Implementing EDF Scheduler Report

Advanced Embedded Systems nanodegree

NAME	AHMED SHERIF MOHAMED
DATE	25-9-2022

Contents

System Overview

Task Number	Task Name	Task Periodicity (ms)	Task Deadline (ms)	Task Execution Time (ms)
Task_1	Button_1_Monitor	50	50	0.02
Task_2	Button_2_Monitor	50	50	0.02
Task_3	Periodic_Transmitter	100	100	0.02
Task_4	Uart_Receiver	20	20	0.02
Task_5	Load_1_Simulation	10	10	5
Task_6	Load_2_Simulation	100	100	12

Calculating System's Hyper Period

System Hyper Period is Least common multiple of individual task periodicities.

Hyper Period = LCM (50, 50, 100, 20, 10, 100) = 100 MS

Calculating System's CPU Load

System CPU Load is the summation of all individual tasks execution time to periodicity's ratio.

CPU Load = $\frac{0.02}{50} + \frac{0.02}{50} + \frac{0.02}{100} + \frac{0.02}{20} + \frac{5}{10} + \frac{12}{100} = 0.6236 = 62.36\%$

Calculating System's Schedulability

Using Utilization Rate Monotonic Approach

Assuming Rate-Monotonic Scheduler then the system is guaranteed to be scheduled if

$$CPU\ LOAD \leq n(2^{\frac{1}{n}} - 1)$$

Since

CPU LOAD = 62.36%

And

n = number of tasks = 6

Then

URM (Utilization of rate monotonic) = $6(2^{\frac{1}{6}} - 1)$ = 0.73477 = 73.47%

Since

U < URM

Then

The System is guaranteed to be scheduled

Using Time Demand Analysis Approach

1. Finding the greatest common divisor of the system to calculate the step

   GCD (50, 50, 100, 20, 10, 100) = 10 ms

2. Compute parameters

   Beginning = Start of a Hyper period
   Step = system GCD
   Ending = End Hyper period

Beginning	T = 0
Step	10 ms
Ending	100 ms
Number Of Tasks	6

3. Compute The time demand Function $W_i(t)$

$$W_i(t) = E_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{P_K} \right\rceil * E_k$$

I: Task index

P: Task Period/Deadline

E: Execution time

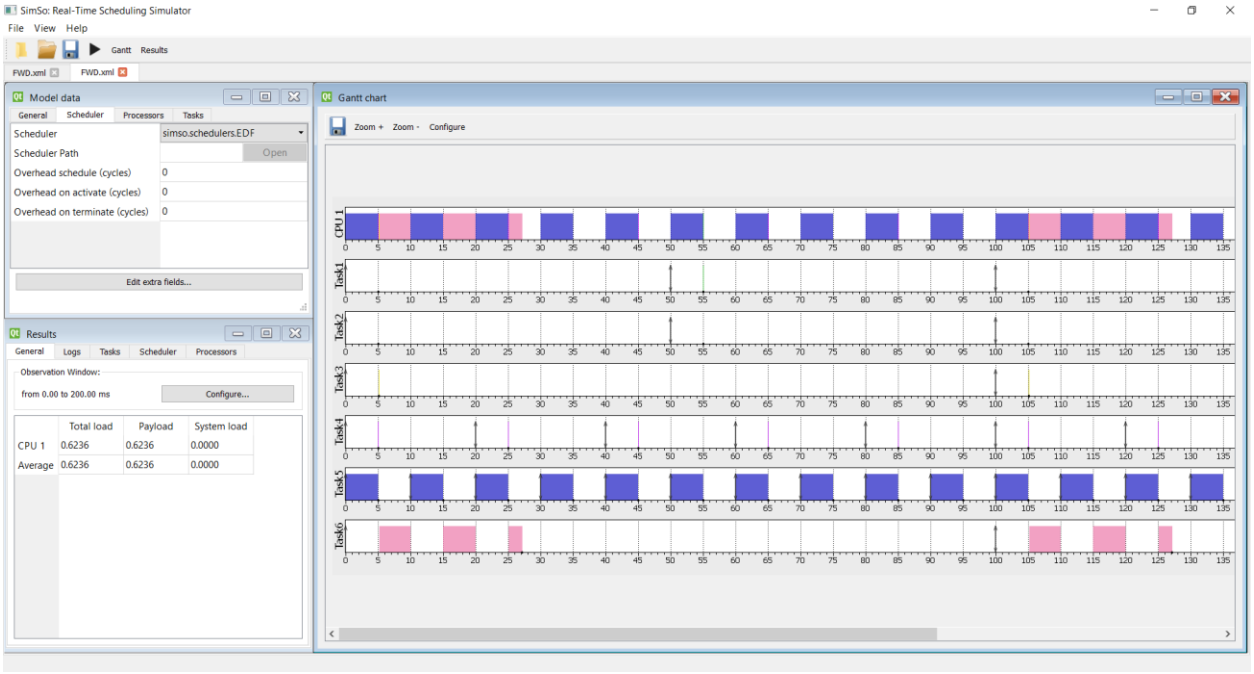
Using Microsoft Excel:

t	W1	W2	W3	W4	W5	W6
0	0.02	0.02	0.03	0.05	5	12
5	0.02	0.04	0.07	0.12	5.12	17.12
10	0.02	0.04	0.07	0.12	5.12	17.12
15	0.02	0.04	0.07	0.12	5.12	22.12
20	0.02	0.04	0.07	0.12	5.12	22.12
25	0.02	0.04	0.07	0.12	5.17	27.17
30	0.02	0.04	0.07	0.12	5.17	27.17
35	0.02	0.04	0.07	0.12	5.17	32.17
40	0.02	0.04	0.07	0.12	5.17	32.17
45	0.02	0.04	0.07	0.12	5.22	37.22
50	0.02	0.04	0.07	0.12	5.22	37.22
55	0.02	0.06	0.11	0.16	5.26	42.26
60	0.02	0.06	0.11	0.16	5.26	42.26
65	0.02	0.06	0.11	0.16	5.31	47.31
70	0.02	0.06	0.11	0.16	5.31	47.31
75	0.02	0.06	0.11	0.16	5.31	52.31
80	0.02	0.06	0.11	0.16	5.31	52.31
85	0.02	0.06	0.11	0.16	5.36	57.36
90	0.02	0.06	0.11	0.16	5.36	57.36
95	0.02	0.06	0.11	0.16	5.36	62.36
100	0.02	0.06	0.11	0.16	5.36	62.36

Task index	Periodicity	Execution Time	W100	Schedulable
1	50	0.02	0.01	PASS
2	50	0.02	0.06	PASS
3	100	0.03	0.11	PASS
4	20	0.05	0.16	PASS
5	10	5	5.36	PASS
6	100	12	62.36	PASS

Screenshots

SimSo Simulator



Keil uVision