

EL2450 HOMEWORK 2

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1 Rate Monotonic scheduling

Task 1: Explain what Rate Monotonic scheduling means.

Rate Monotonic scheduling means that all tasks are given a priority. At the beginning of each cycle, the task with the highest priority is run until Rate Monotonic scheduling means that all tasks are given a priority. At the beginning of each cycle, the task with the highest priority is run until completion.

Task 2: Are the three tasks schedulable?

Calculating the utilization factor U from

$$U = \sum_{i=1}^n \frac{C_i}{T_i} = \frac{6}{20} + \frac{6}{29} + \frac{6}{35} = 0.75 \quad (1)$$

The rules states that if $U < 1$ the set is schedulable.

Task 3: What are the differences in control performance between the different pendulums?

All pendulums are asymptotically stable and have similar control performance. The performance is shown in Figure 1.

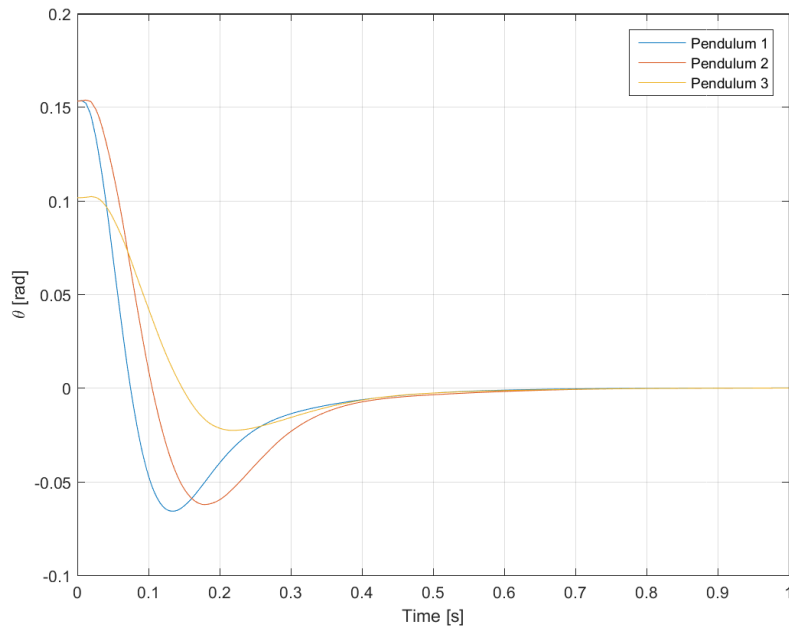


Figure 1: Performance of pendulums under rate monotonic scheduling.

Task 4: Compare against the schedule in the model. Does it match?

As can be seen below in Figure 2, the schedules match. The tasks are schedulable as stated in q2.

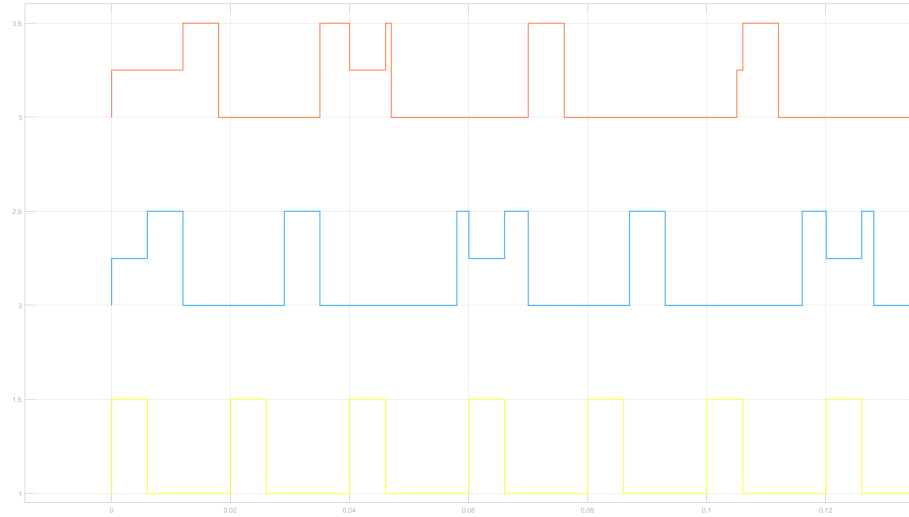


Figure 2: Schedule for pendulums when computation time of all is 6 ms. Yellow is small pendulum, blue is medium and red is big.

Task 5: Setting the execution time for all three processes to 10ms, what are the differences with respect to control performance?
For this execution time, the CPU utilization factor becomes

$$U = \sum_{i=1}^n \frac{C_i}{T_i} = \frac{10}{20} + \frac{10}{29} + \frac{10}{35} = 1.1. \quad (2)$$

The utilization factor is thus larger than one which means that the processes is not schedulable. This is seen in Figure ?? where the small pendulum is no longer stable because of the fact that the deadlines are missed.

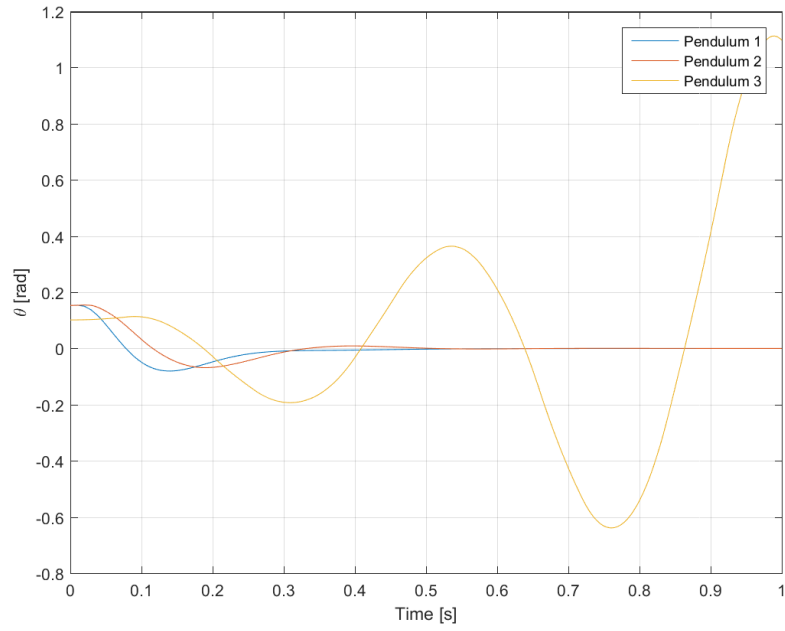


Figure 3: Performance of pendulums under rate monotonic scheduling with computation time 10 ms for each task.