

Contents

List of Figures	ix
List of Tables	xiii
Preface	xv
1. TIME-VARYING SHORTEST PATH PROBLEMS	1
1 Introduction	1
2 Concepts and problem formulation	2
3 Properties and NP-completeness	5
4 Algorithms	8
4.1 Waiting at any vertex is arbitrarily allowed	9
4.2 Waiting at any vertex is prohibited	14
4.3 Waiting time is subject to an upper bound	15
5 How to take care of the “zero” ?	19
6 Speedup to achieve an optimal time/cost trade-off	21
7 Additional references and comments	24
2. TIME-VARYING MINIMUM SPANNING TREES	27
1 Introduction	27
2 Concepts and problem formulation	28
3 Arc series-parallel networks	31
3.1 Complexity	32
3.2 A pseudo-polynomial algorithm	33
4 Networks containing no subgraph homomorphic to K_4	41
4.1 Properties and complexity	41
4.2 An exact algorithm	43
5 General networks	52
5.1 Strong NP-hardness	52

5.2	Heuristic algorithms	57
5.3	The error bound of the heuristic algorithms in a special case	62
5.4	An approximation scheme for the problem with arbitrary waiting constraints	64
5.4.1	Creating a spanning reducible network	64
5.4.2	Numerical experiments	65
6	Additional references and comments	66
3.	TIME-VARYING UNIVERSAL MAXIMUM FLOW PROBLEMS	69
1	Introduction	69
2	Definition and problem formulation	71
3	The time-varying residual network	74
4	The max-flow min-cut theorem	80
5	A condition on the feasibility of f-augmenting paths	81
6	Algorithms	89
7	Additional references and comments	104
4.	TIME-VARYING MINIMUM COST FLOW PROBLEMS	107
1	Introduction	107
2	Concepts and problem formulation	108
3	On the negative cycle	110
4	Successive improvement algorithms	113
4.1	Waiting at any vertex is prohibited	113
4.2	Waiting at any vertex is arbitrarily allowed	120
4.3	Waiting at a vertex is constrained by an upper bound	124
5	How to fine-tune the algorithms in special cases?	130
6	The time-varying maximum (k, c) -flow problem	131
7	Additional references and comments	134
5.	TIME-VARYING MAXIMUM CAPACITY PATH PROBLEMS	135
1	Introduction	135
2	NP-completeness	136
3	Algorithms	138
4	Finding approximate solutions	145
5	Additional references and comments	149

6. THE QUICKEST PATH PROBLEM	151
1 Introduction	151
2 Problem formulation	152
3 NP-hardness	153
4 Algorithms	155
5 The static k -quickest path problem	157
6 Additional references and comments	165
7. FINDING THE BEST PATH WITH MULTI-CRITERIA	167
1 Introduction	167
2 Problem formulation	168
3 The MinSum-MinSum problem	171
4 The MinSum-MinMax problem	173
5 Additional references and comments	174
8. GENERALIZED FLOWS AND OTHER NETWORK PROBLEMS	175
1 Introduction	175
2 Time-varying networks with generalized flows	175
2.1 Notation, assumptions, and problem formulation	176
2.2 Time-varying generalized residual network and properties	178
2.3 Algorithms for the time-varying maximum generalized flow problem	182
3 The time-varying travelling salesman problem	192
4 The time-varying Chinese postman problem	197
4.1 NP-hardness analysis	198
4.2 Dynamic programming	199
5 Additional references and comments	206



<http://www.springer.com/978-0-387-71214-7>

Time-Varying Network Optimization

Sha, D.; Wong, C.K.

2007, XVI, 248 p. 63 illus., Hardcover

ISBN: 978-0-387-71214-7