Bonus Assignment 3, COSC 6384 Real-Time Systems

Spring 2016, Due date: May 3, 2016, 11:59pm CST

This assignment consists of two parts: (1) read and understand the referenced paper [1], and (2) write a program to implement the power scheduling algorithm for *sporadic* tasks in this referenced paper (Algorithm *STS*).

A *sporadic* task is denoted by $T = \{a, c, d\}$, where a is the arrival time, c is the computation time, and d is the deadline. In this assignment, it is assumed that the speed/voltage of the system/processor running these tasks can be scaled in the interval (0, 1.0].

A scheduling decision is made whenever any of the following two events occurs: (i) Event-1: a new sporadic task arrives and is accepted into the system by the acceptance test, and (ii) Event-2: the current task completes its execution. When an Event-1 occurs, the scheduler updates the optimal voltage schedule of the processor for all the tasks including this new one in the task queue. The variable voltage scheduling algorithm is shown as Algorithm STS in [1]. When an Event-2 occurs, the completed task is removed from the task queue and we execute the task at the head of the task queue following the current voltage schedule.

What you need to do when implementing the STS algorithm [1]:
Given an input - a set of sporadic tasks arriving dynamically, schedule the tasks in an on-line manner to (1) meet all deadlines or discard the newly arriving task if it would cause any accepted/uncompleted task to its deadline, including the new task itself; and (2) to schedule the tasks in optimal speeds in order to minimize the energy consumption.
Output: The complete task schedule and the optimal speed schedule.

What you will be given for the input is a file **input.txt**. You program needs to read the input from this file. In the file, the format of the input is:

Number of tasks: N
Task 1: [a c d]
Task 2: [a c d]
….
….
Task N: [a c d]

Here is an example of the file:
Number of tasks: 3
Task 1: [0 4 10]
Task 2: [3 5 9]
Task 3: [6 5 14]

Please note that the tasks are assumed to arrive dynamically, although the input file makes it looks like *static*. That is, your system does not know the task until it arrives. You can always assume that all tasks arrive and finish their works in [0, 200]. There is no floating point number in the program and result, rounding the floating point numbers to integers **appropriately** if necessary.

You report should contain:

1. Listing of your **source code**.
2. **Explicit description** of how to run your program, and how to add my testing input file into your project.

Turn in a **hardcopy** of your listing and any description. Also, you need to **email a zipped file** to xzou@uh.edu. The zipped file should contain all files and subdirectories in your project directory. Make sure to name your zipped filed as following format:

   FIRST NAME_LAST NAME_COSC6384 Assignment3.zip

Reference:

[1] I. Hong, M. Potkonjak, and M. B. Srivastava, "On-line scheduling of hard real-time tasks on variable voltage processor," Proc. Computer-Aided Design (ICCAD), pages 653 – 656, November 1998.