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The Development of a Status Prediction Model for Railway Tracks from On-Board Monitoring Data

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Abstract

Monitoring the tracks' status by inspection trains is a common procedure for maintaining the railway system safety. However, railway regulators nowadays are facing the challenge of lacking time and resources to perform inspections due to increasing traffic demand. One possible solution for this is applying the On-Board Monitoring (OBM) technique, which aims to use commercial trains for monitoring the tracks' status. This allows railway regulators to perform more inspections without affecting the traffic and using expensive inspection trains. However, the new OBM data differ from those collected by common inspection trains in several aspects, including lower data quality, higher monitoring frequencies and fewer features recorded. Therefore, new methods should be developed for applying the new data. This study develops a Markov model for predicting the tracks' status using OBM data. Practical regulations and thresholds are applied for setting the states in the model. Real data collected from the Switzerland railway network are used for verifying the model. Results show that the proposed model is capable of predicting the degradation of the tracks' status and the occurrence of the Drivers Response Failures (DRF), which can assist the railway regulators in scheduling maintenance tasks.

Keywords

Track quality index, Markov model, railway maintenance