

Capacity Test for Shunting Movements at Railway Stations

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Shunting Processes

Shunting movements are carried out in and around the large railway stations in order to provide passenger trains with the right composition of rolling stock, to facilitate the inside and outside cleaning and the short term maintenance of the rolling stock. These shunting movements have to take place between the timetabled passenger and cargo trains. They should not disturb these trains. The limited capacity of time and space (routing and storage) leads to several bottlenecks in the railway process. For every shunting movement between the shunting area and the platform area, an appropriate time instant and route on the infrastructure have to be determined.



Capacity Test

Currently every detail of a shunting movement is planned months before actual operations to verify whether the capacity of the infrastructure is sufficient. This results into a lot of replanning. To prevent this replanning a capacity test is developed which verifies whether the capacity of the infrastructure is sufficient to facilitate all the shunting movements between the platform area and a shunting area. It checks whether it is still possible to schedule and route the shunting movements between the passenger and cargo trains, taking into account a certain *headway time* between each pair of train movements for robustness sake.

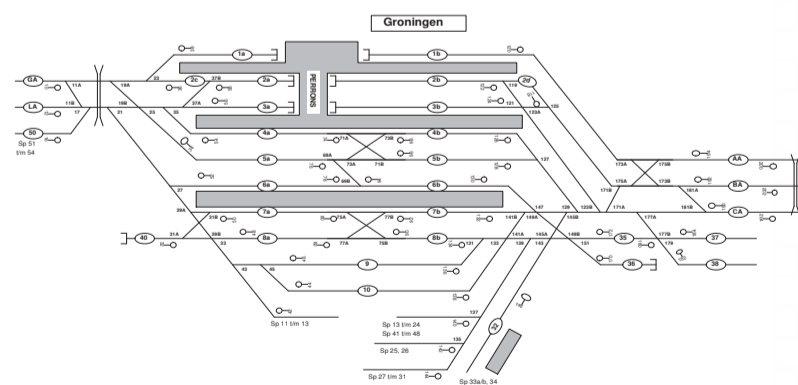
Mathematical Tools

A mixed integer programming model is developed which verifies whether it is possible to plan all the shunting movements, between the passenger and cargo trains. The model is solved by CPLEX 10.0. The tool is tested on almost all larger railway nodes of the Netherlands, and the computation time CPLEX needs to solve it for a test interval of 24 hours is in the order of a few seconds.

$$\begin{aligned} \min & cx \\ Ax & \leq b \\ x & \geq 0 \end{aligned}$$

Developed Tools

A user friendly decision support system is developed in java which is currently being tested at Dutch Railways. It will be a very important planning tool and part of the new planning systems of the Dutch Railways. Expected is that it will save planners at least 60% of their time, because detailed shunt planning can be postponed to shortly before real operation.



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