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IMPROVING TRAIN DRIVING EFFICIENCY BY LEARNING FROM PAST JOURNEYS

Lars Geese, Cedric Steinbach, Andreas Oetting

Technical University Darmstadt, Germany

lars.geese@tu-darmstadt.de, steinbach@verkehr.tu-darmstadt.de, oetting@verkehr.tu-darmstadt.de

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Summary: The efficiency of rail operations is influenced by the driving style of train drivers. Passenger comfort, maintenance costs, and energy consumption can vary depending on individual driving behavior, even within the constraints of timetables, train protection systems, and regulations. Automated train operations—even at lower Grade of Automation levels—remain years away for most Rail Undertakers. Therefore, optimizing manual train driving remains a significant opportunity to improve efficiency. Driver Advisory Systems (DAS) are already in use to support energy-efficient and on-time driving by providing real-time recommendations based on computed optimal trajectories. However, the extent to which train drivers follow DAS recommendations depends on factors such as individual acceptance, workload, and the practicality of the suggested actions. To further optimize efficiency, this presentation introduces a new method for providing train drivers with individual feedback on their driving style through post-journey analysis. This approach aims to identify concrete and individual improvement steps—both general and route- or vehicle-specific—that can be communicated to drivers on a regular basis in a suitable learning environment. Unlike DAS, this method does not interfere with the driver during the journey but instead offers retrospective insights based on an analysis of past train rides. The development of the presented approach comprises a new calculation method of post-hoc optimal trajectories that were feasible for a given train journey. A trajectory is considered feasible if a train driver can follow it under all real-world conditions (e.g., vehicle condition, weather conditions). The necessary vehicle, infrastructure, and traffic data to calculate the optimal yet feasible trajectories are identified as well as data sources for the actual trajectories.Further needed components of the post-hoc analysis are functions to compare the calculated optimal and actual trajectories, assessment functions to evaluate driving styles, and methods to derive actionable improvement steps.This presentation briefly shows the challenges of DAS practicability, the necessity of the new approach and presents preliminary findings of the post-hoc analysis.The findings include the requirements for feasible trajectories, the identified necessary data sources and the possible calculation methods for the proposed post-journey feedback.