

Ministry of Communications and Information Technology



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Project: Implementing EDF Scheduler

1. Analytical Methods:

Tasks	Periodicity	Deadline	Occurrence in hyper-period	Execution time
Button 1	50ms	50ms	2	6.2us
Button 2	50ms	50ms	2	6.2us
Periodic Transmitter	100ms	100ms	1	90us
UART Receiver	20ms	20ms	5	8.1us
Load 1	10ms	10ms	10	5ms
Load 2	100ms	100ms	1	12ms

System Hyperperiod:

It is the LCM of all the periodicities of the tasks (the time at which all the tasks occur together).

It is equal to 100ms.

CPU Load:

$$U = R/C$$

$$U = (E1 + E2 + E3 + E4 + E5 + E6)/H$$

$$U = ((6.2us * 2) + (6.2us * 2) + (90us) + (8.1us * 5) + (5ms * 10) + (12ms)) / 100ms$$

$$U = 62.16\%$$

System Schedulability:

- Rate Monotonic:

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

$$U = (6.2us/50ms) + (6.2us/50ms) + (90us/100ms) + (8.1us/20ms) + (5ms/10ms) + (12ms/100ms)$$

$$U = 0.6216$$

$$U_{rm} = 6 * (2^{(1/6)} - 1) = 0.735$$

$$U < U_{rm}$$

System is schedulable.

- Time Demand:

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

Worst case = 100ms

Tasks	Results	Schedulable?
Load 1	$W1(10) = 5 + 0 = 5 < 10$	YES
UART	$W2(20) = 8.1\mu s + (20/10)*5 = 10 < 20$	YES
Button 1	$W3(50) = 6.2\mu s + (50/20)*8.1\mu s + (50/10)*5 = 25 < 50$	YES
Button 2	$W4(50) = 6.2\mu s + (50/50)*6.2\mu s + (50/20)*8.1\mu s + (50/10)*5 = 25 < 50$	YES
Periodic Transmitter	$W5(100) = 90\mu s + (100/50)*6.2\mu s + (100/50)*6.2\mu s + (100/20)*8.1\mu s + (100/10)*5 = 50 < 100$	YES
Load 2	$W6(100) = 12 + (100/100)*90\mu s + (100/50)*6.2\mu s + (100/50)*6.2\mu s + (100/20)*8.1\mu s + (100/10)*5 = 62 < 100$	YES

2. SimSo Simulation:

SimSo: Real-Time Scheduling Simulator - [Model data]

File View Help

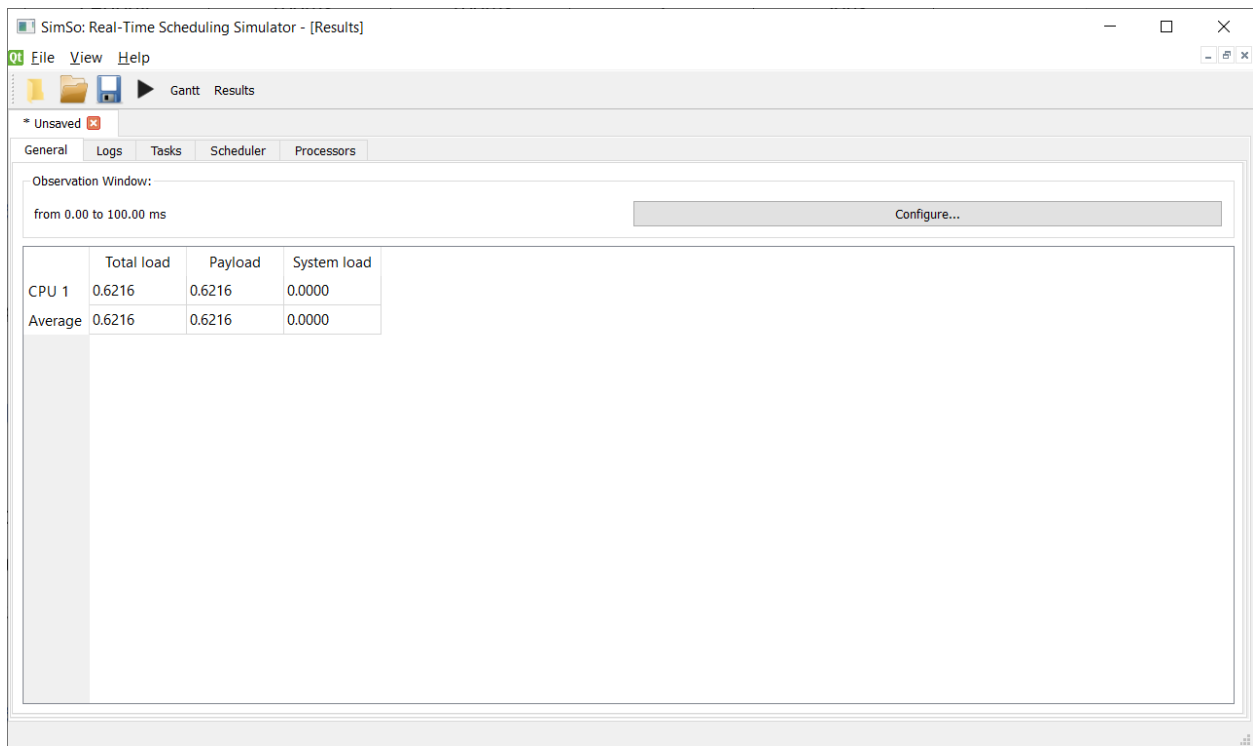
Unsaved

General Scheduler Processors Tasks

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	priority
1	B1	Periodic	<input checked="" type="checkbox"/> Yes	0	50.0	-	50.0	0.0062	0	0
2	B2	Periodic	<input checked="" type="checkbox"/> Yes	0	50.0	-	50.0	0.0062	0	0
3	Rx	Periodic	<input checked="" type="checkbox"/> Yes	0	100.0	-	100.0	0.09	0	0
4	UART	Periodic	<input checked="" type="checkbox"/> Yes	0	20.0	-	20.0	0.0081	0	0
5	LOAD 1	Periodic	<input checked="" type="checkbox"/> Yes	0	10	-	10	5.0	0	0
6	LOAD 2	Periodic	<input checked="" type="checkbox"/> Yes	0	100.0	-	100.0	12.0	0	0

Edit data fields...

Remove selected task(s) Add task Generate Task Set



The results are as expected and it matches the analytical method.

3. Keil Simulation:

