Ministry of Communications and Information Technology

Name: Ramy Mohamed Ahmed Mohamed

Email: 1807443@eng.asu.edu.eg

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

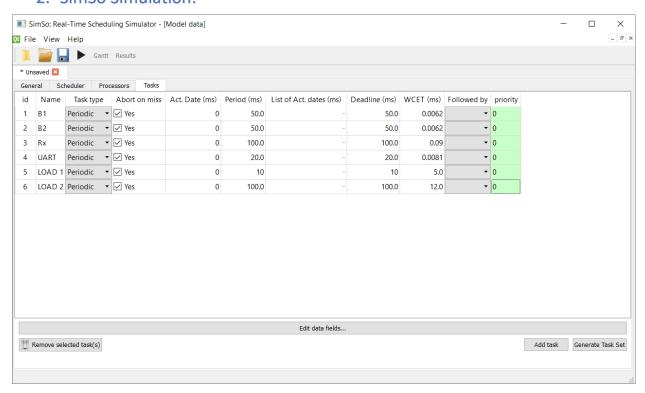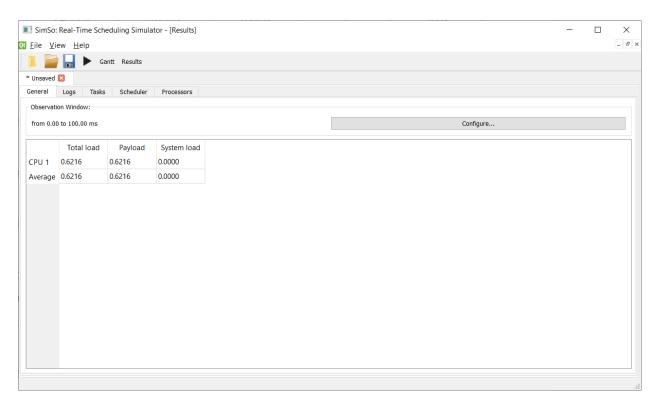Urm = 6*(2^(1/6)-1) = 0.735

U < Urm

System is schedulable.

- Time Demand:

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

Worst case = 100ms

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

2. SimSo Simulation:

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

3. Keil Simulation: