

Contents

Part 1. Soft Computing and Metaheuristics

Fuzzy Adaptive Neighborhood Search: Examples of Application	1
<i>Armando Blanco, David Pelta, José L. Verdegay</i>	
1 Introduction	1
2 Description of <i>FANS</i>	2
3 On the Usefulness of Fuzzy Valuations	6
4 Examples of Application	9
5 Conclusions	19
References	19
Branch-and-bound algorithms using fuzzy heuristics for solving large-scale flow shop scheduling problems	21
<i>Jinliang Cheng, Hiroshi Kise, George Steiner, Paul Stephenson</i>	
1 Introduction	21
2 Lower bounds	23
3 Dominance rules and fuzzy approximation	27
4 Branch-and-bound algorithm	29
5 Computational experiments	30
6 Concluding remarks	33
References	34
A Fuzzy Adaptive Partition Algorithm (FAPA) for Global Optimization	37
<i>Melek Basak Demirhan, Linet Özdamar</i>	
1 Introduction	37
2 Fuzzy Adaptive Partitioning Approach	38
3 Computational Results	41
4 Conclusion	44
References	45
Fuzzy Memes in Multimeme Algorithms: a Fuzzy-Evolutionary Hybrid	49
<i>Natalio Krasnogor, David A. Pelta</i>	
1 Introduction	49
2 The Protein Structure Prediction Problem	50
3 Memetic Algorithms	52
4 Fuzzy Memes for Multimeme Algorithms	53
5 Experiments setup and results	57
6 Conclusions	63
References	64

Vehicle Routing Problem With Uncertain Demand at Nodes: The Bee System and Fuzzy Logic Approach	67
<i>Panta Lučić, Dušan Teodorović</i>	
1 Introduction.....	67
2 Statement of the problem	68
3 A Proposed solution of the problem	68
4 Results obtained using the "intelligent" vehicle routing system.....	77
5 Conclusion	79
References	80
Fuzzy Constructive Heuristics	83
<i>José A. Moreno Pérez, J. Marcos Moreno Vega</i>	
1 Introduction.....	83
2 Fuzzy Constructive Methods	84
3 Fuzzy Stopping Rules	85
4 The non-guillotine rectangular two-dimensional cutting problem ...	86
5 Computational experiments	91
References	95
 Part 2. Heuristics and Mathematical Programming	
Heuristics for Optimization: two approaches for problem resolution	97
<i>J.M. Cadenas, M.C. Garrido, F. Jimenez</i>	
1 Introduction.....	97
2 Fuzzy rule learning in FMP	99
3 Fuzzy rule learning in MFGN framework.....	106
4 Analysis of results.....	110
5 Conclusions	110
References	111
Optimization with linguistic variables	113
<i>Christer Carlsson, Robert Fullér</i>	
1 Introduction.....	113
2 Optimization with linguistic variables.....	116
3 Examples	117
4 Extensions	118
5 Summary	120
References	120
Interactive Algorithms Using Fuzzy Concepts for Solving Mathematical Models of Real Life Optimization Problems	123
<i>C. Mohan, S.K. Verma</i>	
1 Introduction.....	123
2 Non-Symmetric Treatment of Linear and a Class of Non-Linear Mul- tiobjective Fuzzy Programming Problems	126

3	PL-Pareto Optimal Solution	129
4	Calculation of Fuzzy Aspiration Levels	131
5	The Proposed IMMOFP Interactive Algorithm	132
6	Illustrative Examples	133
7	Concluding Observations	136
	References	137

Fuzzy Data Envelopment Analysis: A Credibility Approach . . . 141
Saowanee Lertworasirikul, Shu-Cherng Fang, Jeffrey A. Joines, Henry L. W. Nuttle

1	Introduction	141
2	Fuzzy DEA Model	143
3	Possibility, Necessity, and Credibility Measures	145
4	CP-DEA model	154
5	Numerical Examples	155
6	Concluding Remarks	156
	References	157

Fuzzy Optimization using Simulated Annealing:

An Example Set 159
Rita Almeida Ribeiro, Leonilde Rocha Varela

1	Introduction	159
2	Basics on the approach used for formulating and solving the example set	160
3	Set of linear examples tested and discussion of the results	164
4	Set of non-linear examples tested and discussion of the results	174
5	Conclusions	179
	References	179

Part 3. Practical Heuristic Algorithms

Multi-stage Supply Chain Network

by Hybrid Genetic Algorithms 181
Mitsuo Gen, Admi Syarif

1	Introduction	181
2	Mathematical Model	184
3	Design of the Algorithm	185
4	Overall Procedure	192
5	Numerical Examples	193
6	Conclusion	194
	References	195

