element, 102
- transformation layer, 3
- transistor
 - bipolar, 114
 - diode-connected, 161
 - MOSFET, 197
 - nFET, 197
 - pFET, 197
 - vertical bipolar, 114
 - well, 197
- Traveling Salesman Problem, 32, 40

- TSP, *see* Traveling Salesman Problem
- tunning
 - spatial frequency, 133
 - speed, 129
 - orientation, 136
- two-alternative-forced-choice, 178

- universal serial bus, 153
- update rule, 34
- USB, *see* universal serial bus

- V1, *see* cortical area
- vector average, 19, 180
- velocity-tuned, 184
- virtual ground, 55, 57, 109
- virtual typewriter, 155
- visual cortex, 13, 76
- visual motion perception, 46
 - biological, 7
 - human system, 24, 177

- wavelength, 8
- well-conditioned, 23, 45
- well-defined, 40
- well-posed, 23, 48, 191, 192
- winner-takes-all, 33, 175
 - amplifier, 41
 - cascaded, 42, 88
 - hard, 40
 - multi, 85, 86
 - network, 33, 39
 - soft, 40, 154, 157, 188
 - weighted, 81, 85
- wiring costs, 37
- WTA, *see* winner-takes-all

