

Contents

1	Process Planning in Supply Consortia	1
1.1	Value Creation in Supply Consortia	2
1.2	Supply Consortia Resource Deployment Paradigms	5
1.2.1	Centralized Planning	7
1.2.2	Autonomous Control	8
1.2.3	Hierarchical Planning for Consortium-Type Governance	8
1.3	Transport Processes in Supply Consortia: Relevance and Challenges	10
1.3.1	Transport Process Derivation in a Supply Consortium	11
1.3.2	Process Endangering Events and Data Uncertainty	17

Part I Model-Based Transport Process Planning: Approaching the Limits

2	Transport Processes and Uncertainty	23
2.1	Formalization of Uncertainty within Decision Problems	23
2.2	Operational Management of Peaks in Transport Demand	24
2.3	A Dynamic Vehicle Routing Problem with Subcontractor Options	27
2.3.1	General Scenario Outline	27
2.3.2	Coordinator's and Service Agent's Interest Integration	28
2.3.2.1	Reference Configuration	29
2.3.2.2	Penalization of Late Arrivals	29
2.3.3	Dispatching Task of the Fleet-Managing Agent	30
2.3.4	Generation of Parameterized Test Cases	32
2.4	Conclusions	34
3	Decision Support: Applying the State-of-the-Art	35
3.1	Decision Support Systems and Transport Process Planning	36
3.1.1	Process Control by Decision Support Systems	36
3.1.2	DSS-based Control of Transport Process	37
3.1.3	Event-Handling in DSS for Dynamic Transport Dispatching	39

3.1.4	Challenges in Dynamic Disposition and Dispatching	40
3.1.5	Rolling Horizon Disposition and Dispatching	41
3.2	Online Planning in HARD- and PEN-Configurations	42
3.2.1	Memetic Algorithm for the Transportation Plan Generation	42
3.2.2	Constraint Handling Techniques	43
3.3	Simulation Experiments Report	44
3.3.1	Simulated Scenarios	45
3.3.2	Performance Indicators	45
3.3.2.1	Process Quality Indicators	45
3.3.2.2	Financial Process Evaluation Indicators	47
3.3.3	Computational Assessment of HARD and PEN	47
3.3.3.1	Online-Process Quality Assessment	48
3.3.3.2	Offline Process Quality Assessment	51
3.3.3.3	Online-Evaluation of the Process Costs	53
3.3.3.4	Offline-Assessment of the Process Costs	53
3.3.4	Varying Penalties	55
3.4	Conclusions	58

Part II Extending the Application Boundaries of Model-Based Planning

4	Decision Support in Principal-Agent-Relationships	63
4.1	Adaptive Process Control Systems	64
4.1.1	Reliable and Unreliable Adaptive Systems	64
4.1.2	Process Controller of Adaptive Systems	67
4.1.3	System Intervention by Image Modification	70
4.1.4	Image Modification and Event Handling in DSS	74
4.2	Image Modification and Process Re-Planning	74
4.2.1	Image Modification and Integrated Principal-Agent Resource Allocation	75
4.2.2	Preparing Integrated Principal-Agent Resource Allocation . .	77
4.2.3	Algorithmic Update of the Agent's Decision Model	79
4.3	Summary	81
5	Adaptive Controllers for Mathematical Optimization Models	83
5.1	Preparations	84
5.1.1	System Development Corridor	84
5.1.2	Definition of a Suitable Intensity Function	84
5.2	Accounting Scheme Adaptation	85
5.2.1	Accounting Schemes	85
5.2.2	Objective Function Re-Parameterization	86
5.2.3	Adaption of the Accounting Scheme to the Current Process Punctuality	86
5.3	Adaptive Exercising of LSP-Options	87
5.3.1	Decision Model Preprocessing and Presolving	88

