

Closing the Design Loop with Electronics Workbench Multisim and National Instruments SignalExpress

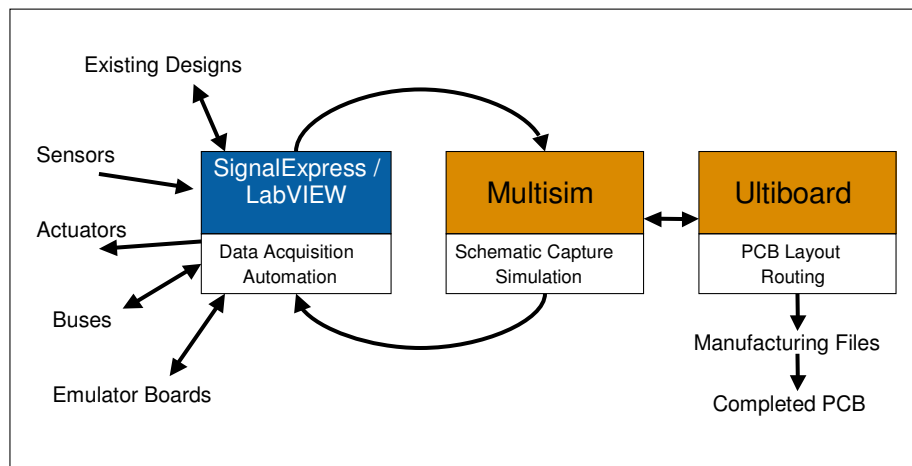
“The crossover point between design and the characterization and validation process of actual hardware has traditionally been neglected,” said Ian Sutte, vice president of sales and marketing at Electronics Workbench. “With SignalExpress, design engineers can easily bridge the design and measurement domains to accelerate product development time by identifying and addressing discrepancies.”

Design engineers are always looking to improve circuit simulations. With Electronics Workbench Multisim and National Instruments SignalExpress, they can close the hardware design loop. This combination provides design engineers with input and feedback never before available, helping them efficiently test and verify both circuits and simulations.

Historically, hardware design engineers have simulated circuits with models based on component electrical or physical characteristics. These simulations have been very powerful and helpful in the design and verification process, but they are not without limitations.

Although design engineers continue to look for ways to reduce time to market for new designs, the crossover point between hardware design and the characterization and validation process traditionally has been neglected. By bridging between design and measurement, engineers can iterate more tightly through the design process by identifying discrepancies and addressing them in their prototypes. To do this, they need to be able to easily reuse and compare the signal data, simulated or measured, in either domain.

It has been difficult and time-consuming to accurately model real-world signals such as those from sensors or buses. It would be beneficial to capture these signals and use them to drive simulations. Engineers could then use simulation waveforms to drive existing interfaces and verify that the design is working according to specifications. It would also be useful to be able to directly compare simulation waveforms to real-world waveforms to help tighten simulations and aid in debugging.



Printed Circuit Board Design

Electronics Workbench develops electronic design automation tools for all major steps in the circuit design flow, including schematic capture, simulation, PCB layout, autorouting, and CAM preparation. Design engineers use simulation programs to test and verify designs. Simulation helps them reduce time to market, find errors in their designs before they become costly mistakes, evaluate potential problems caused by

variations in real-world component properties, and optimize their designs.

Circuit simulators are powerful tools that use models to represent component behavior. Alone, they cannot capture or drive real-world signals, so designers need to use data acquisition and control devices and associated application software to drive signals.

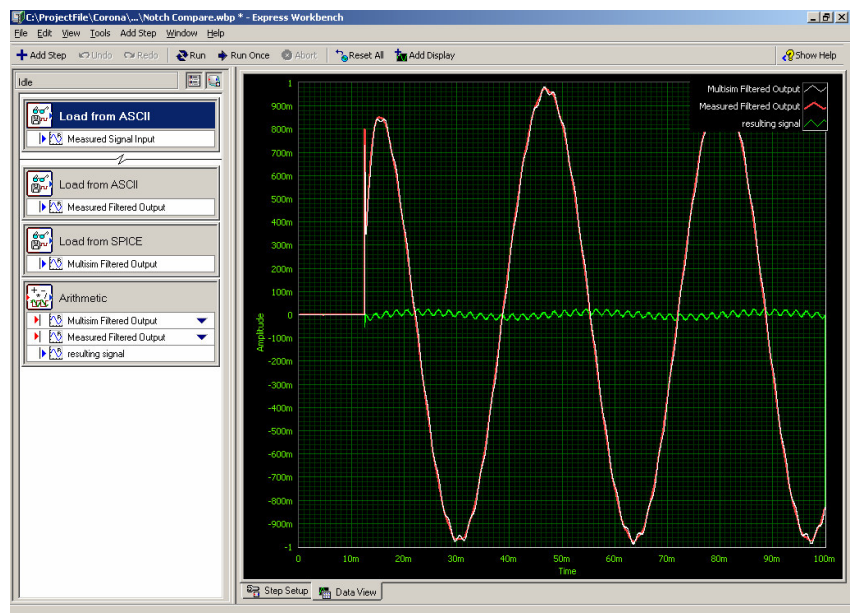
Bridging Design and Test

By combining the schematic capture, simulation, and analysis tools available in Multisim and the data acquisition and measurement features provided by National Instruments measurement devices and SignalExpress software, design engineers can easily sample real-world signals and incorporate them into simulations. These engineers then can drive their simulations with data acquired from sensors, test points, or even data and address buses.

Design engineers also can import simulation results from Multisim into SignalExpress. They can compare simulated and real data and drive external circuitry with the simulation results to significantly increase efficiency in the design verification process.

The screen shot below shows how an engineer can use SignalExpress to compare the start-up, time-domain response of a notch filter with its simulation results. In this example, the engineer triggers the measurement with a start trigger and illustrates how the filter settles through this start-up. The engineer acquires the stimulus signal with a data acquisition board and exports it to Multisim. From Multisim, the exact physical stimulus signal is used to drive the simulation as well. The two plots on the graph below show the comparison of the physical output from the filter with the simulated output from Multisim – both from the same stimulus signal.

Many designs are not first-generation, but are modifications or extensions of existing ones. A vast number include modules from past designs. Using SignalExpress and Multisim, design engineers can accurately represent existing circuitry in their simulations. This is extremely useful when they cannot easily model portions of the designs for simulation. For circuit prototypes and microprocessor or microcontroller emulator board signals, design engineers can use SignalExpress to make measurements on the existing designs and export the data to Multisim, where they can use it to enhance and expand simulation capabilities.



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