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Development and validation of Dynacar RT software, a new integrated solution for design of electric and hybrid vehicles

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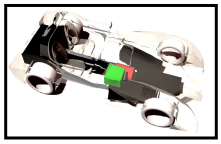
Abstract— Vehicle modeling and simulation is becoming a key competence for the development of the electrified vehicle systems, from preliminary designs to implementation and validation phases. Usually different vehicle models are used in design phases, leading to lack of traceability and robustness in the design process. An integrated approach is presented in order to allow automotive engineers to use a single vehicle model from the very beginning of the design to the most severe hardware in the loop and power train in the loop requirements. The new modeling concept presented has been validated with a 100kW electric race car in a test track. Validation results compared to simulation predictions are presented in the paper.

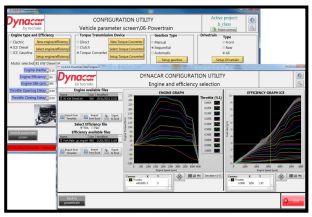
Dynacar by tecnalia

Integrated Real Time vehicle model for the design of electric and hybrid vehicles

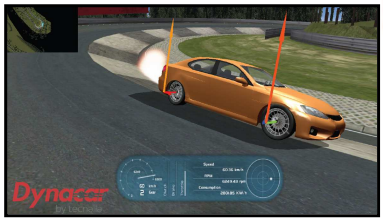
EVS26 MAY 6-9, 2012 LOS ANGELES, CALIFORNIA ELECTRIC VEHICLE SYMPOSIUM



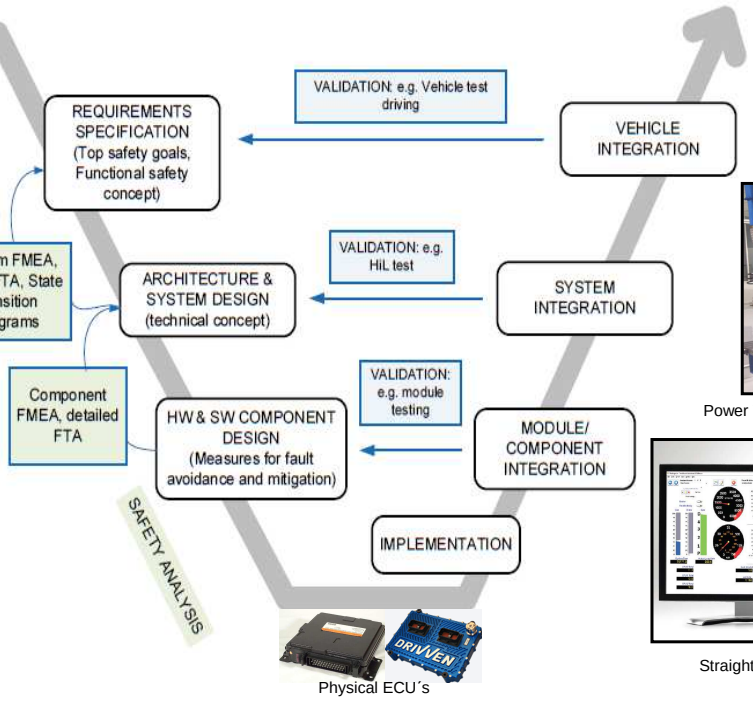
Virtual Rolling Chassis[tm] set up



Detailed Power Train and driving scenario configuration



Virtual testing execution with advanced graphic 3D environment



Physical ECU´s

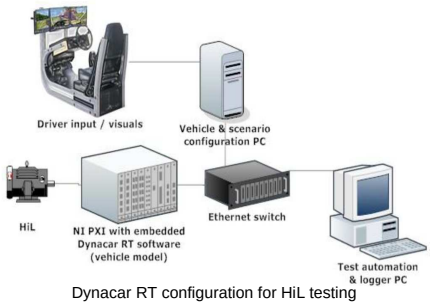
Vehicle Testing and Validation

Power Train in the Loop using model based testing

Straightforward Hardware in the Loop testing using Dynacar in National Instruments Hardware

Dynacar can be used in the development of electric, hybrid and ICE powered vehicles for the following purposes:

- Quick vehicle performance assessment
- Power Train system and subsystem specification definition
- Power Train control strategies design and development (SW / Model in the Loop)
- Human in the loop assessments as driving simulator



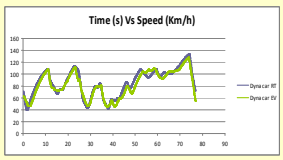
Dynacar RT configuration for HiL testing

Dynacar can be used in the validation of electric, hybrid and ICE vehicles systems for the following purposes:

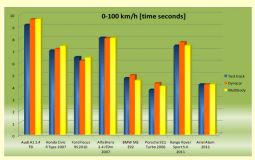
- Hardware in the loop of power train controllers
- Engine / transmission in the loop
- Electric drive in the loop
- Model based test of Energy Storage systems
- "Third party" real time model integration through Veristand[tm] 2011 from National Instruments
- Combined Human & Power train in the loop

Dynacar has been validated by means of the following activities:

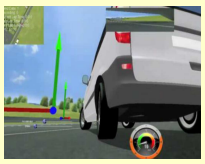
- Physical measurements in track testing (less than 6% error)
- Comparison with multi body-off line vehicle simulation tools
- Several R&D projects related to electro-mobility and driving dynamics
- Both lateral and longitudinal dynamics are validated



Vehicle instrumentation in test track



Comparison with vehicle modeling SW



Electrification R&D projects

- Based on the methodology presented in EVS24, Stavanger, 2009: Awarded as "Best Dialogue presentation": Integrated Modelling Approach for Highly Electrified HEV. Virtual Design and Simulation Methodology for Advanced Power Train Prototyping
- Awarded as CAE innovation of the year 2011 by "Automotive Testing Technology International".
- Dynacar RT technology has been deployed several industry laboratories and research institutes

EVS 24 Towards Zero Emission STAVANGER, NORWAY 13-16 MAY 2009 The 24th International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium & Exhibition

automotive testing EXPO 2011 north america October 25, 26 and 27 2011 The Suburban Collection Showplace, Novi, MI, USA

automotive testing technology international