Scheduling Analysis

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Sprints

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Overview

We Have 3 Tasks and we want to schedule using rate-monotonic:

- T1 {P: 5, E: 2.5, D: 5}
- T2 {P: 15, E: 4.5, D: 15}
- T3 {P: 20, E: 3.5, P: 20}

Goals

1. Calculate The URM.

2. Calculate The time demand analysis.

3. Model the task set using Simso.

Tasks needed

Tasks	Priority	Periodicity	Execution	Deadline
Task 1	2	5 ms	2.5	5
Task 2	1	15 ms	4.5	15
Task 3	0	20 ms	3.5	20

System Tick Rate

- We can calculate System tick rate by summing all execution time of all tasks and take the system tick rate bigger than it.

- Sum of execution tasks = 2.5 + 4.5 + 3.5 = 10.5 ms

- So .. System tick Rate > 10.5ms .... = **12 ms**

Hyperperiod

Hyperperiod = LCM(5,15,20)

Hyperperiod = **20 ms**

URM Calculations

- ● Equations

$$U = \sum_{i=1}^{n} \frac{C_i}{P_i} \leq n(2^{\frac{1}{n}} - 1)$$

U = Total Utilization
C = Execution time
P = Periodicity
N = Number of tasks

$$URM = n\left(2^{\frac{1}{n}} - 1\right)$$

**Note : the rule is >> [U <= URM]**

- ● Solution

U = (2.5 / 5) + (4.5 / 15) + (3.5 / 20) = 0.975

URM = 3 * (2⅓ - 1) = 0.799

∵ **U > URM**

∴ **System needs more tests.**

Time Demand Analysis Calculations

- Equations

$$Wi(t) = ei + \sum_{k}^{i-1} [^{t}/_{Pk}] \text{ ek} \qquad \text{for } 0 < P \leq Pi$$

, Where

W=Worst response time

E=Execution time

P=Periodicity

T=Time instant

- Solution

Task 1 : W(5) = 2.5 + 0 = 2.5 ms.

>> ∴ time provided > time needed (Success).

Task 2 : W(15) = ((15/5) * 2.5) + 4.5 = 12 ms

>> ∴ time provided > time needed (Success).

Task 3 : W(20) = (20/5)*2.5 + (20/15)* 4.5 + 3.5 = 22.5 ms.

>> ∴ time provided < time needed (Failed).

∴ Task 3 is not schedulable.

∴ System needs more tests

Simso Results

∴ **Task 3 missed the Deadline as shown in figure.**