Dynasim

Case Study

Dynasim's Dymola Software Helps Toyota
Design and Rapidly Bring New Hybrid Car to Market

The Challenge

"Automotive Control Systems have become more complex year by year. Toyota has realized that substantial improvement in development process is seriously needed. Efficient physical modelling is a key for the purpose. Traditional tools are insufficient for required high reusability of developed models and cutting development time," says Akira Ohata, Toyota Motor Corporation.

The Project

The development of the Coordinated Control System for the Toyota Prius hybrid car with both a standard engine and an electrical motor posed new challenges during the design about four years ago. Since torque is delivered from two sources, a completely new coordinated controller needed to be developed and tested.

The Solution

The Dymola software from Dynasim (www.dynasim.se) was chosen as rapid modelling tool for debugging electronic control units, determining the hardware specification and making the strategy of system development. The potential of re-usability of developed model in Dymola was very attractive. Dymola adopts the technology of symbolically handling equations which allows Dymola to preserve the model composition diagram with the icons of the parts while still solving algebraic loop problems (which in other tools still, needs to be solved by hand).

The Result

A gearbox model of the hybrid system and a 3D multibody systems (MBS) model of gearbox suspension were made. Those were used to simulate hybrid torque control of engine and electrical motor including reduction of gearbox oscillation caused by engine torque pulsation.

A testimonial to success

"Models for the hybrid power train developed in Dymola were used to validate that the C-code of the controller worked as specified. The controller was developed within in a very strict deadline. It was a success since no serious software error has been found in the market although we had done very rapid development. Dymola will be positioned as one of the important tools to promote the concurrent development of hardware and software."

Akira Ohata
Project General Manager, Power train Development Center, Toyota Motor Corporation

Contact person

Mr. Michihiro Ohashi
General Manager, Toyota Techno Service Corp., http://www.tec-serv.co.jp/