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Sysyn M.,
Institute of Railway Systems and Public Transport,
Technical University of Dresden, Dresden, Germany

Gerber U.,
Institute of Railway Systems and Public Transport,
Technical University of Dresden, Dresden, Germany

Kluge F.,
Institute of Railway Systems and Public Transport,
Technical University of Dresden, Dresden, Germany

Nabochenko O.,
Department of the rolling stock and track, Lviv
branch of Dnipro National University of Railway Transport, Lviv, Ukraine

Kovalchuk V.
Department of the rolling stock and track, Lviv
branch of Dnipro National University of Railway Transport, Lviv, Ukraine

Abstract

The paper deals with remaining useful life (RUL) prognosis of common crossings based on inertial measurements. Axle-box inertial measurements on operational trains could be a cheap alternative to conventional inspection means. The low correlation between maximal wheel acceleration and useful life of the crossing is considered and the reasons are analysed. A machine learning approach, including feature extraction, selection, fusion and degradation modelling, is then used to cope with the problem. More time domain and spectral features are extracted from measured vertical accelerations to provide a higher utilization of the available information. After removing redundant features, the data is fused using principal component analysis to obtain a condition indicator for common crossings. A data-driven prognostic methodology is proposed based on an iteratively updated exponential degradation model. The assessment of the prognosis quality is carried out depending on the crossing lifetime and the reached value of the condition indicator.

Keywords: railway turnout, remaining useful life, condition indicator, axle-box inertial measurement, feature extraction and transformation, degradation modelling

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