A Review for Scheduling Algorithm in Hard Real Time System in DVS Platform

Abhilasha Tiwari, Mr.Sanjay Gupta

Abstract— This review covers hard real-time scheduling algorithms and schedulability analysis techniques. The review takes the form of an analysis of the problems presented by different application requirements and characteristics. Issues covered include uniprocessor and multiprocessor systems, periodic and aperiodic processes, static and dynamic algorithms, transient overloads and resource usage. . It provides taxonomy of the different scheduling methods, and considers the various performance metrics that can be used for comparison purposes. A detailed review is provided covering partitioned, global, and hybrid scheduling algorithms, approaches to resource sharing, and the latest results from empirical investigations. The survey identifies open issues, key research challenges, and likely productive research directions.

Index Terms— real-time scheduling, schedulability analysis techniques, aperiodic processes

I. INTRODUCTION

In [1] Real-time scheduling refers to the problem in which there is a deadline associated with the execution of a task. In this paper, Author's addresses the scheduling problem for a uniprocessor platform that is powered by a renewable energy storage unit and uses a recharging system such as photovoltaic cells. First, Author's describes a model where two constraints need to be studied: energy and deadlines. Since executing tasks require a certain amount of energy, classical task scheduling like earliest deadline is no longer convenient. Author's present an on-line scheduling scheme, called earliest deadline with energy guarantee (EDeg) that jointly accounts for characteristics of the energy source, capacity of the energy storage as well as energy consumption of the tasks, and time. In order to demonstrate the benefits of our algorithm, Author's evaluate it by means of simulation.Author's show that EDeg outperforms energy non-clairvoyant algorithms in terms of both deadline miss rate and size of the energy storage unit.

In [2] real time scheduling; preemption is one of the causes of run time overhead and large memory requirements. This paper focuses on reducing the number of preemptions in Earliest Deadline First (EDF) scheduling using a technique called Dynamic Preemption Threshold Scheduling (DPTS) in uniprocessor platform. This method is an improvement over existing threshold algorithms, but the complexity is slightly higher. The simulation results show that context switches are reduced by about 91% on an average. This technique is also applied for scheduling of sporadic requests along with periodic tasks. Preemptions that occur when tasks share resources and are required to synchronize are also reduced in this work. Their work also focuses on task set generation with limited hyper period (L.C.M. of periods of the tasks) as compared to previous scheduling algorithm it is not that much efficient because it is not saving energy.

In [3] real-time embedded system, that must carry their own power source and cannot depends on the power outlet on the wall, apart from feasibly schedule the set of tasks, power management is also the major issue because without power the system is useless. In this paper, Author's propose a harvesting aware real-time scheduling algorithm with variable speed assignment scheme to set of periodic tasks aims to reduce the energy consumption while feasibly schedule the set of periodic tasks within their deadline. This can be done by DVS(Dynamic Voltage and frequency Selection), executing the task with the speed such that a task can consume as much energy which is quite sufficient to complete it successfully within its deadline. this scheduling algorithm is good in terms of energy saving and job assignment for a periodic task ,But in this scheduling algorithm number of variables are more and it is very lengthy also that causes the more complexity as compare to previous algorithm,

In [4] this papers the problem of on-line real-time scheduling in a uniprocessor platform that is powered by a renewable energy storage unit and uses a recharging system such as photovoltaic cells. Since executing tasks require a certain amount of energy, we must take into account the characteristics of the energy source, capacity of the energy storage as well as energy consumption of the tasks, and time. For this sake, Author's presented a scheduling algorithm called EH - EDF (Energy Harvesting - Earliest Deadline First). In such algorithm, scheduling decisions are taken at run-time without having any prior knowledge about the characteristics of the future energy production and task characteristics. Proposed scheduling algorithm is unable to take the decision before run time there is no guarantee of available energy also.

