7/11/2023

SCHEDULING ANALYSIS TASK

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1. INTRODUCTION

This document will be analyzing the schedulability of three random tasks given in the requirements slide.

1.1. Requirements

Schedule the following task set using rate monotonic:

Task Name	Priority	Periodicity	Execution Time	Deadline
TASK 1	3	5	2.5	5
TASK 2	2	15	4.5	15
TASK 3	1	20	3.5	20

- Calculate the URM.
- Calculate the time-demand analysis.
- Model the task set using Simso.

2. URM

I have to Calculate Tasks Utilization and Rate Monotonic Utilization, and if the URM is bigger than U then the tasks are schedulable, if not then it's not schedulable using URM analysis and I should try other analyses like time-demand analysis to ensure if it is schedulable or not.

2.1. Calculations

$$U = \frac{R}{C}$$

U = Utilization

R = Requirements which in simple terms is the Busy Time

C = Capacity which in simple terms is Busy Time + Idle Time

So, $U = \frac{2.5}{5} + \frac{4.5}{15} + \frac{3.5}{20} = 0.975$

And, $$URM = n(2^{\frac{1}{n}} - 1)$$

URM = rate-monotonic utilization

n = Number of tasks.

So, $URM = 3\left(2^{\frac{1}{3}} - 1\right) = 0.799$

Hence, **U > URM (which means system is not schedulable).**

3. TIME-DEMAND ANALYSIS

It measures time required for each task and then compare it with the provided time. If time required is smaller than the required then the task is schedulable and if it's bigger then it's not schedulable.

3.1. Calculations

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k \quad for\ 0 < t \leq p_i$$

Where,

- w = worst response time
- e = execution time
- p = periodicity
- t = time instance

Since time required for **TASK 1**: $w_1(5) = 2.5 + 0 = 2.5ms$ and **Time provided = 5ms**

Then $w_1 < t_{p1}$ i.e., **TASK 1 is schedulable.**

Since time required for **TASK 2**: $w_2(15) = 4.5 + 2.5 * (\frac{15}{5}) = 12ms$ and **Time provided = 15ms**

Then $w_2 < t_{p2}$ i.e., **TASK 2 is schedulable.**

Since time required for **TASK 3**: $w_3(20) = 3.5 + 4.5\left(\frac{20}{15}\right) + 2.5 * (\frac{20}{5}) = 22.5ms$ and **Time provided = 20ms**

Then $w_3 > t_{p3}$ i.e., **TASK 2 is not schedulable.**

4. Simso

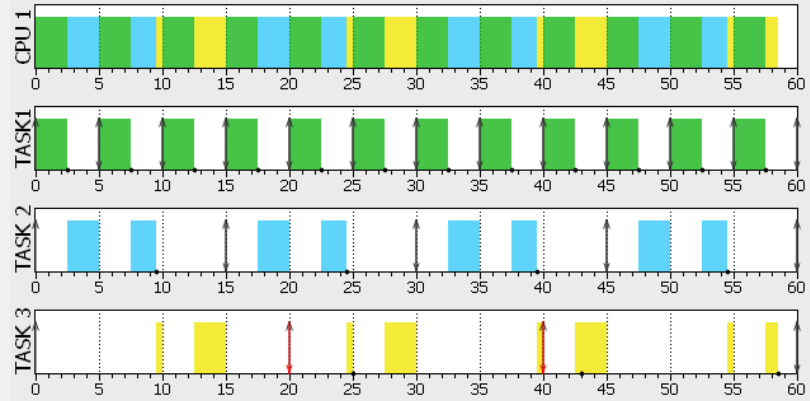
4.1. Model Data

Duration (cycles)	60000000
Duration (ms)	60
Cycles / ms	1000000
Execution Time Model	WCET

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)
1	TASK1	Periodic	No	0	5	-	5	2.5
2	TASK 2	Periodic	No	0	15	-	15	4.5
3	TASK 3	Periodic	No	0	20	-	20	3.5

Using Rate Monotonic Scheduler

4.2. Gantt Chart



4.3. Program's Results

Observation Window:

from 0.00 to 60.00 ms Configure...

	Total load	Payload	System load
CPU 1	0.9750	0.9750	0.0000
Average	0.9750	0.9750	0.0000

4.4. Conclusion

Task 3 is not schedulable, CPU is almost fully loaded.