Albert-Ludwigs-Universität
Institut für Informatik
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Summer Term 08

Energy Efficient Algorithms
Assignment 3

Exercise 1: Implementing QALG in Java.
In this assignment you are asked to implement algorithm *QALG* that was introduced in the lecture. As input we provide a text file called *idleperiods* containing the lengths of 689 210 idle periods that were extracted from the traces of the Auspex File Server Archive reflecting the behaviour of a single host during one week. The file is available for download. The given system is the IBM Mobile Hard Drive.

Implement *QALG* in Java. Proceed as follows:

- Use a window size and an update frequency of 50 (i.e. the lengths of the last 50 idle periods have to be memorized and the transition times depending on the currently memorized idle times have to be updated every 50 idle periods).
- Choose the interval boundaries a_j in the following way: Divide the interval $[0, \infty)$ of possible idle lengths into $n = 20$ intervals $[a_j, a_{j+1})$ $(0 \leq j \leq 19)$ by dividing each of the intervals $[b_0, b_1), [b_1, b_2), [b_2, b_3), [b_3, \infty)$ into 5 equally sized subintervals (for $[b_3, \infty)$, choose subintervals of length 3.175). Here, b_i denotes the minimum length of an idle period for which switching to state s_i would be optimal.
- Use b_0, b_1, b_2, b_3 as initial values for the transition times t_0, t_1, t_2, t_3.

Hint: Values b_i and thus values a_j that are listed in Table II in the handout are not correct. They must be recomputed.

Further requirements:

- After the last update, your Java program should output for each $0 \leq j \leq 19$ the number c_j of idle periods from among the currently memorized 50 periods whose lengths fall into interval $[a_j, a_{j+1})$.
- Furthermore, the resulting transition times t_0, t_1, t_2, t_3 of this update should be displayed.
- Finally, the program should output the total energy consumption incurred by *QALG* for the power management during the given sequence of idle periods.

Submission:

By Monday, June 16, 2008, 12 a.m., send your executable class document(s) as well as your source code via email to `sonja.lauer@informatik.uni-freiburg.de`.