APPROXIMATION ALGORITHMS FOR ENERGY EFFICIENT SCHEDULING[1]

A. Kononov

Sobolev Institte of Mathematics, Novosibirsk, Russia;
Novosibirsk State University, Novosibirsk, Russia
e-mail: alvenko@math.nsc.ru

One of the main mechanisms used for minimizing the energy consumption in computing systems and portable devices is the so called *speed-scaling mechanism* [1], where the speed of a processor may change dynamically. If the speed of the processor is $S(t)$ at a time t then its power is $S(t)^\alpha$, where $\alpha > 1$, and the energy consumption is the power integrated over time,

$$E = \int_{t_0}^{t_1} (S(t))^\alpha dt.$$

In this setting, we consider the speed scaling scheduling problem: we are given a set $\mathcal{J} = \{J_1, \ldots, J_n\}$ of n jobs, where each job $J_j \in \mathcal{J}$ is characterized by its processing volume (work) W_j, its release date r_j and its deadline d_j, and a single (or a set of identical) speed-scalable processor(s). The processing time of a job depends on the speed. If J_j is executed at constant speed S, it takes $\frac{W_J}{S}$ time units to complete the job.

We call a schedule for the jobs in $\mathcal{J}$ *feasible* if every job is executed between its release date and its deadline. We seek for a feasible schedule of the jobs minimizing the overall energy consumption.

Most of the energy optimization scheduling problems are NP-hard. We review some of the recent methods used to derive approximation algorithms for these scheduling problems [2–4].

REFERENCES

1. S. Albers *Energy-efficient algorithms* — Communications of the ACM – 2010, Vol. 53, №5, p. 86-96.
2. A. Antoniadis, C.-C. Huang *Non-preemptive speed scaling* — In Proceedings of 13th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT 2012), Lecture Notes in Computer Science, Berlin: Springer — 2012, Vol. 7357 – p. 249–260.
3. E. Bampis, A. Kononov, D. Letsios, G. Lucarelli, M. Sviridenko *Energy efficient scheduling and routing via randomized rounding* — In 33rd IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2013), LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik – 2013, p. 449-460.
4. G. Greiner, T. Nonner, and A. Souza *The bell is ringing in speed-scaled multiprocessor scheduling.* — In 21st ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2009), ACM — 2009, p. 11–18.

[1]The author is supported by the Russian Fond of Humanity (project 13-02-10002)