Index

a priori knowledge 19, 53, 255
absolute success 19
Ackley function 110, 123, 127, 184–190, 246–254, 256, 261, 263–272, 276–277
Acceleration 70, 356–358, 364
accessible resources 324
acoustic medium 43
acoustic remote sensing 42–43
acoustic signal 43
acoustics 42
adaptation of intrinsic control parameters 37, 80
adaptive adaptation 82
adaptive nulling algorithm 345
adaptive penalty 53
adjustable control weight gradient method 71
admission criteria 122
aerodynamics 43
aeronautics 43, 290
aerospace 43
age 23–24
aggregator 371
agriculture 43, 290
aligned spheroidal inclusion 293
alphabetic gene 22
alternative robustness indicator 93
alternative search space 256–257
ancillary services market 371–373, 376
ant colony optimization 22
antenna array 291–293, 335–339, 342, 344–349
antenna number ratio 287
applebaum adaptive algorithm 344
application problem 109, 117, 128–129
arithmetic binomial crossover 30, 32
arithmetic crossover 29, 56, 61
arithmetic exponential crossover 30–31
arithmetic multi-point crossover 29
arithmetic one-point crossover 29, 31, 95
arithmetic swapping 29
arithmetic swapping intensity 29
array element 292
artificial immune systems 20
artificial neural networks 20
attribute 23, 32, 35
auction 117, 370, 374–375, 377
auction rule 375
Australian National Electricity Market 374
automated vehicle identification 389
automobile 43
automotive 43
auxiliary Pareto population 75–76
auxiliary particle filter 395, 397
auxiliary population 65
available bandwidth 312
average fitness 82
average load 324, 328

Differential Evolution Anyong Qing © 2009 John Wiley & Sons (Asia) Pte Ltd
bandwidth 311–315, 324–330, 333, 353, 360
basin 154
battery life 288
bees algorithm 22
bell 137, 139–140, 142, 148, 158, 161, 175
benchmark electromagnetic inverse scattering 53, 65, 90, 95, 105, 117, 127, 129
Bernoulli experiment 67
cable 299
best base 68, 90, 140, 147, 152
better base 53, 68
biased initialization 66
biasing 66, 106, 120
bidding 300, 369–387
bidding strategy 370, 373, 377–383, 386
bilateral contracts 370–371, 378
binary chromosome 27, 57, 67, 139–140, 147, 168
binomial crossover 27, 57, 67, 139–140, 147, 168
binomial mutation 67
biological science and engineering 43
biology 34, 43
bioreactor 43
birth right 75
bit-rate 287
blind source 302
Boltzmann probability distribution 21
Boolean inversion mutation 32
Boolean operation 24, 41
bounce back 54
Branin RCOS function 107, 110, 128
Branin test bed 106
Brent algorithm 8–9
brick wall penalty 53
broker 371
Broyden’s algorithm for nonlinear equation 10, 15
Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithms 17
brute force algorithm 8
channel capacity 287
chaotic adaptation 81
chaotic sequence 81
Chapman-Kolmogorov equation 392
Chebyshev pattern 347
Chebyshev polynomial fitting problem 41
chemical kinetics 107
chemical science and engineering 44
chemistry 44, 118
circuit board 297
circular-cylindrical conductors and tunnels 293
civil engineering 290
climatology 44, 47
cloning 83
cluster mutation 325
cluster size 327
clustering 118, 145, 300, 302, 399–400, 405
closeness 301, 399
co-allocation 322–323
coevolution 75–77
code 41, 51, 58, 61, 106, 109, 117–188, 316
code-division multiple-access 288
coefficient of combination 53
cognitive rate 35
colonoscopic diagnosis 49, 31
color map generation 301, 399–400, 405
color quantization 301, 399–401, 403–405
combined feasible direction method 71
combustion 107, 111
commensurate 75
commercial software packages 18
communicating tasks 322, 329
communication bandwidth 324–325, 327, 329
communication system 287–288
comparative study 58, 95, 104
companion website 42, 70, 117, 289
