Abstract

This paper elaborates the implementation of a PCI based device driver for a Data Acquisition System (DAS) Card using the RTDM (Real-Time Driver Model) skin over Xenomai kernel, which is integrated with the Linux kernel. A C language kernel module was written for the PCI bus based driver to provide hard real-time capabilities and determinism to any application accessing the DAS card. The PCI DAS card used consisted of 12-bit ADC, 12-bit DAC, Programmable Digital I/O lines (TTL compatible) and Timers/Counters. In order to test all the features of the DAS and the performance of the driver, a test system, consisting of a 3-axis analog accelerometer connected to the ADC of the DAS via a junction box and powered by its DAC, was been constructed. Additionally, a 3-axis digital accelerometer communicated with an AVR development board via I2C in order to generate conditioned input for the programmable digital
I/O lines of the DAS card. A graphical tilt measurement application involving real-time acquisition of the accelerometers data was implemented using OpenGL. Finally, the driver was thoroughly tested with this arrangement, and the interrupt latencies were noted to be around 4µsec.

References

- AN3182 Application Note “Tilt measurement using a low-g 3-axis accelerometer”; ST Microelectronics, 2010.

Index Terms

Computer Science  Data Processings

Keywords

Real-Time PCI Device Driver  Xenomai  RTDM  Data Acquisition Systems
Development and Implementation of a Linux- Xenomai based Hard Real-Time Device Driver for PCI Data Acquisition System (DAS) Card