

Design of a Real Time Closed Loop Simulation Test Bed on a General Purpose Operating System: Practical Approaches

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Abstract : A closed-loop system comprises of a controller, a response system, and an actuating system. The controller, which is the system under test for us, excites the actuators based on feedback from the sensors in a periodic manner. The sensors should provide the feedback to the System Under Test (SUT) within a deterministic time post excitation of the actuators. Any delay or miss in the generation of response or acquisition of excitation pulses may lead to control loop controller computation errors, which can be catastrophic in certain cases. Such systems categorised as hard real-time systems that need special strategies. The real-time operating systems available in the market may be the best solutions for such kind of simulations, but they pose limitations like the availability of the X Windows system, graphical interfaces, other user tools. In this paper, we present strategies that can be used on a general purpose operating system (Bare Linux Kernel) to achieve a deterministic deadline and hence have the added advantages of a GPOS with real-time features. Techniques shall be discussed how to make the time-critical application run with the highest priority in an uninterrupted manner, reduced network latency for distributed architecture, real-time data acquisition, data storage, and retrieval, user interactions, etc.

Keywords : real time data acquisition, real time kernel preemption, scheduling, network latency

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