
Contents

1	Customer-oriented Traffic Planning	1
1.1	Customer-oriented Transportation	1
1.2	Public Transportation Network and Customer Data.....	5

Part I Stop Location

2	Introduction	11
2.1	Application	13
2.2	Literature Review	14
2.3	A Model for Continuous Stop Location	15
3	Covering All Demand Points	21
3.1	Feasibility and Complexity of Complete Cover	22
3.2	A Finite Dominating Set	24
3.3	Complete Cover Along a Polygonal Line	29
3.4	Set Covering With Consecutive Ones Property	32
3.5	Complete Cover in a Realistic Network	40
3.6	Set Covering With Almost Consecutive Ones Property	46
4	Bicriteria Stop Location	59
4.1	Constraint Problems and Lexicographic Minimality	60
4.2	Integer Programming Formulations	62
4.3	Bicriteria Set Covering With Consecutive Ones Property	65
4.4	Varying the Radius	71
5	Extensions	75
5.1	Covering Demand Regions	76
5.2	Minimizing the Total Door-to-door Travel Time	85

Part II Delay Management

6	Introduction	95
6.1	Application	97
6.2	Related Literature	98
6.3	A Model for the Delay Management Problem	100
6.4	Event-activity Networks in Delay Management	104
7	Delay Management With Fixed Connections	109
7.1	Linear Programming Approach	110
7.2	Relation to the Critical Path Method	111
7.3	Relation to the Feasible Differential Problem	115
8	Minimizing the Sum of All Delays	119
8.1	A Linear Model	121
8.2	Activity-based Model	125
8.3	Constant Weights and the Never-meet Property	133
8.4	A Simple Special Case	145
8.5	Solving the model with constant weights	147
8.6	Solving the Total Delay Management Problem	163
9	The Bicriteria Delay Management Problem	175
9.1	A First Analysis	176
9.2	Integer Programming Formulation	179
9.3	Lexicographic and Supported Efficient Solutions	180
9.4	Finding All Efficient Solutions	182
10	Extensions	195
10.1	The General Delay Management Problem	195
10.2	Railway and Bus Specific Requirements	201

Part III Tariff Planning

11	Introduction	207
11.1	Frequently Used Tariff Systems	208
11.2	Application	212
11.3	Literature Review	213
11.4	A Model for the Zone Design Problem	213
12	Finding Zones and Zone Prices	219
12.1	The Fare Problem	220
12.2	The Maximum Deviation Zone Design Problem	224
12.3	Extensions for Real-world Problems	232

A	Integer Programming	237
B	Bicriteria Optimization	239
C	Gauges as Distance Measures	243
	Frequently Used Notation	247
	List of the Main Problems	251
	References	253
	Index	265