compensate 139, 149, 207, 293, 336, 397

Index
competition 55, 58, 64, 69–70, 74, 78, 369–370, 372–374, 386
composite function 123
composite material 293
composition 106, 122
compression 301–302, 399
computational cost 38, 61, 81, 92, 108
computational electromagnetics 293
computational power 322, 330
computer engineering 289
computer networks 289
computer security 289
computed tomography 301
condensation algorithm 72, 390, 395–397
congestion management system 300
conjugate directions 13
conjugate gradient algorithm 17–18
consistency 25, 94, 107, 109, 179–180
constrained and unconstrained testing environment 108
continuity 3, 18, 126, 148–149, 153, 207
continuous optimization parameter 18
contour 302
contraction 13–14
correlation 302
cosec-squared pattern 339–342
cost function 345–346, 348–349, 354, 366
covariances 32, 34
credibility degree 312–313, 317–318
cross-entropy method 108
cross selection 69
cryptography 289
cubic interpolation algorithm 10–11
cultural algorithm 22, 72
current harmonic distortion 300
customer 371, 376
cyclic two-point crossover 28, 32
Darwin’s theory of evolution 21
data transmission codes 288
data transmission rates 288
database 2, 61, 302, 321
Davidon-Fletcher-Powell (DFP) algorithm 17
De Jong test bed 107
deceptive function 111
decision maker 48, 75
decision-making system decoding 297
decomposability 4, 108
dedicated resources 322, 324
defense 44–45
Dekkers Arts test bed 107
delay 311–315
delay jitter 311–315
deletion 83
DEMC particle filter 390, 392–393, 395–397
deregulation 369, 371, 373–374
derivative 4, 7, 9–11, 15–19
DESA 355–359, 362–366
desktop grids 321
destination node 312
detection 43, 288, 301–302, 362, 389
deterministic adaptation 80–82
deterministic optimization algorithm 7, 9–10, 16–20, 55, 70–71, 256, 382
device sizing 353–355, 359, 362, 366
device parameters 353–354
design goals 353–355, 360, 362–363
dichotomous algorithms 7–8
dielectric 293–294
difference pattern 339–344
difference vector 53, 58, 62, 68, 77, 81
differentiability 5, 18, 126, 164, 168
differential evolution Markov chain 390
differential evolution strategies 51, 57, 62, 65, 71, 74–75, 89–90, 137–191, 255
differential evolution with individuals in groups 65
differential-free mutation 68
differentiated service 311
digital communication 288
digital television 288
digitizer 23
Dijkstra kth shortest path algorithm 316
direct mutation 81–82
direct product 17
directed adaptation 81–82
directed mutation 81
directivity 335, 342–344
dipole array 295
DISCO 371, 372, 377
discontinuity 149, 153, 207
discrete optimization parameter 2, 345
discrete Taylor pattern 339–340
dispatch 298, 370, 372–379, 385–386
displacement 43–44, 120, 397
distortion 3, 50, 300, 347, 349
distributed generation 299
distribution network 299
distribution system 298–300, 371
diversity 24, 28, 56, 61, 65, 69, 80, 92, 139–141, 143, 146, 149, 154, 207, 255, 364
dividing rectangle algorithm 71
Dixon Szegö test bed 107
dominant optimal solution 75
donor 58
double-difference pattern 342–344
double-square-loop array 295
downhill simplex algorithm 10, 13, 15
downstream edge 312
DVB-S2 standard 288
dynamic 5, 59, 290, 298, 317, 322, 324, 327, 375, 390–391
dynamic differential evolution 38, 51, 55, 62–64, 90, 96, 104, 137–140, 144, 146, 150, 153, 161, 172, 178, 194
dynamic population size differential evolution 82
dynamic range ratios (DRR) 335
dynamic routing 289
eccentricity 302
economic dispatch 298, 370, 378
economics 45, 118
disse 118, 312
effective anisotropy 293
effective permittivity tensor 293
efficiency 18–20, 57–58, 70–71, 80, 90, 93–94, 96, 140, 192, 255, 298–299, 311, 377
efficiency indicator 93
