

BIO-INSPIRED COMPUTATION IN TELECOMMUNICATIONS

Edited by Xin-She Yang, Su Fong Chien, Tiew On Ting



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Bio-Inspired Computation in Telecommunications

Preface

Humankind has always been fascinated by new ways of communication. Modern telecommunications have a huge impact on the ways we live, work, and think. In fact, modern telecommunications involve a vast array of algorithms, approaches, and technologies. Among many objectives and requirements concerning telecommunications, a key objective is to transmit signals with the optimal quality, least energy consumption, maximum capacity, and highest speed. Such requirements pose a series of challenging optimization problems in telecommunications.

Many problems in telecommunications require sophisticated algorithms and approaches to solve them. In principle, such problems can be tackled by sophisticated optimization techniques; however, traditional approaches do not usually work well. In addition, the stringent time requirements and ever-increasing complexity in constraints and dimensionality have further complicated these challenging issues, which become even more relevant in the current networks and the future 5G networks. Such challenges necessitate new approaches and new methods such as bio-inspired computation.

Current trends in optimization tend to use bio-inspired algorithms and swarm intelligence. In fact, there have been significant developments in bio-inspired computation in recent years, and swarm-intelligence-based algorithms now form an increasingly important part of optimization methods and approaches. Such bio-inspired algorithms are flexible, versatile, and efficient. Consequently, these algorithms can be used to solve a wide range of problems in diverse applications.

The rapid advances in bio-inspired computation have resulted in a much richer literature in recent years. It is impossible to review and summarize a good fraction of the latest developments in both bio-inspired computation and telecommunications. Consequently, we must select from many topics, with the emphasis on state-of-the-art developments, so as to provide a timely snapshot of recent advances. Therefore, this book intends to provide a timely review on a selection of topics, including the analysis and overview of bio-inspired algorithms, bio-inspired approaches to telecommunications, firefly algorithm, intrusion detection systems, VoIP (Voice over Internet Protocol) quality prediction, IP-over-WDM (wavelength-division multiplexing) networks, radio resources management of 4G networks, robust transmission for heterogeneous networks with cognitive small cells, resource distribution for sustainable communication networks, multiobjective optimization in optical networks, cell coverage area optimization for green LTE (long-term evolution) cellular networks, optimal coverage optimization in wireless sensor networks, minimum interference channel assignment for multiradio wireless mesh networks, and others.

The diverse topics covered in this book can provide an ideal and timely source of literature and case studies for graduates, lecturers, engineers, and researchers in telecommunications, wireless communications, computer science, electrical and

electronic engineering, computational intelligence, and neural computing. It is our hope that this book can inspire more research to improve existing methodologies and create innovative technologies in telecommunications via bio-inspired methodologies.

We would like to thank our editors, Steven Elliot and Kaitlin Herbert, and the staff at Elsevier for their help and professionalism. Last but not least, we thank our families for their support and encouragement.

Xin-She Yang, Su Fong Chien, Tiew On Ting

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Contents

Preface	xiii
List of Contributors	xv
CHAPTER 1 Bio-Inspired Computation and Optimization: An Overview	1
1.1 Introduction.....	2
1.2 Telecommunications and Optimization	2
1.3 Key Challenges in Optimization	4
1.3.1 Infinite Monkey Theorem and Heuristicity	4
1.3.2 Efficiency of an Algorithm	5
1.3.3 How to Choose Algorithms.....	5
1.3.4 Time Constraints.....	6
1.4 Bio-Inspired Optimization Algorithms	7
1.4.1 SI-Based Algorithms	7
1.4.2 Non-SI-Based Algorithms	10
1.4.3 Other Algorithms.....	13
1.5 Artificial Neural Networks.....	13
1.5.1 Basic Idea	13
1.5.2 Neural Networks.....	14
1.5.3 Back Propagation Algorithm.....	15
1.6 Support Vector Machine.....	16
1.6.1 Linear SVM.....	16
1.6.2 Kernel Tricks and Nonlinear SVM.....	18
1.7 Conclusions.....	19
References.....	19
CHAPTER 2 Bio-Inspired Approaches in Telecommunications	23
2.1 Introduction.....	23
2.2 Design Problems in Telecommunications.....	25
2.3 Green communications	27
2.3.1 Energy Consumption in Wireless Communications	28
2.3.2 Metrics for Energy Efficiency.....	29
2.3.3 Radio Resource Management.....	31
2.3.4 Strategic Network Deployment	32
2.4 Orthogonal Frequency Division Multiplexing	33
2.4.1 OFDM Systems	33
2.4.2 Three-Step Procedure for Timing and Frequency Synchronization	34

