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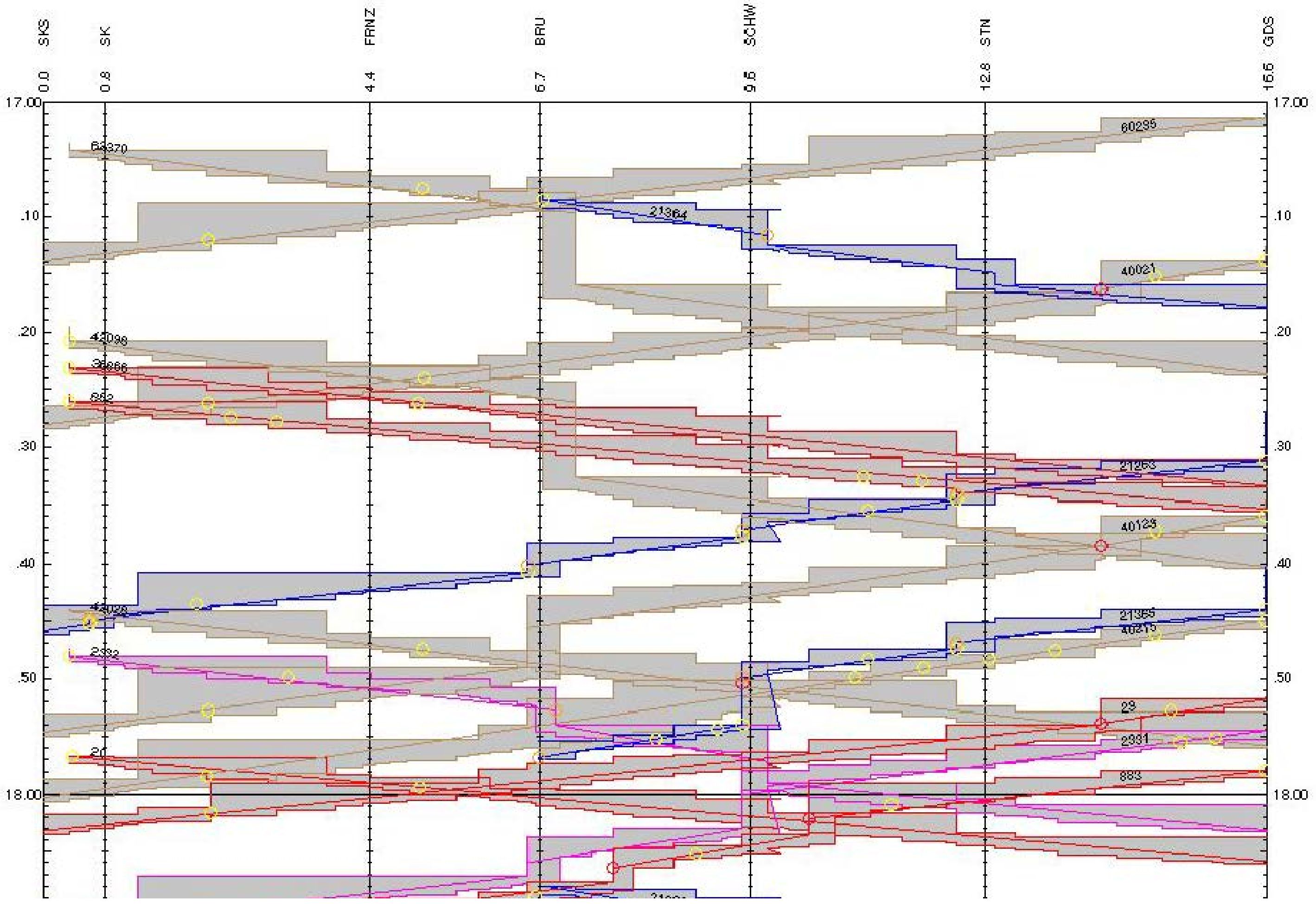
Projektdatenblatt

Performance Assessment of a Rescheduling Routine



Institut für Verkehrsplanung und Transportsysteme

Institute for Transport Planning and Systems

Eidgenössische Technische Hochschule Zürich

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Performance Assessment of a Rescheduling Routine

Background and scope

Punctuality and capacity are key success factors of railways, which usually cannot be improved at the same time without costly infrastructure investments. In order to increase capacity by keeping the same level of punctuality, automatized algorithms for railway dispatching have been proposed. This thesis aims at assessing the performance of such a rescheduling routine developed at ETH Zurich.

