

Design Of A Healthcare System Using RTOS

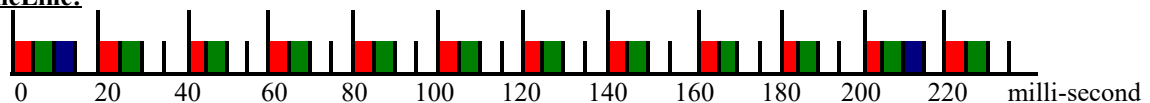
System components:

- A. Interfacing components
A touch LCD as input that can control the system and give commands.
Reading 4 bytes and processing the command takes 2 ms.
- B. Sensing components
 1. Sensor(1): "Heart Beat" Sensor
Heart beat detector with data rate of new data every 100ms.
 2. Sensor(2): "Blood Pressure" Sensor
Measures the blood pressure with data rate of new data every 25ms.
 3. Sensor(3): "Temperature" Sensor
Gets the current temperature with data rate of reading every 10ms.
- C. Actuating components
An "Alert Siren" that takes 1ms for activation and another 1ms for deactivation.

Table Of Tasks:

TASKS	Periodicity (ms)	Execution Time (ms)	DeadLine (ms)	Priority
Interfacing	200	2	15	1
Sensing	20	7	10	2
Actuation	20	2	5	3

Task Timeline:



RED => Actuator Task
 GREEN => Sensing Task
 BLUE => Interfacing Task

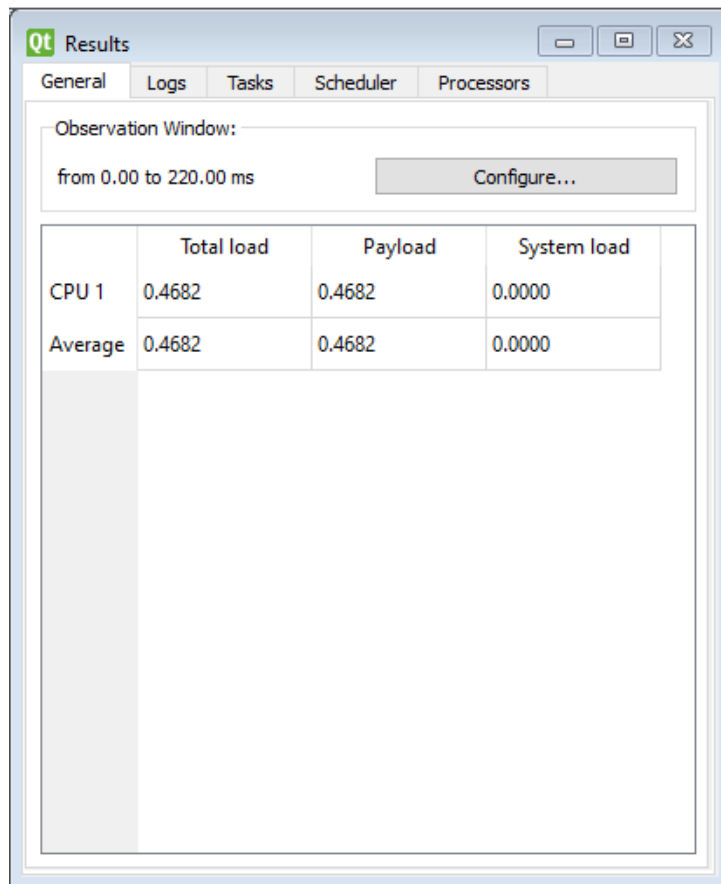
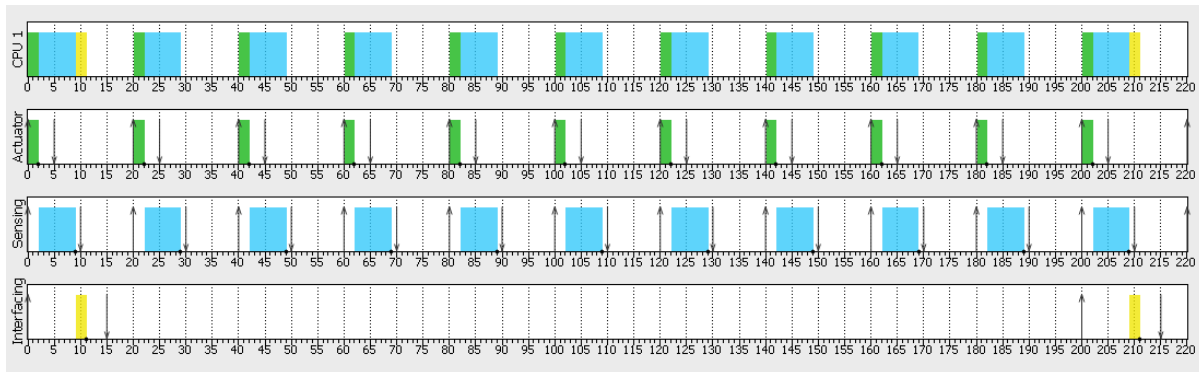
Notes:

1. In reality Actuator task would be blocked until detection of any anomaly from Sensing task.
2. Both temperature and pressure rate of changes are relatively slow comparing to sensors' sampling rates, while heart beats depends on electrical signals from the brain. Therefore using the full sampling potential of both temperature and blood-pressure sensors isn't necessary.

Required:

1. Number of required tasks: 3 Tasks.
2. Priority, periodicity and deadline of each task:

	Priority	Periodicity	Deadline	Execution
-Actuator Task	3	20 ms	5 ms	2 ms
-Sensing Task	2	20 ms	10 ms	7 ms
-Interfacing Task	1	200 ms	15 ms	2 ms
3. System Tick Rate: 20ms
4. System Hyperperiod: 200ms
5. CPU Load: $((10*2 + 10*7 + 2)/200)*100 = 46.0\%$
6. System Feasability: Schedulable (*Check the tasks' timeline above*)
7. Simso Simulation:



*I assumed that the Alert Siren needs to be both activated then deactivated like a buzzer to produce the required sound so the actuation task execution time is 2 ms instead of 1 ms.