In [5] this paper Author's propose a low-complexity and effective task mapping, scheduling and power management method for multi-core real-time embedded systems with energy harvesting. The proposed method is based on the concept of task CPU utilization, which is defined as the worst-case task execution time divided by its period. This work mathematically proves that by allocating the new task to the core with the lowest utilization, we can achieve the

Manuscript received May 17, 2014.
Abhilasha Tiwari, M.Tech 4 th Sem Student, Computer Science & Engineering, VITS Engineering College, Jabalpur
Mr.Sanjay Gupta, Assistant Professor Department of Computer Science & Engineering,VITS Engineering College, Jabalpur

lowest overall energy dissipation. This method, combined with a new dynamic voltage and frequency selection (DVFS) algorithm with energy harvesting awareness and task slack management (TSM) forms the proposed UTilization Based (UTB) algorithm. With periodical tasks in a multi-core platform, this partitioned scheduling method is optimal for energy dissipation if the proposed utilization-based scheduling and DVFS algorithm is applied on each core. Experimental results show that new algorithm achieves better performance in terms of deadline miss rate in a single-core environment, comparing to the best of existing algorithm. When applied on a multi-core platform, the UTB algorithm achieves better efficiency in utilizing the harvested energy and overflowed energy.

In [6] this paper Author's proposed Energy reduction is critical to increase the mobility and battery life for today's pervasive portable computing systems. At the same time, energy reduction must be subject to the real-time constraints and quality of service (QoS) requirements for multimedia applications running on many of these systems. This algorithm presents a novel run-time scheduling approach to reduce the system-wide energy consumption for such systems. In this paper, the multimedia applications are modeled using a popular weakly hard real time model, i.e., the (m, k)-model. Experimental results show that, by judiciously scheduling the real-time tasks and shutting down the processor and/or peripheral devices, Their approach can lead to significant energy savings while guaranteeing the (m, k)-firm deadlines at the same time. as compare to previous scheduling algorithm this is good one in terms of energy saving and meeting deadline.

In [7] Energy consumption and quality of service (QoS) are two primary concerns in the development of today's pervasive computing systems. While most of the current research in energy-aware real-time scheduling has been focused on hard real-time systems, a large number of practical applications and systems exhibit more soft real-time nature. In this paper, Author's study the problem of minimizing energy for soft real-time systems while providing a QoS guarantee. The QoS requirements are deterministically quantified with then constraints, which require that at least out of any consecutive jobs of a task meet their deadlines. In this paper, Author's propose a hybrid approach to achieve the dual goals of QoS guarantee and energy minimization. Author's first present the necessary and sufficient schedulability conditions for the static mandatory/ optional workload partitioning. Then, they propose to dynamically vary the statically defined mandatory/optional partitions to accommodate dynamic run-time variations while minimizing the energy consumption. The experimental results demonstrate that their proposed techniques outperform previous work significantly in terms of both the energy savings and achieved QoS.

In [8] Fault-tolerance and energy have become important design issues in multiprocessor system-on-chips (SoCs) with the technology scaling and the proliferation of battery-powered multiprocessor SoCs. This paper proposed an energy efficient fault tolerance task allocation scheme for multiprocessor SoCs in real-time energy harvesting systems. The proposed fault-tolerance scheme is based on the principle of the primary/backup task scheduling, and can tolerate at most one single transient fault. Extensive simulated experiment shows that the proposed scheme can save up to 30% energy consumption and reduce the miss ratio to about 10% in the presence of faults.

In [9] this paper Author's present a load matching task scheduling algorithm for energy harvesting real-time embedded systems using a realistic model for the battery charging and discharging processes. The proposed approach addresses two important issues that have not been considered by previous work: load matching and battery charge/discharge overhead. The new algorithm increases available energy by managing the system load through task scheduling so that the energy harvesting module delivers maximum power output. It further improves the system wide energy efficiency by considering the charging and discharging overhead when deciding if the harvested energy should be used to charge the battery or directly on the circuits. Experimental results show that, comparing to the best of the existing techniques the proposed algorithm improves the system wide energy efficiency by 8.0% to 56.3% and reduces deadline misses by 13.3% to 81.8% under different workload conditions.

