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Statistical model for pavement rutting based on annual pavement surface measurements.

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Maintaining quality pavement is important for road safety. Further, effective pavement maintenance targeted at the right locations is important for maximising the socioeconomic benefits from the resources allocated to maintenance activities. A flexible pavement is multilayered with asphalt concrete at the top, base and subbase course followed by compacted soil subgrade. Several laboratory testing studies, with layers subjected to various stress combinations, were done for the development of prediction models. The resulting models are known as mechanistic empirical approach. However, such models that consider the rutting contribution of each component layer are limited. In this work, we propose, fit and evaluate statistical spatial models in the framework of linear mixed models with spatial components. Traffic intensity and asphalt concrete layers are included to account for and estimate their contribution to rutting. In addition, the proposed models quantify uncertainty, and identify locations potentially in the greatest need for maintenance. The models are fitted to data for a ten-year analysis period (2011-2020) collected from the 461km Highway stretch of the European route EV14 —Stjørdal, Norway to Storlien on the Swedish boarder. The results show that rutting increases with increasing traffic intensity and that there are spatial dependencies. Further, we provide maps with expected rutting and some locations have been identified for accelerated deformation, with reduction in pavement life expectancy of at least 10 years.

Keywords

road maintenance, statistical models, optimization, uncertainty quantification

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