Safety-critical software needs reliable hardness tests.

Chrona's Validator offers the advantages of SIL simulations in terms of cost and simulation speed as well as the advantages of HIL simulations in terms of accuracy.

1. Software-In-the-Loop (SIL) and Hardware-In-the-Loop (HIL) simulation environments represent established methods and tools for testing real-time embedded systems before they are deployed in products. Each of them has key features that are missing in the other. The Chrona Validator is a cutting-edge simulation environment for verification and validation, which uniquely combines SIL and HIL features that are considered crucial for improving the quality of embedded systems.

2. The new key feature of Chrona's Validator is advanced debugging of embedded systems that deals with timing behavior as if the software would be executed on a target platform. Chrona's Validator also offers regression testing at a level of granularity that leads to a solid comparison between several versions of a system, for example, a legacy system and its reengineered or enhanced artefact.

3. Chrona's Validator has been applied to large industrial legacy systems for simulating the computational part in closed-loop with continuous-time plant models in MATLAB®/Simulink®. For that purpose, the Validator allows co-simulation with other simulation tools based on time synchronization protocols.

4. Chrona's Validator offers as basic feature the logging of the time-stamped values of selected variables (global variables and variables local to tasks) to a file.
Another basic feature is the ability to save the state the entire computational system (hardware model, OS, application program) and start a simulation from previously saved state.

5. Chrona's Validator supports model-based extensions of legacy C applications. The model of a new controller can be first simulated together with the plant model in MATLAB®/Simulink®, in closed-loop with the legacy control software. Then the C code of the new controller, generated for example with the Real Time Workshop®, can be integrated with the legacy application and the resulting software can be tested by simulation.

6. For an accurate simulation of the controller tasks on a virtual platform, Chrona's Validator must use configuration information about the target platform. This information can be automatically read from system configuration files, or it can be provided by setting properties of model components via a visual/interactive user interface. This also allows quick design space exploration of system configurations.

7. The Validator uses instrumentation of the application software with callbacks to the simulator and with functions for calculating execution times of code fragments pertaining to the target platform. The Validator relies on the availability of execution time estimates for basic blocks of C code. Depending on the target execution platform, these estimates can be obtained by the Validator suite, or by other commercially available tools. The instrumentation process is fully automated.

8. Chrona's Validator provides unprecedented system-level debugging based on the ability to pause and step through the simulation of the entire system at different levels of abstraction:

Application software can be debugged at the source code level, using all the classical debugging operations for C code. In particular, one can step forwards and backwards across preemption points in the controller tasks. Hardware-related behavior can be debugged at the hardware model level. For example, the simulation can be paused when the interrupt controller detects an active edge on an input line. Debugging of Operating System behavior is done at the level of the OS model. Plant-related behavior can be debugged by pausing the simulation when plant conditions are satisfied.

If you consider the rewarding integration of Chrona's Validator in your test suite please contact us via www.chrona.com There you can also view a demo of Chrona's Validator.

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