electrical and electronic engineering 42, 287
electricity market 118, 369
electromagnetic 2, 293, 344
electromagnetic inverse scattering 53–54, 65, 90, 95, 105, 117, 127, 129, 293–294
electronic 117, 295, 297
electroencephalograph 301
electronic industry 295
elitism 28, 95
elliptical-cylindrical conductors 293
embedding mechanism 70
empirical rules 78, 89
encoding 23, 19, 324–325
end-to-end QoS guarantee 311
energetic barrier function 82
energetic filter 82
energy market 369, 371, 373
Engaging Village 2 42
England Wales electricity market 376
enterprise management 48
enumeration algorithm 8
environment 43, 45, 300
environmental science and engineering 43, 290
epistasis 4, 325
equal interval 8
equality constraint 2
erasure codes 288
error correcting code 118, 288
error rate 312–315
estimation of distribution algorithm 72
evolution strategies 21, 32–34
evolutionary crimes 35–38, 78–80, 89, 94–95, 137
evolutionary operation 24, 52, 58, 63, 70
evolutionary programming 21, 34
evolutionary terminologies 22
examinatorial 122
exhaustive search algorithm 7–8
<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>expansion</td>
<td>9, 13–14, 106, 126, 297–299</td>
</tr>
<tr>
<td>experimental data fitting</td>
<td>2</td>
</tr>
<tr>
<td>expertise</td>
<td>302</td>
</tr>
<tr>
<td>exploratory</td>
<td>12, 122</td>
</tr>
<tr>
<td>exploratory move</td>
<td>12</td>
</tr>
<tr>
<td>exponential crossover</td>
<td>28, 57, 91, 138–140, 142–143, 146, 149, 153, 169, 178, 183, 194</td>
</tr>
<tr>
<td>extraction</td>
<td>44, 301–302, 366</td>
</tr>
<tr>
<td>extreme learning machine</td>
<td>72</td>
</tr>
<tr>
<td>F8F2 function b</td>
<td>112, 123</td>
</tr>
<tr>
<td>fabrication</td>
<td>2, 297</td>
</tr>
<tr>
<td>failure</td>
<td>18–19, 93, 299</td>
</tr>
<tr>
<td>far-field radiation pattern</td>
<td>335–336</td>
</tr>
<tr>
<td>fast Fourier transform</td>
<td>342</td>
</tr>
<tr>
<td>father</td>
<td>26, 54</td>
</tr>
<tr>
<td>feasible path</td>
<td>311</td>
</tr>
<tr>
<td>feasibility</td>
<td>3</td>
</tr>
<tr>
<td>features</td>
<td>3, 19, 21, 24, 37, 75, 90, 95, 105–109, 120–122, 126–127, 137, 148, 189, 191</td>
</tr>
<tr>
<td>Fibonacci</td>
<td>8</td>
</tr>
<tr>
<td>filter</td>
<td>42, 118–119, 296</td>
</tr>
<tr>
<td>finite difference</td>
<td>9–10, 18</td>
</tr>
<tr>
<td>fitness</td>
<td>23</td>
</tr>
<tr>
<td>fitness function</td>
<td>25, 326</td>
</tr>
<tr>
<td>flat-topped pattern</td>
<td>339–340</td>
</tr>
<tr>
<td>Fletcher Reeves algorithm</td>
<td>17</td>
</tr>
<tr>
<td>fluid dynamics</td>
<td>107</td>
</tr>
<tr>
<td>food engineering</td>
<td>46, 290</td>
</tr>
<tr>
<td>food industry</td>
<td>45–46</td>
</tr>
<tr>
<td>footprint pattern</td>
<td>337</td>
</tr>
<tr>
<td>forestry</td>
<td>46</td>
</tr>
<tr>
<td>Fourier series</td>
<td>338–339</td>
</tr>
<tr>
<td>frequency filtering</td>
<td>294</td>
</tr>
<tr>
<td>frequency selective surface</td>
<td>294</td>
</tr>
<tr>
<td>fuel allocation</td>
<td>44, 298</td>
</tr>
<tr>
<td>full simulation</td>
<td>127</td>
</tr>
<tr>
<td>fuzzy adaptive differential evolution</td>
<td>82</td>
</tr>
<tr>
<td>fuzzy logic weighted sum</td>
<td>73</td>
</tr>
<tr>
<td>fuzzy mathematics</td>
<td>312, 314, 318</td>
</tr>
<tr>
<td>fuzzy QoS multicast routing algorithm</td>
<td>316</td>
</tr>
<tr>
<td>fuzzy rules</td>
<td>315</td>
</tr>
<tr>
<td>fuzzy set</td>
<td>312, 314</td>
</tr>
<tr>
<td>Gallager codes</td>
<td>288</td>
</tr>
<tr>
<td>Gas</td>
<td>44, 46, 49, 118, 377</td>
</tr>
<tr>
<td>gas circuit breaker</td>
<td>300</td>
</tr>
<tr>
<td>Gauss Seidel method</td>
<td>62, 64</td>
</tr>
<tr>
<td>Gaussian distribution</td>
<td>80, 339–340</td>