2.5	OFDMA Model Considering Energy Efficiency and Quality-of-Service	35
2.5.1	Mathematical Formulation	35
2.5.2	Results.....	37
2.6	Conclusions.....	38
	References.....	38
CHAPTER 3	Firefly Algorithm in Telecommunications	43
3.1	Introduction.....	44
3.2	Firefly Algorithm.....	46
3.2.1	Algorithm Complexity.....	48
3.2.2	Variants of Firefly Algorithm	48
3.3	Traffic Characterization.....	49
3.3.1	Network Management Based on Flow Analysis and Traffic Characterization.....	51
3.3.2	Firefly Harmonic Clustering Algorithm.....	52
3.3.3	Results.....	54
3.4	Applications in Wireless Cooperative Networks	55
3.4.1	Related Work	58
3.4.2	System Model and Problem Statement	59
3.4.3	Dinkelbach Method	62
3.4.4	Firefly Algorithm.....	64
3.4.5	Simulations and Numerical Results	65
3.5	Concluding Remarks	70
3.5.1	FA in Traffic Characterization	70
3.5.2	FA in Cooperative Networks.....	70
	References.....	70
CHAPTER 4	A Survey of Intrusion Detection Systems Using Evolutionary Computation	73
4.1	Introduction.....	73
4.2	Intrusion Detection Systems.....	75
4.2.1	IDS Components.....	76
4.2.2	Research Areas and Challenges in Intrusion Detection	78
4.3	The Method: Evolutionary Computation	79
4.4	Evolutionary Computation Applications on Intrusion Detection....	80
4.4.1	Foundations.....	80
4.4.2	Data Collection	81
4.4.3	Detection Techniques and Response.....	83
4.4.4	IDS Architecture	86
4.4.5	IDS Security.....	88
4.4.6	Testing and Evaluation.....	88

4.5	Conclusion and Future Directions.....	89
	Acknowledgments	90
	References.....	91

CHAPTER 5 VoIP Quality Prediction Model by Bio-Inspired Methods 95

5.1	Introduction.....	96
5.2	Speech Quality Measurement Background.....	97
5.2.1	Subjective Methods	97
5.2.2	Intrusive Objective Methods	98
5.2.3	Nonintrusive Objective Methods.....	99
5.2.4	Bio-Inspired Methods	100
5.3	Modeling Methods.....	100
5.3.1	Methodology for Conversational Quality Prediction (PESQ/E-model)	100
5.3.2	Nonlinear Surface Regression Model	104
5.3.3	Neural Network Model.....	105
5.3.4	REPTree Model	105
5.4	Experimental Testbed.....	106
5.4.1	The Data Sets' Structure	108
5.4.2	The Performance Measures	110
5.5	Results and Discussion.....	110
5.5.1	Correlation Comparison	110
5.5.2	Residual Analysis	111
5.6	Conclusions.....	113
	References.....	115

CHAPTER 6 On the Impact of the Differential Evolution Parameters in the Solution of the Survivable Virtual Topology-Mapping Problem in IP-Over-WDM Networks 117

6.1	Introduction.....	117
6.2	Problem Formulation	120
6.3	DE Algorithm	121
6.3.1	Fitness of an Individual	123
6.3.2	Pseudocode of the DE Algorithm	123
6.3.3	Enhanced DE-VTM Algorithm	124
6.4	Illustrative Example.....	124
6.5	Results and Discussion.....	128
6.6	Conclusions.....	139
	References.....	139

