

Embedded & Hybrid Systems II: Design of an Adaptive and Hybrid Energy and QoS aware Heterogeneous Multiprocessor Scheduler for Embedded Systems

Motivation

Today's embedded systems are often implemented on platforms comprising multiple heterogeneous processing units such as general purpose CPUs, DSPs and ASICs in order to meet the high computational demand of modern real-time applications. As these heterogeneous multiprocessor systems are often portable and operated by battery, energy minimization becomes an essential requirement to extend their battery life. At the same time, the systems should deliver certain levels of performance guarantee. The deadline requirements of hard real-time tasks must always be satisfied while deadline misses for soft real-time tasks may be tolerated without degrading the performance of the application.

Objective

To design schedulers for heterogeneous multiprocessor systems that minimizes energy consumption while delivering the performance guarantee according to the user's preference and remaining battery life.

Scope

In the context of a Body Area Network, the scheduling algorithms that we design can be implemented on a portable base station / data logger or PDA that utilizes a multiprocessor platform (See Figure 1). In these devices, power management becomes essential to prolong the battery life. These devices also handle diverse data types and operate in dynamic application and communication environments. For such systems, realizing a scheduler that can optimize the performance with respect to energy consumption and at the same time guaranteeing certain acceptable level of Quality of Service (QoS) becomes conflicting objectives to meet. We are also exploring the possibility of realizing our algorithms on ad-hoc and sensor networks that are used to monitor health (Figure 2).

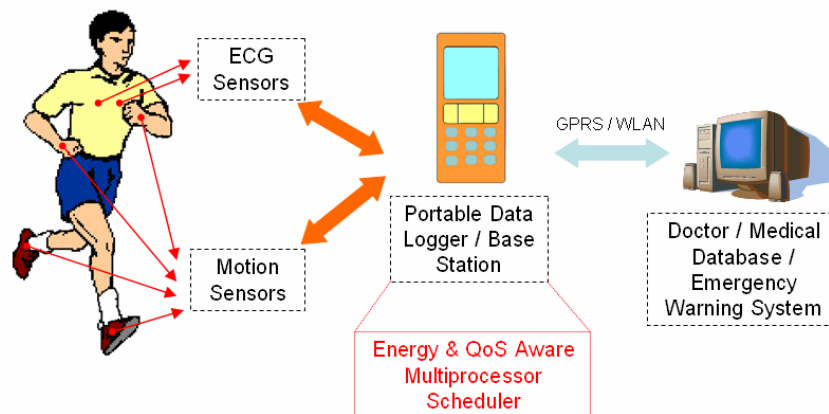


Figure 1. Energy & QoS Aware Scheduling Algorithms residing on a Multiprocessor-based portable Data logger / Base station

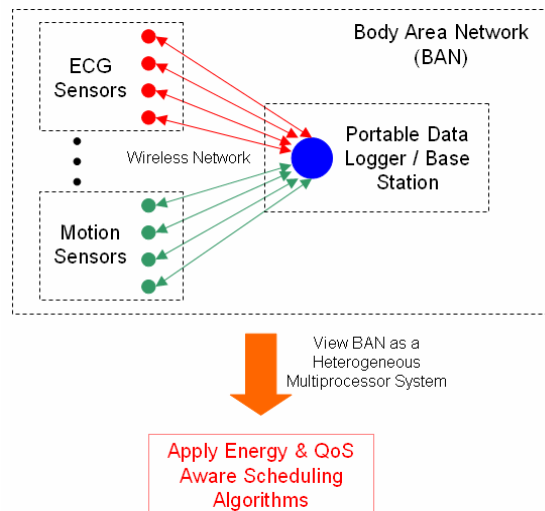


Figure 2. Overall Workings of the BAN System with Energy & QoS Aware Algorithms

Innovative Idea / Novelty

We focus on designing an adaptive scheduler for heterogeneous multiprocessor systems that is aware of energy availability in the platform and the QoS requirements of applications.

Demonstrable Activities

The major goal of this project is to design adaptive, energy and QoS aware scheduling strategies for heterogeneous multiprocessor systems.

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