CSC 714 – Project Proposal

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Title: Bounding the blocking time for EDF-DVS.

(http://www4.ncsu.edu/~smohan/csc714)

Abstract

Bounding the worst-case blocking time of jobs is key to *a priori* task schedulability analysis. We propose to come up with the blocking term for EDF-DVS and also a bound for the blocking time.

1.Introduction

High performance of a processor is required only for a short duration [1]. The rest of the time, a low-performance, low-power processor would suffice. DFS/DVS achieves this low performance by lowering the operating frequency and scaling the operating frequency of the processor. In the case of real-time systems, real-time guarantees must be maintained even though the operating frequency/voltage may be scaled.

Resources are taken into account by determining a blocking time for tasks covering delays incurred by lower priority tasks engaged in critical sections that cause a higher priority task to suspend until resources become available [2]. Available results as of now, for EDF scheduling, which considers blocking due to resources, are as follows:

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Symbols used:

D_i - deadline of task i

P_i – priority of task i

C_i – worst-case execution time of task i

T_i - period of task i

B_i – blocking time (or factor) of task i

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PIP

For all i, $\sum_{k=1 \text{ to } i} (C_k / T_k) + (C_i + B_i) / T_i \leq 1$ - eqn 1,

where

$B_i = \min (B^l_i, B^s_i)$ - eqn 2

$B^l_i = \sum_{j = (i + 1) \text{ to } n} (\max_k [D_{j,k} : C(S_k) \geq P_i])$ - eqn 3

$B^s_i = \sum_{k = 1 \text{ to } m} (\max_{j>1} [D_{j,k} : C(S_k) \geq P_i])$ - eqn 4

PCP

$\sum_{k = 1 \text{ to } n} [(C_i + B_i) / T_i] \leq 1$ - eqn 5

where

$B_i = \max_{j,k} [D_{j,k} : T_j < T_i \wedge C(S_k) \geq T_i]$ - eqn 6

2.What we propose

We intend to obtain a blocking term for EDF-DVS using the look-ahead strategy akin to the equations 2 and 5 above. Further, we intend to find a bound for this blocking time.

3.References

[1] P. Pillai and K.G. Shin. Real-time Dynamic Voltage Scaling for low-power Embedded Operating Systems.

[2] F. Mueller. Real-Time Schedulability Analysis for Ada.

[3] T.P. Baker. A Fixed-Point Approach to Bounding Blocking in Real-Time Systems.