</tr>
<tr>
<td>Gaussian-Newton algorithm</td>
<td>71</td>
</tr>
<tr>
<td>GENCO</td>
<td>371, 374, 376–380, 383–384, 386</td>
</tr>
<tr>
<td>gender</td>
<td>23, 71</td>
</tr>
<tr>
<td>generation (of population)</td>
<td>23–24, 55, 62–63, 70, 82</td>
</tr>
<tr>
<td>generation (of electricity)</td>
<td>297</td>
</tr>
<tr>
<td>generation expansion planning</td>
<td>298</td>
</tr>
<tr>
<td>generator</td>
<td>298</td>
</tr>
<tr>
<td>gene</td>
<td>22–23</td>
</tr>
<tr>
<td>genetic algorithms</td>
<td>21, 24–26, 28, 32, 38, 58, 68, 70–72, 77–78, 107–108</td>
</tr>
<tr>
<td>genetic and evolutionary algorithm toolbox</td>
<td>109</td>
</tr>
<tr>
<td>genetic annealing algorithm</td>
<td>41</td>
</tr>
<tr>
<td>genetic condensation algorithm</td>
<td>390, 395–397</td>
</tr>
<tr>
<td>geometric centroid</td>
<td>13</td>
</tr>
<tr>
<td>geoscience</td>
<td>46</td>
</tr>
<tr>
<td>global optimum</td>
<td>3, 400</td>
</tr>
<tr>
<td>global search</td>
<td>70, 122, 256, 359, 362, 364</td>
</tr>
<tr>
<td>Globus Toolkit</td>
<td>324</td>
</tr>
<tr>
<td>golden section algorithm</td>
<td>8–9</td>
</tr>
<tr>
<td>Google</td>
<td>7, 42</td>
</tr>
<tr>
<td>gradient</td>
<td>10–11, 16–17, 70</td>
</tr>
<tr>
<td>grid application</td>
<td>323</td>
</tr>
<tr>
<td>grid computing</td>
<td>289, 322, 325</td>
</tr>
<tr>
<td>grid environment</td>
<td>326, 332</td>
</tr>
<tr>
<td>grid middleware</td>
<td>321, 324</td>
</tr>
<tr>
<td>grid node</td>
<td>322, 324, 327, 329–330</td>
</tr>
<tr>
<td>grid point</td>
<td>10–11</td>
</tr>
<tr>
<td>grid resources</td>
<td>290, 323, 326, 328, 332</td>
</tr>
<tr>
<td>grid search algorithm</td>
<td>10</td>
</tr>
<tr>
<td>Griewank function</td>
<td>95, 112, 123</td>
</tr>
<tr>
<td>group competition</td>
<td>78</td>
</tr>
<tr>
<td>group multimedia</td>
<td>311</td>
</tr>
<tr>
<td>group selection</td>
<td>69</td>
</tr>
<tr>
<td>Gulf Research and Development function</td>
<td>107</td>
</tr>
<tr>
<td>hardness</td>
<td>127–128</td>
</tr>
<tr>
<td>Hartman functions</td>
<td>107</td>
</tr>
<tr>
<td>Hessian matrix</td>
<td>10, 16–17</td>
</tr>
<tr>
<td>heterogeneous processing</td>
<td>321</td>
</tr>
<tr>
<td>Heaviside step function</td>
<td>346</td>
</tr>
<tr>
<td>hexagonal planar array</td>
<td>342–343</td>
</tr>
<tr>
<td>hierarchy</td>
<td>38</td>
</tr>
<tr>
<td>high speed data transmission</td>
<td>287</td>
</tr>
<tr>
<td>higher-order Whitney element</td>
<td>293</td>
</tr>
<tr>
<td>highest total number of successful searches</td>
<td>93</td>
</tr>
<tr>
<td>highest number of successful trials</td>
<td>123, 127–128, 139–140, 192</td>
</tr>
<tr>
<td>homepage</td>
<td>106</td>
</tr>
<tr>
<td>Hooke Jeeves algorithm</td>
<td>12</td>
</tr>
<tr>
<td>host optimizer</td>
<td>70</td>
</tr>
</tbody>
</table>
howling removal unit 42, 118, 296
hybrid differential evolution 51, 70–71, 90, 345, 355, 400, 404–405
hybrid optimization algorithm 7, 355, 399–400
hydrosience 46
hydrothermal power system 298
hyper-ellipsoid function 113, 123, 127, 154, 207, 231, 269, 274
ICEO test problem 108–109
ideal antenna array 292
identity 302
identity matrix 16
idle times 323
IEEE Xplore 42
IIR filter 42
image matching 301
image processing 301
image quality 301, 399, 401, 404
image registration 44, 49, 301
implementation terminology 44
implicit filtering algorithm 71
importance density 392
inaccurate interval 312
inaccurate network information 312, 317
incommensurate 75
inconsistency 94, 107
independent system operator 370–371
individual 23–24, 35
individualism 71
induction motor 292, 298
inertial weight 35
information technology 288
initialization 19, 24–25, 52, 65, 356
inner product 17