Rescheduling routine

The core of the rescheduling routine is a linear constrained optimization problem which is implemented in a C++ code and solved by a commercial CPLEX solver. In order to assess the performance of the routine, simulations in OpenTrack (release 1.8.4) are performed as a substitute for reality. The routine receives real-time operational data from OpenTrack and combines them with a pre-generated set of blocking time stairways in order to compute the best dispatching decisions (Figure1). The main goal is to find a feasible solution for all trains, with second priority, train delay is minimized.

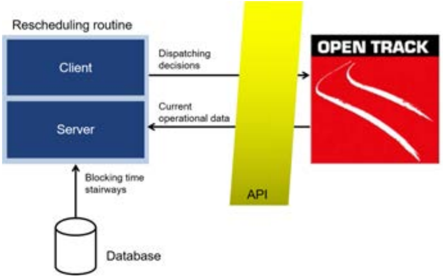

Figure 1: Experimental setup: The rescheduling routine receives simlated operational data from OpenTrack, combines them with a set of pre-processed blocking time stairways to compute the best dispatching decision

Test case

Tests on a microscopic simulation model of the Gotthard railway between Arth-Goldau and Sisikon (Figure 2) reveal that computa-

Figure 2: Railway line between Arth-Goldlau and Sisikon, which is used for the test case

tion time strongly increases at small pulse lengths, whereas solution quality in terms of operational feasibility (Figure 3) and unscheduled stops (Figure 4) does not improve. This is

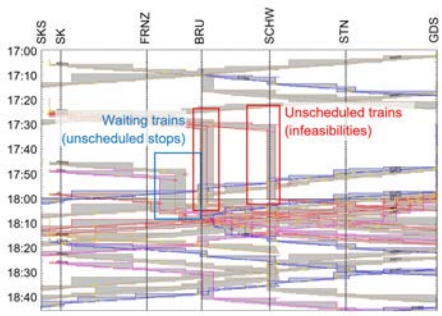

Figure 3: Trains with no feasible disposition schedule block subsequent trains (data labels: pulse length [s])

due to infeasibilities, which may be caused by an inadequate solution space. However, improvements of computation time as well as the number of unscheduled stops can be ob-

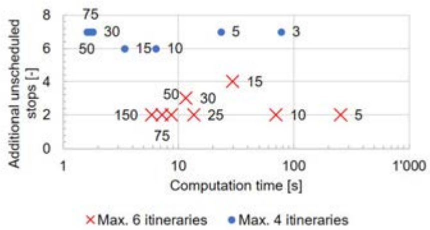

Figure 4: Scenario with large average delays, rescheduling at 17:30: Three trains are not rescheduled within the rescheduling horizon (until 18:00) due to infeasibilities. As a result, two subsequent trains have to wait behind

served by increasing the number of routing options.

Conclusion

Assessing model performance proofs to be a difficult task. Nevertheless, the experiments give insights about the influence of different parameter sets and boundaries: Increasing the problem size, e.g. by shortening the time shifts for allocation of blocking time stairways, does not guarantee an improvement of the solution quality. The experiments further reveal that many parameter sets lead to infeasibilities causing secondary delays. In order to obtain good results at reasonable computation times, special attention needs to be paid at suitable parameter combinations. They may be based on operational conditions such as average delay.

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Applied methods/procedures
Microscopic railway simulations in OpenTrack (realease 1.8.4) using an application programming interface (API) to the rescheduling algorithm

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