5.3.2	An Adjustable Constraint Family	88
5.3.3	Preparing the Coordinator Agent's Interventions	89
5.3.4	Intervention Specification	90
5.3.4.1	Random Request Sequencing (RRS)	91
5.3.4.2	Distance-to-be-Bridged Sequencing (DBS)	91
5.3.4.3	Vehicle Availability Sequencing (VAS)	91
5.3.4.4	Remaining Time Based Sequencing (RTS)	92
5.3.4.5	Isolation Based Sequencing (IBS)	92
5.4	Evaluation and Assessment of the Model Controllers	94
5.4.1	Simulated Scenarios	94
5.4.2	Presentation and Discussion of Results	95
5.4.2.1	Parameterization of SDAD and CSAD	95
5.4.2.2	Online Comparison of Static and Adaptive Strategies	98
5.4.2.3	Offline Comparison of Static and Adaptive Strategies	100
5.4.2.4	Online-Evaluation of the Process Costs	101
5.4.2.5	Offline Cost Comparison of the Four Strategies	102
5.5	Hybridization of Model Adaptation Strategies	103
5.5.1	Parameterization of the Hybrid Strategy	103
5.5.2	Online Performance Comparison	104
5.5.3	Offline Assessment	105
5.5.4	Cost Evaluation	107
5.6	Summary of Findings	108

Part III Adaptive Model Controllers in Action

6	Responsiveness Improvement	111
6.1	Flexibility and Logistic Operations	112
6.1.1	Literature Review	112
6.1.2	Flexible Plans and Flexible Systems	113
6.1.2.1	Planflexibility	113
6.1.2.2	Systemflexibility	115
6.2	Quantification of Flexibility	116
6.2.1	Measures for Planflexibility	116
6.2.2	Systemflexibility Quantification	117
6.3	Computational Experiments	118
6.3.1	Experimental Setup	118
6.3.2	Results	119
6.4	Conclusion of Findings	121
7	Nervousness Reduction in Re-Scheduling	123
7.1	External and Internal Nervousness	124
7.2	Schedule Transition Nervousness	124
7.3	Transport System Nervousness	126

7.4	Flexibility and Nervousness of Logistic Operations	127
7.5	Numerical Experiments	127
7.6	Conclusions	131
8	Impacts on Robustness	133
8.1	Robustness in the Literature	134
8.1.1	Robustness of Schedules	134
8.1.2	Robustness of Systems	135
8.1.3	Achieving, Implementing and Conserving Robustness	136
8.1.4	Measuring and Quantification of Robustness	137
8.1.4.1	Planrobustness	138
8.1.4.2	Systemrobustness	138
8.2	Definition of Robustness	139
8.2.1	Basic Terms	139
8.2.2	Evaluation Schemes and Acceptable Updates	140
8.2.3	Evaluation of Disturbances	140
8.2.3.1	Controlling the Variation between the Original and its Update.	140
8.2.3.2	Referential Variation.	142
8.2.4	Comparison of Input-Output-Variations	143
8.2.4.1	Comparison of Update and Original.	143
8.2.4.2	Comparison of Updates with a Fixed Reference Schedule.	144
8.2.5	The Role of the Schedule Update Strategy	145
8.3	Robustness of Schedules and Systems	145
8.3.1	Robust Schedules	145
8.3.2	Robust Systems	146
8.3.3	Robustness and Flexibility	147
8.4	Quantification of Robustness	148
8.4.1	Planrobustness Quantification	148
8.4.2	Quantification of Systemrobustness	149
8.5	Robustness in a Transportation Scenario	149
8.5.1	Setup of the Simulation Experiments	150
8.5.2	Presentation and Discussion of Simulation Results	151
8.6	Conclusions	155
9	Summary and Conclusions	157
9.1	Principals, Agents and Dynamic Decision Problems	157
9.2	Innovative Methods for Decision Derivation and Evaluation	158
9.3	Principal-Agent Relationships: Improved Process Quality	160
	References	163
	Index	177

Model-Based Control of Logistics Processes in Volatile
Environments

Decision Support for Operations Planning in Supply
Consortia

Schönberger, J.

2011, XII, 184 p., Hardcover

ISBN: 978-1-4419-9681-7