installation 299, 339
integer factorization problems 289
integer optimization parameter 61
integrated circuit 3, 296, 353
integrated service 311
intelligence 35
interaction 91–92
interference sources 344
interleave-division multiple-access 288
internet 311
internet routing 289
intersite communication 327
intranode communication 327
intrasite communication 327, 329
intrinsic camera parameters 391
intrinsic subroutines 18
intrusions 289
inverse crimes 35
inverse problem 35, 293–294
investment fund management 2, 3, 6
iron industry 46–48
isotropic elements 336–339
iterator logistic map 81
Jacobi method 62, 64
Jacobian 15
joint self-adaptive adaptation 83
Katsuura function 108, 113, 128
Kowalik function 107
landscape 4, 124–125, 154, 364
leader 38, 80
leaf 302
least significant bits (LSB) 345, 347
Levenberg–Marquardt descent strategy 71
Levy Montalvo test bed 107
limit of number of generations 55
limit of number of objective function evaluations 92, 98, 128, 180, 255
line search 16–17
linear adaptation 81
linear array 292–293, 336, 338–341
linearity 4, 108
local optima 3, 336
local quadratic approximation 8–9
local queue 323
local search 70, 160, 355, 364
logic dominance function 24, 74
logistics 48
long-term planning 371
Los Alamos National Laboratory 21
loss 299–300, 377
low density parity-check (LDPC) codes 288
magnet motor 292, 297
magnetic resonance imaging 301
maintenance scheduling 371
manufacturing industry 290
mapper 323, 331
mapping problem 290, 322, 324–325, 332–333
maritime 48
market clearing price 370, 375
market competition 373, 386
market element 370
market operator 371, 376
market participant 371–372, 374, 376, 378, 386
market rule 371
marketer 371
Markov chain particle filtering 71
mass rapid transit system 290
materials science and engineering 48
mathematics 48
mating partner 68–69
mating pool 26
mean 34, 80, 378–379, 382, 394, 400, 403–404
mechanics 48–49
medicine 49, 107, 301
member function 73, 314
membership function
memetic algorithms 21
memory 23, 35, 71
memory update 35
metering information 372
metric 17
Metropolis criterion 355, 357, 364
Michalewicz function 107, 114, 129
microstrip antenna 291
microwave 46, 293
microwave absorber 61
microwave device 295
migrating operation 70
mimicking 21
MINPACK-2 test bed 107
mirror vertex 14
misconduct 35
misconception 35, 38, 89–90, 140
mixed optimization parameter 61
modality 5–6, 107–108, 123–126, 168, 180, 184, 231
modified differential evolution 51, 64, 90, 347
modified Newton-Raphson method 71
modulation period 338–339
monopulse antennas 342
Monte Carlo algorithm 20–21
More Garbow Hillstrom test bed 107
mother-child competition 55, 64, 69–70, 78
mother 26, 52, 54–55, 58, 64–65, 68–70, 74, 78
motion 291, 295, 302, 389–391
motor 291–292, 298
movement 35
moving picture experts group-1 (MPEG) 42
multi-computer systems 323
multi-dimensional 7, 10–11, 15–17, 55
multi-input multi-output system 287
multi-mode left shift 71
multi-objective differential evolution 72, 90, 322, 326, 328, 332–333
multi-objective optimization 73–77, 354
multi-point crossover 27
multi-population differential evolution 65
multi-processor scheduling problem 290
multi-processor supercomputer 289
multi-protocol label switching 311
multi-sensor fusion problem 42, 119
multicast routing algorithm 311, 316, 318
multicast tree 314, 316–317
multimedia 311
multimodal objective function 3, 5
multipart bid 375–376
multiple mutations 67
multiple patterns 339
multisite mapping 321–323, 333
multistart COMPLEX 362–364, 366
mutation 24, 28, 32, 34, 38
mutation intensity 37, 53, 56–57, 78–82, 92–93, 192, 201, 208, 214, 221, 228, 235, 241, 248, 256, 277, 316
