Rail4Future

Projekttitel:	**Resilient Digital Railway Systems to enhance performance**
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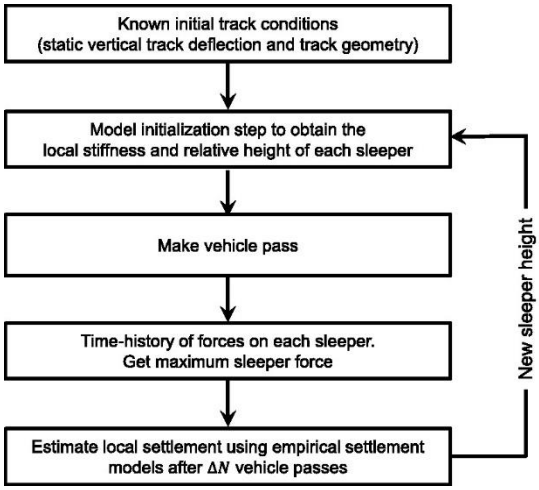

To be able to implement different use cases into a virtual platform, it is crucial to be familiar with simulation tools, simulation processes, file formats, programming languages, input parameterization, output generation, result validation, asset (model & data) integration, containerization and co-simulation techniques. Besides, some use cases take a relatively long time to finish their large-scale simulation in the platform. Thus, the simulation models of the use cases are to be reduced, trained by using an AI-based algorithm and then to be adapted to the platform. In addition, the OS of the platform is a significant concern, because the simulation runs of models are OS-dependent. Furthermore, we need to connect the platform to a license server for some use cases, that allows us to run model simulations belonging to the use cases in the platform. Therefore, the necessity of commercial software licenses cannot be denied for the use case implementation. To overcome the limitations, we proposed a model standardization approach, where we standardize and containerize the simulation unit of different use case models incl. the AI-based simulation models with their data, and a model simulation approach, showing how to run simulations, how input parameterization, output generation and result validation of all the use cases are realized in the platform. In order to make the platform extensible in a sustainable way different strategies to implement different models and data on the R4F platform are needed, Several railway use cases such as the MBS model of a railway vehicle, ML-based surrogate model of the vehicle, anti-slip traction and vehicle speed control use case, RLT calculation of a steel bridge, VTI use case,where used as a case study to develop these strategies. During this implementation, we mention different open-source or commercial software tools, packages, libraries, file formats and interface standards, which we propose to use to standardize the simulation units of these use cases, and then run their simulation in the platform By this, we aim to reduce model and data complexity, to describe system structure, to increase tool-independence and file. Furthermore, implementation of the use cases in detail is presented to highlight the practical aspects.