Fuzzy evolutionary approach for multiobjective combinatorial optimization: application to scheduling problems 197
Imed Kacem, Slim Hammadi, Pierre Borne

1	Introduction	197
---	------------------------	-----

2	Multiobjective Optimization: The State Of The Art	197
3	Fuzzy Evolutionary Approach	200
4	Application: Case Of Flexible Job-shop Scheduling Problem (FJSP)	207
5	Discussions And Conclusions	216
	References	217

Fuzzy Sets based Heuristics for Optimization: Multi-objective Evolutionary Fuzzy Modeling 221
Fernando Jiménez, Antonio F. Gómez Skarmeta, Gracia Sánchez, José M. Cadenas

1	Introduccion	221
2	Fuzzy model identification	223
3	A technique to improve transparency and compactness of the fuzzy rule sets	224
4	Training of the RBF neural networks	225
5	Criteria for fuzzy modeling	225
6	Multi-objective neuro-evolutionary algorithm	226
7	Experiments and results	230
8	Conclusions and future research	232
	References	233

An Interactive Fuzzy Satisficing Method for Multiobjective Operation Planning in District Heating and Cooling Plants through Genetic Algorithms for Nonlinear 0-1 Programming . 235
Masatoshi Sakawa, Kosuke Kato, Satoshi Ushiro, Mare Inaoka

1	Introduction	235
2	Operational Planning of a DHC Plant	236
3	An Interactive Fuzzy Satisficing Method	241
4	Genetic Algorithms for Nonlinear 0-1 Programming	242
5	Numerical Experiments	247
6	Conclusion	248
	References	249

Adaptive Hybrid Genetic Algorithm with Fuzzy Logic Controller 251
YoungSu Yun, Mitsuo Gen

1	Introduction	251
2	Adaptive Genetic Operators (AGOs)	253
3	Proposed Hybrid Concepts and Logics	256
4	Proposed Algorithms for Experimental Comparison	258
5	Numerical Example	260
6	Conclusion	262
	References	262

Part 4. Applications to Real World Problems

Finding Satisfactory Near-Optimal Solutions in Location Problems	265
<i>María J. Canós, Carlos Ivorra, Vicente Liern</i>	
1 Introduction	265
2 The fuzzy p -median problem	266
3 Calculating the satisfaction level	268
4 An interchange heuristic procedure	271
5 Computational results	272
6 Conclusions	275
References	275
Route Choice Making Under Uncertainty: a Fuzzy Logic Based Approach	277
<i>Vincent Henn</i>	
1 Introduction	277
2 Modeling Traffic Assignment	278
3 Fuzzy Sets as a Basis for Representing Imperfections	280
4 Fuzzy Sets Based Heuristics for Traffic Assignment	282
5 Analysis of the Model	287
6 Conclusions and Perspectives	290
References	291
A New Technique to Electrical Distribution System Load Flow Based on Fuzzy Sets	293
<i>Carlos A. F. Murari, Marcelo A. Pereira, Marcelo M. P. Lima</i>	
1 Introduction	293
2 Fuzzy Number	294
3 Fuzzy Numbers' Operators	295
4 Fuzzy Load Flow	298
5 Tests	299
6 Conclusions	302
References	305
A Fuzzy Adaptive Partitioning Algorithm (FAPA) for Global Optimization: Implementation in Environmental Site Characterization	307
<i>Linet Özdamar, Melek Basak Demirhan</i>	
1 Introduction	307
2 Environmental Site Characterization: Problem Definition	308
3 Implementation of Fuzzy Adaptive Partitioning Algorithm (FAPA) in Site Characterization	309
4 Numerical Results on Hypothetical Sites	313
5 Conclusion	314
References	315

Capacitated Vehicle Routing Problem with Fuzzy Demand ...	317
<i>Brigitte Werners, Michael Drawe</i>	
1 Introduction.....	317
2 A Fuzzy Multi-Criteria Modeling Approach	318
3 A Fuzzy Multi-Criteria Savings Heuristic.....	326
4 Conclusion	333
References	334
An Adaptive, Intelligent Control System for Slag Foaming....	337
<i>Eric L. Wilson, Charles L. Karr</i>	
1 Introduction.....	337
2 The Problem Environment: Slag Foaming in an Electric Arc Steel Furnace.....	340
3 An Architecture for Achieving Intelligent Adaptive Control.....	342
4 Results	347
5 Summary	350
References	350