mutation probability 37, 67, 78, 95
mutation with selection pressure 53, 67
mutual coupling 292–293
MVF 109
natural integer code 61
natural mapping 23
natural real code 29, 51, 61
natural selection 21, 58
nearness degree 312
negative constraint 2
neighborhood 74
nested differential evolution 83
nested self-adaptive adaptation 83
Netlib 109
network configuration 288, 298–299
network resource 311
network simulator 2 (NS2) 316
Newton algorithm 9, 15–17
Newton-Raphson method 71
Index

next generation internet 311
NLS 109
node 311–312, 322–333
node load 330–331, 333
noise 5, 59, 67, 69, 121, 287
non-dominated solutions 331
non-dominated sorting differential evolution 77–78
non-isotropic elements 336
non-uniform arithmetic binomial crossover 32
non-uniform arithmetic multi-point crossover 31
non-uniform arithmetic one-point crossover 31
non-intrinsic control parameter 92, 95, 105, 122, 125, 255
non-uniform arithmetic binomial crossover 32
non-uniform arithmetic exponential crossover 32–33
non-uniform arithmetic multi-point crossover 31
non-uniform arithmetic one-point crossover 31
non-uniform arithmetic swapping 31
nondestructive testing 107
nonlinear equation 8–10, 15, 106–108
nonlinear least squares 107, 109
nonlinearity 4
norm 354
normal distribution 32, 357, 378–379
not-ready communication 323–324
NSFNET 316
number of instructions 324
number of successful searches 92
number of successful trials 92–93, 123, 127–128, 137, 139–140
objective function 2–11, 13, 16, 18, 20–21, 23, 25, 51, 57, 61, 72–75, 90, 207, 298, 325, 379, 400
odd square function 108, 114, 129
oil 46
one-dimensional 3, 5, 7, 9, 11, 15–16, 34, 293, 401
one-point crossover 27, 95
online test bed 108
opposite number 65–66
opposite population 65–66
opposition-based differential evolution 65–67
optics 49–50
optimal solution 2–3, 5–6, 8, 13, 19–21, 55, 65, 75, 81, 93, 103, 122, 255, 317, 322, 325, 327, 329, 355, 399
optimization 1
optimization algorithm 3, 7, 9–11, 16–20, 55, 70–71, 108
optimum 3, 8–9, 38, 56, 122
overall optimal 93–94
overall resource efficiency 311
overhead 16, 18, 29

packaging 297
packet duplication 311
packet loss rate 311
parabola 8–9
parabolic interpolation algorithm 8–10
parallel computing 290
parallelizable 139
parallelization 65, 139
parameter dependence 108
parametric study 39, 78, 89, 105, 137, 191, 256
parent population 26, 32, 69, 81
Pareto children 76
Pareto differential evolution 72, 74–76
Pareto front 75, 331
Pareto individual 75
Pareto optimal set 326
Pareto optimality criterion 332
Pareto set differential evolution 75–76
Pareto solution 75–77
partial derivative 10, 15–16
partial simulation 128, 137
particle 35
particle swarm optimization 22, 35–36, 58, 72, 95–104
partition 27, 29, 31
pasturage 43
pattern move 12
pattern recognition 301
pattern search algorithm 10, 12
penalty 53
penalty factor 354–355
penalty function 53, 114, 354, 400
performance indicator 93–94, 122
perspective projection 390–391
perturbation mutation 32, 67, 98
Index

415

petroleum 44, 46
pharmacology 49
physical algorithms 20
physics 50
pixel 301–302, 390–391, 394–397, 400–402, 404
pollution 299
PoolCo 370, 373
population 24, 35
population status 62, 82, 140
position 35
position update 35
positive constraint 2
positron emission tomography 301
Powell test bed 108
Powell’s conjugate direction algorithm 10, 13
Powell’s direction set method 71
power adaptation 81
power allocation 288
power control 288
power demand 298
power engineering 290, 297
power generation 297–298
power plant 44, 45, 47, 300
power system 298–300, 369, 372–373, 383
prediction methods 324
premature convergence 28, 61, 67, 70, 364
