

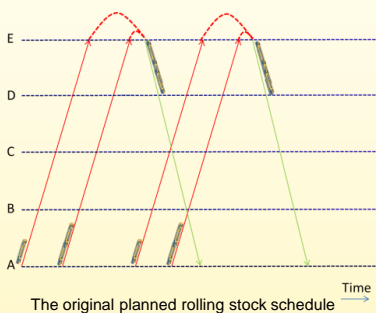
Rolling Stock Rescheduling by Using Dead-Heading Trips

“Do dead-heading trips help reduce the number of cancelled trains during a disruption?”

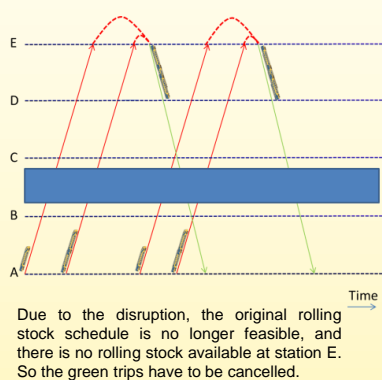
Railway monitors are allowed to send empty train units from one station to another while rescheduling the rolling stock during disruptions. Such a trips is called a dead-heading trip. In this research we add this additional feature to the current mathematical models for the Rolling Stock Rescheduling Problem (RSRP).

Example of the use of dead-heading trips

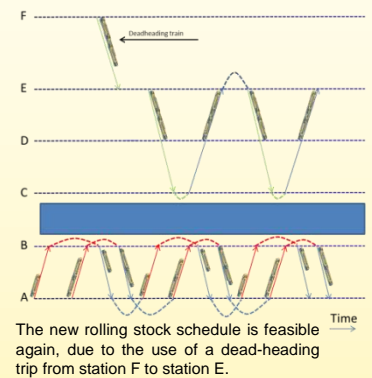
Original rolling stock schedule



A disruption between B and C



The new rolling stock schedule



Model description

The model has the current rolling stock (RS) schedule and the adapted timetable as input.

The goal is to reschedule the rolling stock in such a way that as little trains as possible are cancelled and the schedule converges as soon as possible back to the original RS schedule.

The model is an adaption of the current RSRP model of Nielsen (2011) with an additional integer variable for the number of empty train units send from station A to station B at a certain moment in time.

The dead-heading trips have to satisfy the following constraints:

- The empty train units are directly appointed to a trip departing from station B.
- The stations A and B are no more than a certain threshold value apart from each other
- Station B has to be accessible from station A during the disruption

Advantages

- Possible less cancelled trains
- Quicker return to the original RS schedule
- Higher passenger satisfaction

Relevance

The relevance of this model is practical oriented. The Dutch Railways do have many reschedule flexibilities during disruptions to reschedule.

Most of the flexibilities are not included in the current RSRP models and that is partly the reason the models can not be applied in practice.

Using dead-heading trips is one of the flexibilities, so adding them to the models is the first step to using the models in practice.