CHAPTER 7	Radio Resource Management by Evolutionary Algorithms for 4G LTE-Advanced Networks	141
7.1	Introduction to Radio Resource Management	142
7.1.1	Frame Structure	143
7.1.2	DL and Uplink	143
7.2	LTE-A Technologies	145
7.2.1	Carrier Aggregation	145
7.2.2	Relay Nodes	145
7.2.3	Femtocell	146
7.2.4	Coordinated Multipoint Transmission	146
7.3	Self-Organization Using Evolutionary Algorithms	147
7.3.1	SON Physical Layer	147
7.3.2	SON MAC Layer	148
7.3.3	SON Network Layer	148
7.3.4	LTE-A Open Research Issues and Challenges	149
7.4	EAs in LTE-A	150
7.4.1	Network Planning	151
7.4.2	Network Scheduling	152
7.4.3	Energy Efficiency	153
7.4.4	Load Balancing	154
7.4.5	Resource Allocation	155
7.5	Conclusion	161
	References	162
CHAPTER 8	Robust Transmission for Heterogeneous Networks with Cognitive Small Cells	165
8.1	Introduction	165
8.2	Spectrum Sensing for Cognitive Radio	167
8.3	Underlay Spectrum Sharing	168
8.3.1	Underlay Spectrum Sharing for Heterogeneous Networks with MIMO Channels	169
8.3.2	Underlay Spectrum Sharing for Heterogeneous Networks with Doubly Selective Fading SISO Channels	169
8.4	System Model	170
8.4.1	System Model with MIMO Channel	170
8.4.2	System Model with Doubly Fading Selective SISO Channel	170
8.5	Problem Formulation	171
8.6	Sparsity-Enhanced Mismatch Model (SEMM)	173

8.7	Sparsity-Enhanced Mismatch Model-Reverse DPSS (SEMMR)	175
8.8	Precoder Design Using the SEMM and SEMMR	177
8.8.1	SEMM Precoder Design	177
8.8.2	Second-Stage SEMMR Precoder and Decoder Design ...	178
8.9	Simulation Results.....	180
8.9.1	SEMM Precoder.....	180
8.9.2	SEMMR Transceiver.....	181
8.10	Conclusion.....	182
	References	183
CHAPTER 9	Ecologically Inspired Resource Distribution Techniques for Sustainable Communication Networks	185
9.1	Introduction	185
9.2	Consumer-Resource Dynamics	186
9.3	Resource Competition in the NGN.....	188
9.4	Conditions for Stability and Coexistence	192
9.5	Application for LTE Load Balancing.....	195
9.6	Validation and Results	197
9.7	Conclusions	201
	References	201
CHAPTER 10	Multiobjective Optimization in Optical Networks	205
10.1	Introduction	206
10.1.1	Common Optical Network Problems in a Multiobjective Context.....	206
10.2	Multiobjective Optimization	208
10.2.1	Multiobjective Optimization Formulation	208
10.2.2	Multiobjective Performance Metrics	209
10.2.3	Experimental Methodology.....	210
10.2.4	Algorithms to Solve MOPs.....	212
10.3	RWA Problem	215
10.3.1	Traditional RWA.....	215
10.3.2	Multiobjective RWA Formulation	216
10.3.3	ACO for RWA	216
10.3.4	MOACO for RWA	217
10.3.5	Classical Heuristics	220
10.3.6	Simulations	221
10.3.7	Experimental Results	222

