Real-Time and Embedded Systems: Problem Set 3

Dr. Colin Perkins

3rd February 2005

The third week of lectures has described some priority-driven scheduling algorithms and schedulability proofs for aperiodic and sporadic tasks. This problem set aims to test your understanding of these algorithms. You should answer all questions.

Question 1: Consider a system of three periodic tasks T_1 = (3, 1), T_2 = (4, 0.5) and T_3 = (10, 2). Demonstrate that this system can be scheduled using a) the rate monotonic algorithm; and b) the EDF algorithm.

Question 2: The system from question 1 must also support the execution of three aperiodic jobs: A_1 which is released at time 0.5, A_2 which is released at time 12.25, and A_3 which is released at time 17. Each of the aperiodic jobs executes for 0.75 units of time. The system is scheduled using the rate monotonic algorithm, with a server task, T_s = (5, 0.5) to schedule these aperiodic jobs. Show the resulting schedules for sufficient time to illustrate how the aperiodic tasks are scheduled and to demonstrate correctness (or otherwise) of the schedule, and calculate the response times for each of the aperiodic tasks, if the server is scheduled as a) a polling server; b) a deferrable server; and c) a simple sporadic server.

Answers must be submitted by 5pm on 10th February 2005. A drop box will be available for submissions in Lilybank Gardens and submissions will only be accepted via that drop box. This problem set is worth 5% of the mark for this module. The usual rules apply for late submissions: 20% of the mark will be deducted for each day late. Ensure your name and matriculation number are included on each submission, and attach a pink statement of originality form.