Bibliography


Chan FTS, Tiawari MK (2007) Swarm intelligence focus on ant and particle swarm optimization, 1st edn, I-Tech Education and Publishing


Ortega-García et al. J (1994) Robust speech modeling for speaker ID in forensic acoustics, ESCA Workshop on Automatic Speaker Recognition, pp 217-220


White MS, Flockton SJ (1997) Chapter in evolutionary algorithms in engineering applications. Springer


Yang XS (2014) Nature-inspired optimization algorithms


http://www.speech.cs.cmu.edu/comp.speech/SectionI/Data/noisex

http://en.wikipedia.org/wiki/Speech_processing
Note: Page numbers followed by f and t indicate figures and tables respectively

A
Accelerated particle swarm optimization (APSO), 45
application in speech enhancement, 46
implementation, 47
acoustic path, magnitude and phase response of, 47f
algorithm, flow chart, 48f
improved SNR of, 52, 53t
performance of improved SNR, 49f
objective measures, 50
fractional articulation index (FAI), 51
perceptual evaluation of speech quality (PESQ), 50–51
signal-to-noise ratio (SNR), 50
weighted spectral slope (WSS), 51–52
parameter selection for, 49
acceleration coefficients, 49, 49f
maximum iterations, 50
swarm size, 49
and PSO (see also PSO)
mean square error convergence analysis of, 59f
simulation conditions chosen for, 52, 52t
and SPSO, 52–53
FAI for, 57f, 56t
PESQ measure for, 56f, 56t
power spectral densities of, 58f
spectrograms of, 55f
time domain waveforms of, 54f
WSS scores for, 57f, 57t
Acceleration, 29, 62, 63, 64, 78, 80
Acceleration coefficients, 42–43, 49, 81
Adaptive noise cancellation (ANC), 4, 111
adaptive filter, 8–9, 9f
concepts of, 7–8
IIR filter, 9–10
setup, 8f
to speech enhancements, PSO-based, 43
algorithm, 44
dual-channel, block diagram, 45f
APSO. See Accelerated particle swarm optimization (APSO)
ARAQPSO. See Asexual reproduction-based adaptive quantum particle swarm optimization (ARAQPSO)
Asexual reproduction-based adaptive quantum particle swarm optimization (ARAQPSO), 27–28, 33
reproduction, 34
selection, 33–34
Artificial bee colony optimization, 20
Autocorrelation matrix, 13

B
Babble noise condition, 47
performance evaluation of algorithms using FAI measure, 98, 100f, 100t
using objective measure WSS, 99, 102f, 102t
using PESQ, 56f, 56t, 101f, 101t
using SNRI measure, 49f, 53r, 98, 99f, 99t
spectrograms of, 109, 109f
time-domain waveforms of, 108, 108f
Babble noise reference, 81
in comparison of
FAI for, 83, 83t
graphical representation of, 83, 83f
improved SNR, 81, 82f, 82t
intelligibility objective measure FAI, 70, 71f, 71t
Bat algorithm (BA), 92–93, 112, 113
advantage of, 96–97
biological background of, 91–92
convergence plots of MSE for, 107, 107f
flow chart of, 95f, 96
hunting behavior, 93f
loudness and pulse emission, 94–95
movement of virtual bats, 93–94
performance evaluation of algorithms, 98, 99f
babble noise condition (see Babble noise condition)
factory noise condition (see Factory noise condition)
graphical representation of, 98, 99f
pseudocode of, 96
simulation conditions of, 98, 98r
in speech enhancement, 97

C
Conventional PSO algorithm. See Standard particle swarm Optimization (SPSO) algorithm

D
Differential evolution, 20
Differential search algorithm, 20
Diversification, 21
Dynamic relaxation, 20

E
Echolocation, 91–93, 96

F
Factory noise condition, 47, 100
performance evaluation of algorithms using objective measure FAI, 102, 103, 103r, 104f
using objective measure PESQ, 104, 105f, 105r
using objective measure SNRI, 100, 102, 103r, 103, 104f
using objective measure WSS, 104, 106f, 106r
spectrograms of, 109, 109f
time-domain waveforms of, 108, 108f
FAI. See fractional articulation index (FAI)
Finite impulse response (FIR), 7
Fractional articulation index (FAI), 51

G
Genegetic algorithm (GA), 20, 27
Gradient-based algorithms. See also Speech enhancement
LMS algorithm, 11–12
normalized LMS algorithm, 12
RLS algorithm, 12–13
versus stochastic optimization techniques, 13–14
Gravitational constant, 62
Gravitational force, 62, 63
in GSA algorithm, 63f
Gravitational search algorithm (GSA), 62–64, 111
advantages of, 65–66
babble noise reference (see Babble noise reference)
comparison of PSD of, 74, 74f
experimental conditions for, 69f
flow chart of, 65f
hybridizing, 113
observation on application, 74
versus PSO, 66
proposed speech enhancement algorithm with, 66–68
IIR system, 67
proposed algorithm, 68
template of, 64
time domain waveforms, comparison, 72f, 74
Gravitational search algorithm, 20