Price Storm Lampinen test bed 108
Prim algorithm 316
principle of pattern multiplication 336
printed dipole linear array 293
probability density function 66, 80, 378, 392
probability theory 312
processing nodes 322
pulse repetition frequency 338
pyramidal horn 291
QoS multicast routing 311
QoS routing 311
QoS satisfaction degree 314–318
quadratic polynomial 8
quality of service 311, 322
quasi-Newton algorithms 16–17
Qing function 95, 102, 115, 124, 127, 157, 214, 270
radar 295
radiation efficiency 338, 346
radio network design 119, 288
radiological imaging 301
radome design 2–3
rain attenuation 288
random adaptation 80
random base 38, 90, 91, 139–140, 167, 169, 183
random multi-start 17, 19
random perturbation mutation 32
random sampling 21, 355–356, 364, 366, 382
randomness 5, 19, 21, 36, 92, 328
ranking selection 26
Rastrigin function 95, 115, 124, 127, 180, 241, 273
reactive power 298–300
real time dispatch 372
real-coded genetic algorithm 29, 37, 95
real-to-integer conversion 61
reconfiguration 300
reconstruction 302
rectangular planar array 337
reflection 13–14
reinitialization 54, 70
regularization 53–54
reliability 326
reliability degree 316
remote queue 323
remote sensing 301
request success rate 317
reservoirs 298
restructured power system 372
retail pricing 370
RETAILCO 371
Retrieval 301, 399
ripple levels (rpls) 340
robotics 42, 291, 301
robustness 20, 93–94
robustness indicator 93
Rosenbrock saddle function 4, 6
rotation 106, 108, 121, 125, 175, 179, 239
rotation matrix 121, 391
rough sets theory 71
roulette-wheel selection 26
rules of thumb 56
Salomon 4, 115, 125
Salomon test bed 108
sampler 291, 355–359
sampling function 337
sampling points 337
sampling radius 355–356
satellite transmission 288
scalability 6, 108, 121
scaling 23, 44, 121, 382, 394
scatter search 21, 72
scheduling 43, 47–48, 50, 290, 297–298, 323, 371, 374
Schwefel test bed 108
Schwefel function 1.2 115, 125, 127, 175, 234, 272
Schwefel function 2.22 116, 125, 127, 164, 221, 271
Schwefel function 2.26 116, 126–127, 168, 227, 256
search 92
Secant algorithm 8–10, 15
seed 70
seismology 50
selection 24, 26, 32, 34, 52, 55, 58, 65, 69, 70–71, 74, 355, 366
selection pressure 53, 67
selection probability 26
self-organizing migrating algorithm (SOMA) 21, 109
self-adaptive adaptation 83
sensitivity 37, 78, 93, 261, 364
sensor 301, 399
separability 4, 123, 125, 164, 175, 179, 184
separate co-evolution 76–77
separation 302
sequential mechanism 70
sequential quadratic programming 71
set of intrinsic control parameters 39, 93
Shannon limit 287–288
shape recognition 302
sharing knowledge 35
shell-and-tube heat exchanger 78, 119
sideband radiations 336, 338, 344–346, 348–349
sidelobe levels (slls) 335
signal processing 302, 353
signal quality 288
signal-to-noise ratio 287, 403
similarity 23, 69, 75
similarity selection 69
simplex method 10, 13, 71, 362
simulated annealing algorithm 20–22, 107
single-input single-output communication 287
single-part bid 375–376
single photon emission computed tomography 301
social behavior 71
social rate 35
social welfare 370
solution accuracy 69, 94
sound 302
source node 312
speaker 42, 302
speech 302
sphere function 4, 6, 95–100, 116, 125–127, 129, 137, 191, 257
SPICE OPUS 353, 359, 362, 366
stability 93, 298–299
staircase error 29
standard binary genetic algorithm 25, 29, 78, 95–96
standard deviation 34, 80, 378–379
standard search space 256, 266
starting point 7, 11, 17–19, 70, 192, 293
statistical sampling 21, 378, 382
steel industry 46–48
steepest descent algorithm 16, 70
steepest descent direction 16
step function 107, 116
stochastic gradient descent 72
