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Sebastian Meiswinkel

On Combinatorial Optimization and Mechanism Design Problems Arising at Container Ports

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With a foreword by Prof. Dr. Erwin Pesch

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Foreword

Globalisation and the internet are main driving forces for the rapid increase of freight transport over the past years, and its growth is predicted to continue in the same rate for the next decade or more amongst others due to China's One Belt One Road (or New Silk Road) initiative, that is intended to intensify the trade between Europe and Asia along the former silk road.

Intermodal transport is mostly the transport of containers in one supply chain in more than one transport mode, e.g, by rail, road or sea. While the long distances are covered by huge container vessels that periodically operate between sea ports, or by intercontinental trains, trucks are operating on the so called last mile between customers and a rail transshipment terminal or a sea port in order to deliver or pick-up the freight.

Transshipment yards and container ports are main points where the transportation mode of goods can be changed. Since rail and roads are operating at their capacity limits, an acceleration of freight transport requires faster processes in order to improve the efficiency of cargo handling at container terminals and to cope with the increasing shipping volume.

In this book "On Combinatorial Optimization and Mechanism Design Problems Arising at Container Ports" the author concentrates exactly on that, analysing different transportation problems arising at container terminals from a quantitative point of view.

In the first part, the author discusses situations where an operator of a container terminal serves clients who can be assumed to behave selfish. If the operator of a container terminal requires private information from the clients for a socially optimal decision, it is necessary to provide an incentive or mechanism that all clients commit their true information and do not try to influence the outcome by false information. Algorithmic mechanism design is a research area that deals with the construction of these methods to make the clients to be truthful. The author made a major contribution to this field by improving the understanding of truthfulness in case of specific scheduling problems.

The second part of this book deals with real world optimization problems without any private information that appear at container ports. Efficient handling of the internal

processes is important for the terminal being competitive, since many terminals are under high competitive pressure and therefore need to optimize their processes.

This book should be most suitable to researchers and students of logistics and operations research. In addition, the contents of this book might be very interesting to those in industry who need to solve problems on the design, operation, and management of container ports.

Prof. Dr. Erwin Pesch

Preface

This thesis represents the result of my PhD study at the Chair of Management Information Science at the University of Siegen. This time has been a challenging and long journey, but I was fortunate enough to be accompanied by many people. I thank all of them, particularly the ones below.

First, I would like to express my great gratitude to my supervisor Prof. Dr. Erwin Pesch. He offered me the opportunity to work at the Chair of Management Information Science and to conduct my PhD research. He was very open-minded in his supervision and I enjoyed very much the freedom he gave me to pursue the research direction I like. Throughout my study, he continuously supported me with his broad knowledge in the fields of logistics and operations research. His professional comments and invaluable advices have helped me improve the scientific quality of this thesis.

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Siegen, March 2018 Sebastian Meiswinkel

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