

# Contents

<b>1 Introduction .....</b>	<b>13</b>
1.1 Motivation.....	13
1.2 Related Projects .....	14
1.3 Characteristic of the Riga Commercial Port.....	15
1.3.1 Introduction to the Riga Commercial Port.....	15
1.3.2 Current Situation in Container Terminal Management and Control.....	21
1.4 Overview of the book .....	22
<b>2 Data Processing System Design .....</b>	<b>25</b>
2.1 Introduction to Data Processing System Design Methods and Tools.....	25
2.2 Data Processing System Design Methodology.....	28
2.2.1 Information Survey of an Organisation.....	29
2.2.2 LIS Technology.....	32
2.2.3 Database Canonical Structure Design .....	41
2.2.4 A general Procedure for DPS Design.....	72
2.3 Application of the Data Processing System Design Methodology to the RHCT .....	73
2.4 Conclusion .....	88
<b>3 Harbour Process Modelling and Visualisation .....</b>	<b>89</b>
3.1 An Introduction to Simulation via Two GPSS/H Harbour Models .....	91
3.1.1 Abstract .....	91
3.1.2 GPSS/H in Brief.....	91
3.1.3 GPSS/H Semantics and Syntax .....	91
3.1.4 A Sampling of GPSS/H Features .....	92
3.1.5 A GPSS/H Model for a One-line, One-server Harbour System.....	92
3.1.6 A GPSS/H Model for a More Complicated Harbour System.....	106
3.1.7 Summary.....	114
3.2 Port Terminal Simulation - A State of the Art Survey.....	115
3.2.1 Introduction .....	115
3.2.2 A Review of Recently Published Papers on Port Terminal Simulation .....	115
3.2.3 Modelling Interorganisational Information Systems.....	120
3.3 Modelling and Simulation of the Riga Harbour Container Terminal .....	123
3.3.1 Overview of Resources and Operations.....	123
3.3.2 Modelling Methodology .....	124
3.3.3 Model Input Data.....	129

3.3.4 Model Output Data and Types of Simulation Experiments .....	137
3.3.5 Conduct of Simulation Experiments.....	143
<b>3.4 WWW-Based Simulation Experiments and Presentations</b>	
<b>of the Canal-and-Lock System.....</b>	<b>148</b>
3.4.1 Reference Points.....	148
3.4.2 From the reference Model to a reference Project.....	153
3.4.3 WWW based Simulation project step support.....	155
3.4.4 Open Problems .....	160
3.4.5 Outlook.....	161
<b>3.5 WWW Based Animation of the Canal and Lock System .....</b>	<b>162</b>
3.5.1 Introduction .....	162
3.5.2 Document publishing in the WWW .....	164
3.5.3 Animation in the WWW.....	164
3.5.4 Animation Systems.....	165
3.5.5 Skopeo - An Animation Tool for the WWW.....	166
3.5.6 Summary.....	173
<b>4 Classes for object-oriented Simulation of</b>	
<b>Container Terminals.....</b>	<b>175</b>
4.1 Basic Principles of Object-Oriented Knowledge Representation.....	175
4.1.1 Problems of Flexible Modelling.....	175
4.1.2 Introduction to Object-Oriented Programming .....	177
4.1.3 The SIMULA Programming Language.....	180
4.1.4 Main Structure of Classes for Container Yard Simulation.....	181
4.2 Basic Concepts of Container Terminals.....	183
4.3 General Concepts of Moving Bodies .....	185
4.4 Concepts of Rectangular Systems .....	193
4.5 Skeleton for Internal Routines.....	198
4.6 Concepts of Interactive Work.....	203
4.7 Tools for Displaying Places.....	210
4.7.1 Coloured Displaying.....	211
4.7.2 Monochrome Displaying.....	215
4.8 Some Tools for Animation .....	218
4.8.1 No Animation .....	218
4.8.2 On Line Pseudographic Animation.....	218
4.8.3 Post Run Animation .....	221
4.8.4 Mixed Animation .....	222
4.9 Auxiliary Tools for Storing Results .....	223
4.10 Pseudo-Random Number Generators.....	227
4.11 General Tools for File Handling .....	231
4.12 Philosophy of the Demonstration Model.....	235
4.13 Concepts of Systems with Random Behaviour.....	239
4.14 Classes for the Demonstration Program.....	242
4.15 Structure of the Demonstration Program .....	250
4.16 Prefixed Block Representing the Simulation Experiment.....	255
4.17 Notes on the Behaviour of the Demonstration Program.....	262
4.18 Fictitious Simulation Routines.....	265

4.19 Simulation Model following 20-Foot Container Yard of Riga Harbour.....	274
<b>5 Conclusions .....</b>	<b>279</b>
<b>6 Bibliography.....</b>	<b>281</b>
<b>7 Appendix .....</b>	<b>291</b>

# Authors Index

## Authors

Eberhard Blümel

Egils Ginters

Eugen Kindler

Peter Lorenz

Yuri Merkuryev

Leonid Novitski

Jurijs Pronins

Klaus-Christoph Ritter

Frank Seibt

Thomas J. Schriber

Dick Slagter

Juri Tolujew

Elena Viktorova

## Chapters

1.1; 1.2; 1.4; 5

2, Appendix

4, 5

3, 3.4; 3.5

1.3, 3.2

1.3; 2

1.3., 2.3, Appendix

3.4

3.5

3.1, 3.4

1.1, 1.2;

3.2, 3.3

2, Appendix