stochastic optimization algorithm 17–20, 70, 72, 335, 382
storage 302
strategy parameters 32
subpopulations 65
success rate 98–99, 317
successful mutation 82
successful search 92
successful trial 92–93, 123, 127–128, 137, 192, 262
sum pattern 339–343
superconductivity 107
support vector machine 377, 380, 387
surface roughness estimation 47, 301
swarm 35
swarm algorithms 22
switch 299–300, 338–339
switch on-off time function 338
switched capacitor filter 42, 296
symbolic optimization parameter 2, 20, 22, 51
symmetric objective function 6
symmetry 6, 108, 121, 123, 125, 154
synthesis 42, 292, 335
system failure 299–300
systems of nonlinear equations 107–108
system on chip 297
system operator 299, 370–371, 377
system security 299, 371
system stabilizer 300
system state 299, 394
tabu search 21
target motion parameter 295
task mapping 322
task scheduling 323
Taylor aperture distribution 337
Taylor series 9
telecommunication flow modeling
temperature 21–22, 44, 299, 354–360
tentative benchmark test bed 122–123, 127–128, 137, 256
termination conditions 7–8, 11–13, 15–18, 21–22, 24–25, 33, 36, 52, 55, 63, 66, 76–77
test bed 37, 41, 57, 90, 94–95, 105–106
test problem 90–92, 95, 105–109, 120–122, 127, 328
testing 108, 297, 377
texture classification 120
thermal engineering 50–51
three-dimensional 13–14, 293–294
threshold 56, 73, 138, 140, 148, 322
threshold accepting algorithm 72
threshold margin selection 69–70
throughput 321–322, 325
time-modulated linear array 293
time-modulated planar array
time-shared modality 292, 338, 342
time step 35, 391–392
Tong-Shiao generation station 298
topology 300, 316–317, 353, 359–364
total number of successful searches 92
total output power 345
tournament selection 26, 95
toy function 55, 90, 105, 109–110, 117, 122, 127–128, 137, 189, 256
Tracer 109
Tracking 291, 302, 324, 389–397
tradeoff 57, 96, 143–144, 148, 150, 153
tradeoff factor 354–355, 359, 362
trading profit 371
traffic engineering 311
training 20, 120, 380–382
training set 20
TRANSCO 371
transfer capability 298
translation 106, 121, 391
transmission capacity 299
transmission market
transmission tariff 371
transportation 50, 373
trapping 90, 154
tree network 311
trial 92
trial and error 19, 89
triangular fuzzy number 312
trigonometric mutation 67, 81
two-dimensional 4–6, 13, 294, 342, 389
ultrasound 301
ultrawide-band radio system 288
unconstrained optimization 6, 106, 109
unified co-evolution 77
uniform distribution 80
unimodal objective function 5
union 32, 34, 66, 69, 77
uniqueness 6, 103, 124, 157, 221
unit commitment problem 298
univariate search algorithms 10–12
unmanned aerial vehicle (UAV) 45, 48
unsupervised classification 300
upgrading 299
update 9–10, 16, 62–64, 68, 392, 394
use of resources 322, 326, 328, 330, 332
valid decimal digit 95
value to reach 92, 255
variable metric algorithms 17
variable neighborhood search method 71
variances 32, 34
vector difference 53, 56, 58, 68
velocity 23, 35–36
velocity update 35
verification 42, 302
versatility 20
video 302, 311, 389–390, 394–398
visual license plate recognition 389
voice 302
voltage 299–300, 353, 360, 371
wavelet code 61
wavelet code differential evolution 61
Waxman2 316
Web of Science 42
weighted chebysheff 73
weighted sum method 72–73
Whitley Rana Dzubera Mathias test bed 108
wholesale spot price 369
wireless communication 287–288
Woodward-Lawson (W-L) 337
Workload 323–324, 326
wrapping 120
X-ray 301
Yao Liu Lin test bed 108
Zaharie’s empirical rule 79
(1, 0) – mutation 34
(N, 0) – mutation 24
(N, N (N − 1) / 2) – mutation 34
3D visual tracking 389
(µ, λ) – strategy 32
(µ + λ) – strategy 32
(Nµ, Nλ) – mutation 34