10.4	WCA Problem	224
10.4.1	Related Work	225
10.4.2	Classical Problem Formulation.....	226
10.4.3	Multiobjective Formulation	227
10.4.4	Traffic Models and Simulation Algorithm	227
10.4.5	EA for WCA	228
10.4.6	Experimental Results	229
10.5	p-Cycle Protection.....	232
10.5.1	Problem Formulation	235
10.5.2	Generating Candidate Cycles.....	236
10.5.3	Multiobjective Evolutionary Algorithms.....	237
10.5.4	Experimental Results	238
10.6	Conclusions	239
	References	240
CHAPTER 11	Cell-Coverage-Area Optimization Based on Particle Swarm Optimization (PSO) for Green Macro Long-Term Evolution (LTE) Cellular Networks	245
11.1	Introduction	245
11.2	Related Works	246
11.3	Mechanism of Proposed Cell-Switching Scheme	248
11.4	System Model and Problem Formulation.....	250
11.5	PSO Algorithm	252
11.6	Simulation Results and Discussion.....	254
11.6.1	Simulation Setup	254
11.6.2	Simulation Flow Chart.....	254
11.6.3	Results and Discussion.....	255
11.6.4	Energy and OPEX Savings	259
11.7	Conclusion	260
	Acknowledgment	261
	References	261
CHAPTER 12	Bio-Inspired Computation for Solving the Optimal Coverage Problem in Wireless Sensor Networks: A Binary Particle Swarm Optimization Approach	263
12.1	Introduction	264
12.2	Optimal Coverage Problem in WSN	266
12.2.1	Problem Formulation	266
12.2.2	Related Work	268

12.2.3	Bio-Inspired PSO	269
12.3	BPSO for OCP	269
12.3.1	Solution Representation and Fitness Function	269
12.3.2	Initialization.....	270
12.3.3	BPSO Operations	271
12.3.4	Maximizing the Disjoint Sets	272
12.4	Experiments and Comparisons.....	272
12.4.1	Algorithm Configurations	272
12.4.2	Comparisons with State-of-the-Art Approaches.....	273
12.4.3	Comparisons with the GA Approach.....	274
12.4.4	Extensive Experiments on Different Scale Networks.....	276
12.4.5	Results on Maximizing the Disjoint Sets	278
12.5	Conclusion	282
	Acknowledgments.....	282
	References	283
CHAPTER 13	Clonal-Selection-Based Minimum-Interference Channel Assignment Algorithms for Multiradio Wireless mesh Networks	287
13.1	Introduction	288
13.2	Problem Formulation.....	290
13.2.1	System Model.....	290
13.2.2	Channel Assignment Problem.....	292
13.2.3	Related Channel Assignment Algorithms	294
13.3	Clonal-Selection-Based Algorithms for the Channel Assignment Problem	295
13.3.1	Phase One	296
13.3.2	Phase Two	302
13.3.3	Variants of the Channel Assignment Algorithm	303
13.4	Performance Evaluation	304
13.4.1	Comparison with Other Channel Assignment Algorithms.....	306
13.4.2	Convergence of IA	308
13.4.3	Impact of Parameter Setting	309
13.4.4	Impact of Local Search	312
13.4.5	Variants of Channel Assignment Algorithm	313
13.5	Concluding remarks	318
	References	320
	Index	323

Bio-Inspired Computation and Optimization: An Overview

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CHAPTER CONTENTS

1.1 Introduction	2
1.2 Telecommunications and Optimization	2
1.3 Key Challenges in Optimization	4
1.3.1 Infinite Monkey Theorem and Heuristicity	4
1.3.2 Efficiency of an Algorithm	5
1.3.3 How to Choose Algorithms	5
1.3.4 Time Constraints	6
1.4 Bio-inspired Optimization Algorithms	7
1.4.1 SI-Based Algorithms	7
1.4.1.1 Ant and bee algorithms	7
1.4.1.2 Bat algorithm	8
1.4.1.3 Particle swarm optimization	9
1.4.1.4 Firefly algorithm	9
1.4.1.5 Cuckoo search	9
1.4.2 Non-SI-Based Algorithms	10
1.4.2.1 Simulated annealing	10
1.4.2.2 Genetic algorithms	11
1.4.2.3 Differential evolution	12
1.4.2.4 Harmony search	12
1.4.3 Other Algorithms	13
1.5 Artificial Neural Networks	13
1.5.1 Basic Idea	13
1.5.2 Neural Networks	14
1.5.3 Back Propagation Algorithm	15