Interruption-Driven Load-Adaptive Scheme for Managing Interrupts in Task-Based Real-Time Systems

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An optimal execution of periodic tasks in time (i.e., to schedule them to meet their deadlines) and to simplify design and verification of the system, it is common practice that tasks running on a real-time operating system (RTOS, RT kernel) are assigned to the fixed priority guaranteeing their responses [1], [2], [4]. The fixed priority scheduling method is characterized by being a part the main-loop of the RTOS. The main-loop is threatened by the excessive number of interruptions (IOVs).

In order to avoid the influence of the IOVs, several strategies (such as polling, strict priority disciplines) have been developed [8], [12] or task-queueing strategy that are either software- or hardware-based. Most of these methods are not suitable for resource-constrained systems and they increase the processor utilization significantly. Commercial off-the-shelf (COTS) RTOS is able to utilize the IOVs for processing I/O operations.

An efficient load-adaptive scheduling scheme has been proposed in [10] suitable for resource-constrained systems. The idea is based on the use of the priority inversion vector (PIV) and it can be implemented in the COTS RTOS. The aim of this paper is to present a load-adaptive scheme for interrupt handling in a COTS RTOS environment. The method is able to handle IOVs without increasing the processor utilization significantly.