Efficiency and Robustness in Railway Operations

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Passenger railway transport is an effective means of providing high capacity transport that is energy efficient and has low emissions. As the population of Denmark grows and there is an increased request for mobility, there is a need for railway services offering greater capacity and more reliability. Offering these services presents a challenging sequence of planning problems for operators. These range from problems considered on a daily basis to planning for years in the future, with different problems interacting and influencing each other.

Operations research methods can be used to effectively model, investigate, and solve railway planning problems. Despite advances in computational power these large problems are still challenging to solve, especially as more modelling detail is sought. Within a Danish context this thesis seeks to apply operations research methods to different planning problems beyond past approaches, and where applicable, investigate solution methods that place more focus on the passenger and passenger experience. To cater to the growing demand for rail transport, and compete with different modes of transport, Danish railway operators must offer a consistent, reliable service, that is well planned from both a passenger and operator perspective. This thesis therefore considers different planning problems within passenger railway considering robustness of the system, and efficiency and optimality from the point of view of the passenger or operator.

The contributions of the thesis are in the investigation of robustness in railway, the application of optimization to a number of railway planning problems, and a detailed consideration of the specific concerns of Danish railway services. These contributions are summarised in the introductory chapter, and in the latter part of the thesis are given in each chapter.

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