Susceptibility of optimal train schedules to stochastic disturbances of process times

This work focuses on the stochastic evaluation of train schedules computed by a microscopic scheduler of railway operations based on deterministic information. The research question is to assess the degree of sensitivity of various rescheduling algorithms to variations in process times (running and dwell times). In fact, the objective of railway traffic management is to reduce delay propagation and to increase disturbance robustness of train schedules at a network scale. We present a quantitative study of traffic disturbances and their effects on the schedules computed by simple and advanced rescheduling algorithms. Computational results are based on a complex and densely occupied Dutch railway area; train delays are computed based on accepted statistical distributions, and dwell and running times of trains are subject to additional stochastic variations. From the results obtained on a real case study, an advanced branch and bound algorithm, on average, outperforms a First In First Out scheduling rule both in deterministic and stochastic traffic scenarios. However, the characteristic of the stochastic processes and the way a stochastic instance is handled turn out to have a serious impact on the scheduler performance. © 2013 Springer Science+Business Media New York.

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