Optimization of scalaBle rEaltime modeLs and functIonal testing for e-drive ConceptS

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Publishable Executive Summary

This deliverable (D3.5) is composed of 3 main parts dealing with presentation of different system-level reduction analysis, then with system integration and vehicle-level strategies and finally with real-time simulator description.

Model reduction strategy can be applied for different physical subs-system of an Electric Vehicle, but also for control purpose. The objective is mainly linked to real-time simulation. Some criteria must be respected to make model with fixed step solver and faster than real-time. Some stability studies are presented highlighted the importance of these criteria. Vehicle models, which are presented in this document, are compatible with real-time capability after being reduced thanks to these methodologies.
Furthermore, model reduction strategy can only be used to reduce complex physical model in simpler and faster way to be integrated at vehicle level for example. Example of cooling circuit and brake model are given in this deliverable.

Vehicle level strategies and system-level integration are described to take interaction between system into account. Indeed, interface and communication are key point and must be analysed carefully to insure model stability. Furthermore, optimized energy balance in electric vehicle must be also analysed to enhance the overall vehicle efficiency.

Real-time simulator is a key point of the OBELICS project, especially for electric powertrain. Indeed, inverters are composed of electric components with very high switching frequency, which cannot be managed in conventional simulation approaches. Some examples of real-time simulators are presented using Field Programmable Gate Array (FPGA) approach, which allows running model with very high frequency and being real-time compatible. The interest of such simulator is to reduce the effort for the control calibration process by using simulation instead of prototype.

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