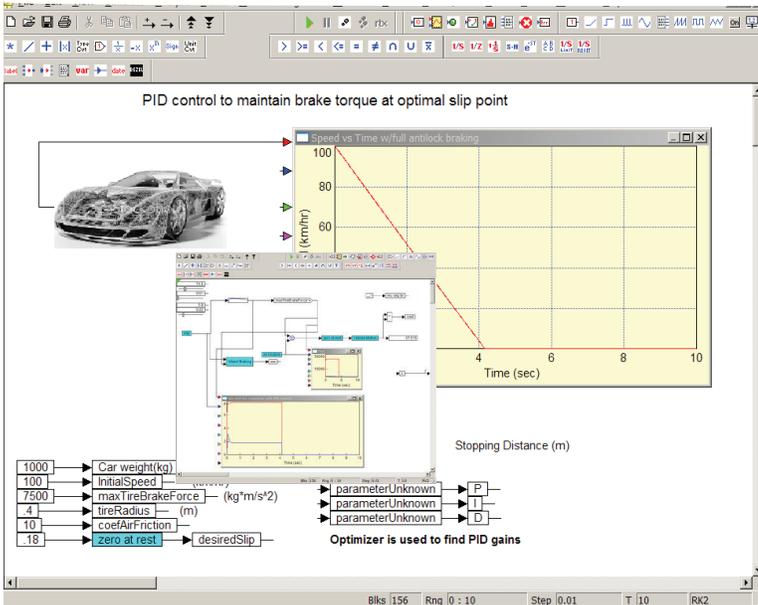


Delphi Automotive

Rapid Prototyping of Brake Control System with Embed SE



Automotive brake effectiveness models.

"At Delphi Automotive, we feel that [Embed SE with its real-time analog and digital I/O] are important additions to the set of tools we use in automotive design and testing."

Gary Fulks
Senior Design Engineer
Delphi Automotive

In the past, it took up to two months of special machine shop work, circuit design, hand-coded software development, and in-car testing to determine whether a design was feasible for production. With the combination of fast and powerful modeling and simulation software from Altair, and highly-reliable, noise-immune data acquisition cards from National Instruments, such testing can be done in less than two days.

Initial Design

Delphi Automotive configured a system consisting of Embed SE (formerly called VisSim) running on a laptop computer with two PCMCIA DAC card 1200s, 16 analog inputs, 4 analog outputs, and 16 digital I/Os. With this complex control system, they achieved closed-loop sampling rates of over 200Hz running a 100MHz Pentium laptop. Embed SE is capable of closed-loop sampling rates of up to 5000Hz depending on the complexity of the closed-loop system and the CPU speed.

Testing Electronic Brakes

A typical use of the Embed SE system model is to test electronic braking assist equipment. Both the closed-loop control, as well as the data logging



INDUSTRY

Automotive

CHALLENGE

Develop a system model to test electronic braking assist equipment

SOLUTION

Leverage Embed SE's real-time analog and digital I/O to capture data in real time

BENEFITS

- Model-Based Design approach reduces testing from two months to less than two days
- Automated performance testing maximizes productivity

can easily be developed and configured with Embed SE. Once the sensors and equipment under test are installed in the vehicle, it is a simple matter to mount the laptop in the passenger seat, secured with a standard 2" nylon web tie-down, then plug in the ribbon cables to the DAQ card 1200s, and turn on the laptop. Because it is difficult to view the laptop display during daylight driving, an LED display panel - driven by the digital I/O of the DAQ card - is used for critical function monitoring. Five-minute runs with strip charts tracking user inputs, pedal pressures, accelerations, and controller outputs are typical.

Robust Software

In over a year of use, the Embed SE model has never failed in real time. The system has proven robust under the harshest demands of vigorous brake testing, lack of good electrical ground, wide temperature and humidity variations common to Ohio, and general garage lab treatment.

Delphi Automotive also uses Embed SE in lab bench situations, such as automated performance testing of hydraulic valves. Using map blocks, it is easy to create time-based test sequences and correlate sensor outputs with command inputs. The wide array of plotting capabilities and data export make it easy analyze electronic braking data.

The VisSim™ product line has been renamed to Embed™ and Embed SE™



For more information

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