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Category: Rail

Country: Sweden

Research Area 8: Planning, Modelling and System Design

Idea Number: 15

Track friendliness 4.0

The rail transportation sector across the world in the 21st century is at a unique juncture. On one hand, it is being increasingly acknowledged as the eco-friendliest mode of transportation for its relatively limited emissions. On the other hand, frequent rail-service breakdowns because of aging infrastructure and unsynchronized maintenance planning has led to some questioning its efficiency. However, in the age of the industrial revolution 4.0 there is an opportunity to move over to predictive maintenance strategies considering both the vehicle and the track as a single integrated system. The combination of the relative regularity of the traffic patterns on a railway line for a given period of time, as compared to a highway, with the availability of powerful cloud-computing interfaces opens powerful modelling opportunities. In particular, it is in principle possible to model the integrated vehicle-track interaction over large tonnage and predict maintenance intervals and grade vehicle classes according to the damage they cause to the tracks. This can further encourage innovation in the way we design running gears and maintain our tracks. Moving beyond physical modelling, the research also aims to demonstrate the economic robustness of the method by including an econometric approach guided by engineering principles. The intended outputs of the methodology are to (a) optimize and predict maintenance intervals of railway track sections for the infrastructure managers to help them decide track access charges for different vehicles, (b) guide vehicle builders regarding the dynamic characteristics of vehicle that warrants minimum track damage.

Key Characteristics

Rail-service breakdowns • Predictive maintenance strategies

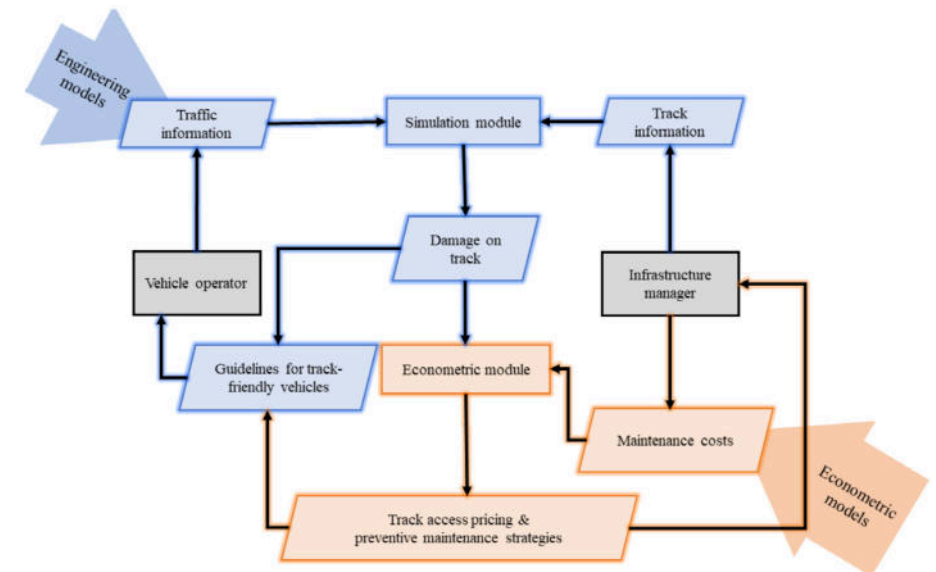


Figure 1: The integrated vehicle-track system approach for better maintenance strategies and innovative running gear solutions. Stakeholders include both the vehicle operators and infrastructure managers

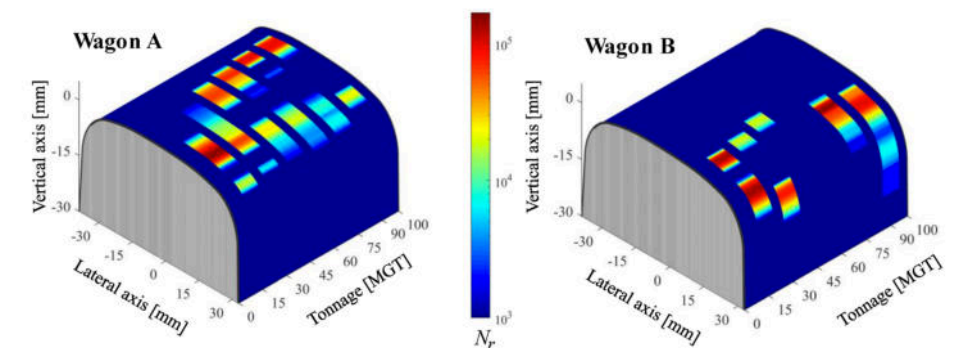


Figure 2: The rail surface damage prediction for two different wagon designs from the simulation module at different periods for a total passage of 100 Million Gross Tonnes (upto 6 years). N_r gives indication to the infrastructure manager on maintenance routines at different points of time. (Model developed by the author)