H
Heuristic optimization techniques, 14, 19–21
diversification, 21
intensification, 21
swarm intelligence, 21–22
applications of, 22–23
Hill climbing, 20, 29
HPSO. See Hybrid particle swarm optimization (HPSO)

Hybrid particle swarm optimization (HPSO)
SSPSO algorithm, 35
θ-SSPSO algorithm, 35–36
standard θ-PSO algorithm, 34–35
Hybrid PSOGSA, 5, 77–78
advantages of, 78
flowchart of, 79f
implementation, in speech enhancement, 79–80
parameter selection, 81
template of proposed algorithm, 80
improved SNR of, 82r
graphical representation of, 82f
mean square error (MSE) for, 85, 87f
observations on application of, 87
power spectral densities of, 88f
simulation conditions for, 82r
time domain waveforms of, 85, 86f

I
Improved particle swarm optimization (IPSO), 27, 32
global search method, 32
local search method, 32–33
Infinite impulse response (IIR), 7, 67
filter, 9–10
basic equation, 10
modelling, 10–11
filter transfer function, 67–69
fitness function, 67
transfer function, 10

Intensification, 21
IPSO. See Improved particle swarm optimization (IPSO)

K
Knowledge learning method, 30–31

L
Law of gravitation, 62
Law of motion, 62
Learning-based particle swarm optimization (LPSO) algorithm, 27
dynamic search of global best position, 31
knowledge learning method, 30–31
subpopulation strategy, 29–30
Least mean squares (LMS) algorithm, 11–12
normalized LMS (NLMS) algorithm, 12, 27
and RLS algorithm, 12–13
Least squares (LS) algorithm, 12
LMS algorithm. See Least mean squares (LMS) algorithm
LPSO. See Learning-based particle swarm optimization (LPSO) algorithm

M
Memetic algorithm, 20
Meta-heuristic optimization, 14, 19–21
diversification, 21

intensification, 21
proposed optimization, 27–28
ARAQPSO, 33–34
HPSO, 34–36
IPSO, 32–33
LPSO, 29–31
MPSO, 29
PSO, 28
speech enhancement, implementation of, 25–26
objective function and its selection, 26–27
swarm intelligence, 21–22
Multichannel enhancement systems, 4–5

N
Nelder-Mead simplicial heuristic, 20
NLMS algorithms. See Normalized LMS (NLMS) algorithm
Noise sources
common sources, 3f
in speech degradation, 2–3
NOIZEUS database, 47, 68, 91, 98
Normalized LMS (NLMS) algorithms, 12, 27

O
Objective function, 11, 19, 45, 67
and its selection, 26–27
Optimization, 17–18

P
Particle, 39
single particle update, 40, 42f
template of algorithm, 41
Particle swarm optimization (PSO), 20, 27, 28, 39
accelerated (APSO) (see also APSO), 45–46
algorithm, flow chart, 48f
application in speech enhancement, 46
implementation, 47–50
mean square error convergence analysis of, 59f
and SPSO, 52–59
algorithm, 40–41
template of, 41
-based adaptive noise cancellation to speech enhancements, 43
algorithm, template, 44
biological background, 39
versus GSA, 66
MSE convergence analysis, 73f, 74
parameters, 42
acceleration of coefficients, 42–43
inertia weight, 43
population size, 42
stop condition, 43
Perceptual evaluation of speech quality (PESQ), 50–51
PESQ. See Perceptual evaluation of speech quality (PESQ)
PSO. See Particle swarm optimization (PSO)

Q
Quality of speech, 2

R
Reactive search optimization, 20
Recursive least squares (RLS) algorithm, 12–13

S
Shuffled sub-swarms particle swarm optimization (SSPSO), 28
Signal-to-noise ratio (SNR), 2, 50, 51, 100, 111, 112
comparison of quality objective measure, 69t, 70
improved (SNRI), 102
of APSO and SPSO, 52, 53, 53t
in factory noise condition, 103t, 104f
performance evaluation of algorithms, 98, 99f, 99r
of PSOGSA, GSA and SPSO, 81, 82f, 82r
Simulated annealing, 18, 20, 66, 94
Single-channel enhancement systems, 4, 112
Speech degradation
sources of noise, 2–3
speech enhancement methods (see Speech enhancement)
Speech enhancement
applications, 2
dual-channel, 26f
gradient-based algorithms
  LMS algorithm, 11–12
  normalized LMS algorithm, 12
  RLS algorithm, 12–13
  versus stochastic optimization techniques, 13–14
  via meta-heuristic optimization (see Meta-heuristic optimization)
methods, classification of, 3–4
multichannel enhancement systems, 4–5
single-channel enhancement systems, 4
Stochastic optimization, 14, 18–19
Stochastic optimization algorithm. See Hybrid PSOGSA
SSPSO. See Shuffled sub-swarms particle swarm optimization (SSPSO)
Swarm intelligence, 21–22
applications of, 22–23
of birds, 22f
  schooling behavior of fish, 22f
Tabu search, 18, 20
Unknowns, 18, 26, 43
Variables, 18, 26, 27
Weighted spectral slope (WSS), 50, 51–52
Zooming, automatic, 96