In [10] The optimality of the Earliest Deadline First scheduler for uniprocessor systems is one of the main reasons behind the popularity of this algorithm among real-time systems. The ability of fully utilizing the computational power of a processing unit however requires the possibility of preempting a task before its completion. When preemptions are disabled, the schedulability overhead could be significant; leading to deadline misses even at system utilizations close to zero. On the other hand, each preemption causes an increase in the runtime overhead due to the operations executed during a context switch and the negative cache effects resulting from interleaving tasks' executions. These factors have been often neglected in previous theoretical works, ignoring the cost of preemption in real applications. A hybrid limited-preemption real-time scheduling algorithm is derived here, that aims to have low runtime overhead while scheduling all systems that can be scheduled by fully preemptive algorithms. This hybrid algorithm permits preemption where necessary for maintaining feasibility, but attempts to avoid unnecessary preemptions during runtime. The positive effects of this approach are not limited to a reduced runtime overhead, but will be extended as well to a simplified handling of shared resources.

II. Conclusion

In energy aware real time scheduling, idea is to save energy by slowing down the processor just enough to meet the deadline of a task and avoid energy overflow. Here we have studied many algorithm and we have compared also but all algorithm of real time scheduling have some limitation so we should proposed a harvesting aware hard real-time scheduling algorithm which reduce the energy as well as timing over- head by utilizing speed in such a way that

response time of task is less than or just equal to the existing approach even though on the cost of lesser energy consumption. Here the execution speed of a task must be selected based on the stored energy as well as available energy through harvesting and deadline of a task. For example In a battery-powered device, the typical power management design goal is to minimize the energy consumption (or) to maximize the lifetime achieved while meeting the required performance constraints.

To achieve better quality of service in terms of minimizing the total amount of energy consumed and improve the system operating time while honoring the deadline of periodic tasks by utilizing the concept of harvesting energy. There is a need for design of an efficient resource manager that judiciously balance the power management technique with harvesting energy in such a way that improve the responsiveness by ensuring the feasibility of periodic tasks while improve the system performance by minimizing the total power consumption and increase the system life span.

REFERENCES

[1] Agrawal, S., Yadav, R. S. and Ranvijay, 2009. A Pre- emption Control Approach for Energy Aware Fault Tolerant Real Time System, International Journal of Recent Trends in Engineering, 381-386.

[2] Allavena, A. and Mosse, D., 2001. Scheduling of frame-based embedded systems with rechargeable batteries, Workshop Power Manage Real-time Embedded System.

[3] Bertogna, M. and Baruah, S., 2010. Limited Preemption EDF Scheduling of Sporadic Task Systems, IEEE Transactions on Industrial Informatics, 579 - 591.

[4] Chetto, M. and Zhang, H., 2010. Performance Evaluation of Real- Time Scheduling Heuristics for Energy Harvesting Systems, EEE/ACM Int'l Conference on Cyber, Physical and Social Computing (CPSCom),Green Computing and Communications (GreenCom), 398 - 403.

[5] Dehghan and Maryam, 2010. Adaptive checkpoint placement in energy harvesting real-time systems, 18th Iranian Conference on Electrical Engineering (ICEE), 932 - 937.

[6] Hussein, E. L. G., Chetto, M. and Chehade, R.H., 2011. EH- EDF: An On-line Scheduler for Real-Time Energy Har- vesting Systems, 18th IEEE International Conference on Electronics Circuit and System (ICECS), 776-779.

[7] Hussein, E. L. G., Chetto, M. and Chehade, R.H., 2011. A real- time scheduling framework for embedded systems with environmental energy harvesting, Elsevier on Computers and Electrical Engineering 37.

[8] Liu, S., Lu, J., Wu, Q. and Qiu, Q., 2011. Harvesting-Aware Power Management for Real-Time Systems With Renewable Energy, IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 1 - 14.

[9] Liu, S., Lu, J., Wu, Q. and Qiu, Q., 2010. Load-matching adaptive task scheduling for energy efficiency in energy har- vesting real-time embedded systems, ACM/IEEE International Symposium on Low-Power Electronics and Design (ISLPED),325 – 330.

[10] Liu, S., Qiu, Q. and Wu, Q., 2008. Energy Aware Dynamic Voltage and Frequency Selection for Real-Time Systems with Energy Harvesting, conference on Design, Automation and Test in Europe, 236 - 241.