



DOCTORAL THESIS

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IT FACULTY

In modern vehicles, tremendous amounts of software fulfill multiple roles and manage various vehicle features, ranging from engine control to safety features, to entertainment. Vehicles today contain more than 100 million lines of code, about five times as much as in modern air crafts and twice as much as in current operating systems. The number of dependencies between the software systems inside the vehicle raises their complexity together with the size. All of these challenges can be related to maintainability, which describes how efficient developers can modify the software.

This thesis focuses on understanding and rigorously assessing the maintainability of simulation models, which are crucial for the development of automotive software. First, we elicit aspects of maintainability from practitioners to outline how they understand maintainability. We then show in detail how to quantify maintainability using software measurements. Building on top of that, we describe how outlier analysis and prediction approaches can be used with the measurement results to investigate and forecast maintainability. Lastly, we show how to evaluate software quality when creating a software architecture in the automotive domain. In this thesis, we combine quantitative analysis and qualitative methods involving practitioners to present rigorous and applicable methods for maintainability assessment.



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Understanding, Measuring, and Evaluating Maintainability
of Automotive Software



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