

Selected solutions for

TDDD07

Real-time Systems

Klervie Toczé
Massimiliano Raciti
Jordi Cucurull
Simin Nadjm-Tehrani

Cyclic scheduling

Real-Time Systems Laboratory
Department of Computer and Information Science
Linköping University, Sweden

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Suggested Solutions

1. Scheduling

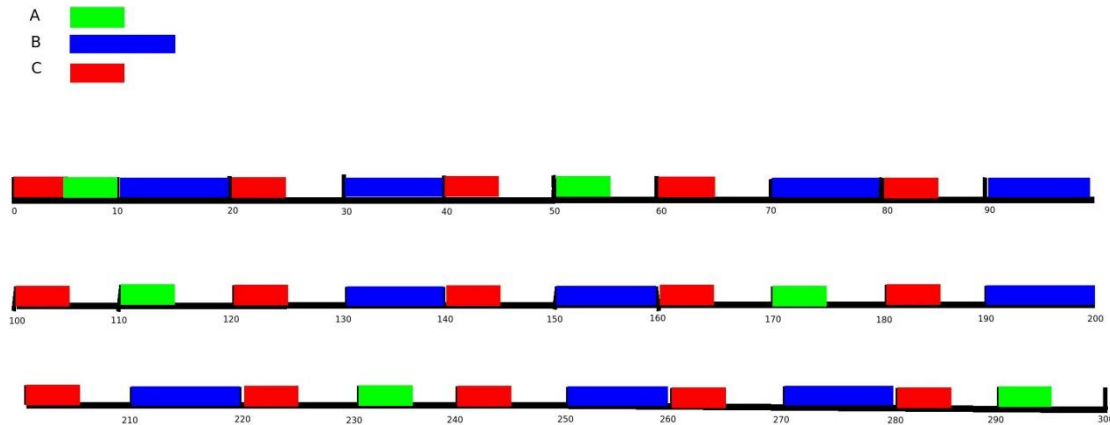
Q1.1:

The task set is schedulable using cyclic scheduling, but the tasks suffer jitter.

Here is an example of scheduling, in which you can see that tasks are affected by jitter

Major cycle: $\text{lcm}(50,30,20) = 300\text{ms}$

Minor cycle: $\text{gcd}(50,30,20)=10\text{ms}$

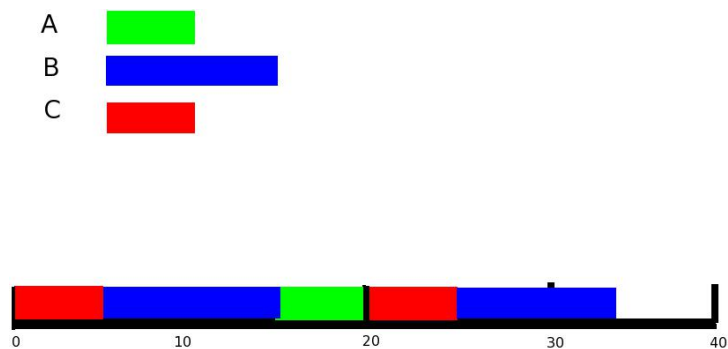


You can try to change the order of execution of the tasks, but the jitter still remains. One of the possible ways to schedule this task set without jitter is by reducing the periods, thus executing tasks more frequently than required (see Example (3.2), i.e. Alternative 2 in the slides of Lecture 2).

<i>Task</i>	<i>New Period (ms)</i>
A	40
B	20
C	20

Major cycle: $\text{lcm}(40,20,20) = 40\text{ms}$

Minor cycle: $\text{gcd}(40,20,20)=20\text{ms}$



Q1.2:

a)

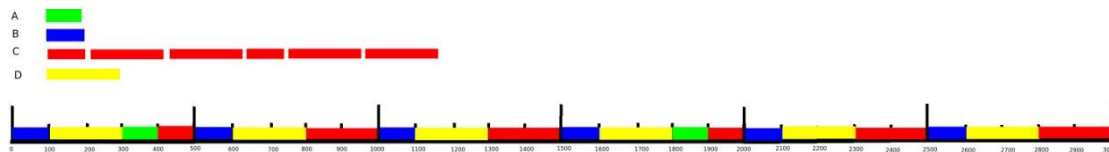
<i>Task</i>	<i>Period</i>	<i>WCET</i>
A (Trajectory follower)	1500	100
B (Sensor & measurement)	500	100
C (Disk storage)	3000	1000
D (Ground communication)	500	200

Major cycle: $\text{lcm}(1500,500,3000,500) = 3000\text{ms}$

Minor cycle: $\text{gcd}(1500,500,3000,500)=500\text{ms}$

The task set is not schedulable. This is due to the disk storage task, that cannot be fitted in any place inside the major cycle. The task set becomes schedulable if we assume that the disk storage task can be divided into 6 processes as following:

$C_1=100\text{ms}, C_2=200\text{ms}, C_3=200\text{ms}, C_4=100\text{ms}, C_5=200\text{ms}, C_6=200\text{ms}.$



Q1.3:

1) According to the description we have the following task set:

Process	Period	WCET
P1 – Stabiliser	50ms	5ms
P2 – Star follower	20ms	5ms
P3 – Energy manager	30ms	10ms

Minor cycle: $\text{gcd}(50, 20, 30) = 10\text{ms}$

Major cycle: $\text{lcm}(50, 20, 30) = 300\text{ms}$

