

Contents

Acknowledgments	viii
Contents	ix
1 Introduction	1
1.1 Challenges.	1
1.2 Contributions.	6
2 On the performance of ACO-based methods in P2P resource discovery	9
2.1 Introduction	10
2.2 Ant colony optimization for P2P searching	11
2.2.1 Semant	14
2.2.2 Neighboring-Ant Search.	16
2.2.3 Random k-walker.	17
2.2.4 Other algorithms	18
2.2.5 Summary of the algorithms.	19
2.3 Proposed ACO extensions	20
2.3.1 Semantic Extension: Routing Concept	20
2.3.2 Hybrid Extension: Hybrid Route Optimization.	21
2.4 Experimental Study	23
2.4.1 Network topologies	23
2.4.2 Quality measures	24
2.4.3 Experiment Setup	25

2.4.4 Performance in an unstructured environment	28
2.4.5 Performance in an structured (hypercube-structured) environment	34
2.4.6 Time-based analysis	44
2.5 Conclusions and Future Work	46
2.6 Acknowledgments	47
3 Ant Colony Optimization for resource querying in dynamic peer-to-peer grids	49
3.1 Introduction	50
3.2 Related Work.	51
3.3 Ant Colony Optimization in P2P	52
3.4 Experimental methodology.	55
3.4.1 Test Setup	56
3.4.2 Types of dynamism	58
3.5 Experimental study.	59
3.5.1 Experiment 1: NetGrow 10k	59
3.5.2 Experiment 2: ResGrow 10k	61
3.5.3 Experiment 3: NodeMigrate 10k.	63
3.5.4 Experiment 4: NetShrink 10k	65
3.6 Conclusions and future works	67
4 A Diffusion-Based ACO Resource Discovery Framework for Dynamic P2P Networks	69
4.1 Introduction	70
4.2 Related Work.	71
4.3 Formal Basis	71
4.3.1 ACS	71
4.3.2 Routing Concept	72
4.4 Diffusion Model Framework	72
4.4.1 In-width diffusion.	75
4.4.2 In-depth diffusion.	75
4.5 Experimental Setup	76
4.5.1 Resource distribution and labeling	76
4.5.2 Query and query resolution.	78
4.5.3 P2P network setup	78

4.5.4 Quality measure	78
4.5.5 Experimental methodology	79
4.6 Experimental Study	80
4.6.1 In-width diffusion experiment	81
4.6.2 In-depth diffusion experiment	85
4.7 Conclusions/Future Work	85
4.8 Acknowledgments	89
5 An ACO-based personalized learning technique in support of people with Acquired Brain Injury	91
5.1 Introduction	92
5.2 Related Work.	93
5.3 Problem Domain	95
5.4 An ACO Algorithm for ABI Rehabilitation Tests Recommendation	98
5.4.1 Ant Colony Optimization	98
5.4.2 Problem space conceptual model	99
5.4.3 Algorithmic Design.	101
5.5 Experimental Study	108
5.5.1 Experimental Procedure.	108
5.5.2 Experiment 1: Zero-knowledge correctness	109
5.5.3 DNA Graphs	110
5.5.4 Experiment 2: Inter-user Similarity.	111
5.5.5 Experiment 3: Unexpected Good and Unexpected Bad.	113
5.5.6 Experiment 4: Indirect Inter-user Influence	115
5.5.7 Experiment 5: Fine-scale user clustering.	117
5.5.8 Experiment 6: Global Experiment	118
5.6 Conclusions and Future Work.	122
6 A non-Hybrid Ant Colony Optimization Heuristic for Convergence Quality	125
6.1 Introduction	126
6.2 Hybrid Ant Systems	128
6.3 Angry Ant Framework.	129
6.3.1 Overview	129
6.3.2 State Transition and Pheromone Evolution	130

6.3.3 Level Assignment Matrix	132
6.3.4 Ant irritation	133
6.4 Experimental results	135
6.4.1 Experimental procedure	135
6.4.2 Resource distribution	136
6.4.3 Results	137
6.5 Discussion and future works	139
6.6 Acknowledgments	140
7 An Efficient ACO Strategy for the Resolution of Multi-Class Queries	143
7.1 Introduction	144
7.2 Related Works	147
7.3 Angry Ant Framework	148
7.3.1 Overview	148
7.3.2 State Transition and Pheromone Evolution	150
7.3.3 Level Assignment Matrix	151
7.3.4 Ant irritation	153
7.4 Experimental results	155
7.4.1 Experimental procedure	155
7.4.2 Random multi-class queries	156
7.4.3 Non-random multi-class queries	159
7.4.4 Computational cost	160
7.5 Conclusions and future works	162
7.6 Acknowledgments	163
8 AntElements: An Extensible and Scalable Ant Colony Optimization Middleware	167
8.1 Introduction	168
8.2 Related Works	169
8.3 AntE Overview	172
8.3.1 Architecture	172
8.3.2 Output and data logging	177
8.3.3 Extensibility and Configuration	178
8.3.4 Low Level Optimization Techniques	181

8.4 Efficiency and Scalability	183
8.5 Existing Implementations.	184
8.6 Conclusions and Future Works	185
8.7 Acknowledgments	186
9 Discussion	187
10 Conclusions and Future Works	191
Bibliography	193
Figures	209
Tables	213