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Development of an Operational Digital Twin of a Locomotive Systems

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A Digital Twin (DT) is a new and powerful concept that maps a physical structure operating in a specific context to the digital space. The development and deployment of a DT improves forecasting prognostic performance and decision support for operators and managers. , DT have been introduced in various industries across a range of application areas including design, manufacturing and maintenance. Due to the large impact of maintenance on the proper functioning of a system, maintenance is one of the most studied DT applications. In the case of trains, poor maintenance can put the rolling carts out of service or, worse, pose a safety risk to passengers and operators. Implementing intelligent maintenance strategies can therefore offer tremendous benefits. This study addresses the development of an architecture for DT designed to formulate and evaluate new hypotheses in predictive maintenance by iterating between physical experiments and computational experiments. The designed DT supports a broad perspective on statistical aspects of simulations and experiments. In addition, the DT enables real-time prediction and optimization of the actual behavior of a system at any stage of its life cycle. Examples of safety valves and suspension systems will be given.

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