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# The impact of track discretisation in rescheduling models for advanced distance-to-go railway signalling

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For effective railway operations, real-time railway traffic management is crucial. In case of disturbances, traffic management can apply rescheduling and rerouting measures to resolve conflicts while minimising the propagation of delay. To support human dispatchers in taking optimised decisions, conflict detection and resolution (CDR) models are developed. Predominantly based on alternative graphs or mixed integer linear programming (MILP), the existing models mostly refer to conventional signalling systems in which the track is discretised into fixed blocks. Only at block entries, trains can receive a brake indication. Hence, train separation is based on a number of blocks. With the implementation of continuous braking curve supervision in distance-to-go (DTG) signalling systems such as the European Train Control System (ETCS) [1], train separation is based on absolute braking distances. Consequently, an explicit relation between speed and train separation is required in CDR models for DTG signalling [2]. Recently, we proposed enhancements for existing CDR models to describe DTG operations. The enhancements relate to track discretisation, speed profile options and train separation. We applied these enhancements to RECIFE-MILP [3], resulting in a tailored CDR model for DTG signalling [4]. In this research, we consider the model for the more advanced DTG signalling systems of ETCS Level 3: Fixed Virtual Block and Moving Block. In these train-centric signalling systems, train position and integrity are monitored on-board – as opposed to conventional trackside train detection. We update the DTG model accordingly, and we investigate the impact of track discretisation granularity on the model performance. The impact is assessed in terms of delay recovery and rescheduling decisions. The results indicate that, depending on the track and traffic scenario, a finer granularity can lead to different rescheduling and rerouting decisions due to shorter train separation.

**Keywords:** Railway traffic management, conflict detection and resolution, rescheduling and rerouting, distance-to-go signalling, moving-block signalling, mixed integer linear programming.

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