

Report

RTOS Design Task

I will discuss the steps I followed to design the system and the enhancement of the design after the first design.

First design:

Number of tasks: I divided the system into 5 tasks and each task has the deadline the same as its periodicity and all of them has the same priority.

- Task 1:

Name: LCD Command.

Periodicity: 50 msec.

Execution Time: 2 msec.

Deadline: 50 msec.

Priority: 1

we choose 50 msec for periodicity because of the human interaction with LCD will not faster than 50 msec so this period satisfies our requirements.

- Task 2:

Name: blood Pressure.

Periodicity: 25 msec.

Execution Time: 3 msec.

Deadline: 25 msec.

Priority: 1

- **Task 3:**

Name: heartbeat.

Periodicity: 100 msec.

Execution Time: 1.5 msec.

Deadline: 100 msec.

Priority: 1

- **Task 4:**

Name: Temp sensor.

Periodicity: 10 msec.

Execution Time: 2.5 msec.

Deadline: 10 msec.

Priority: 1

- **Task 5:**

Name: siren.

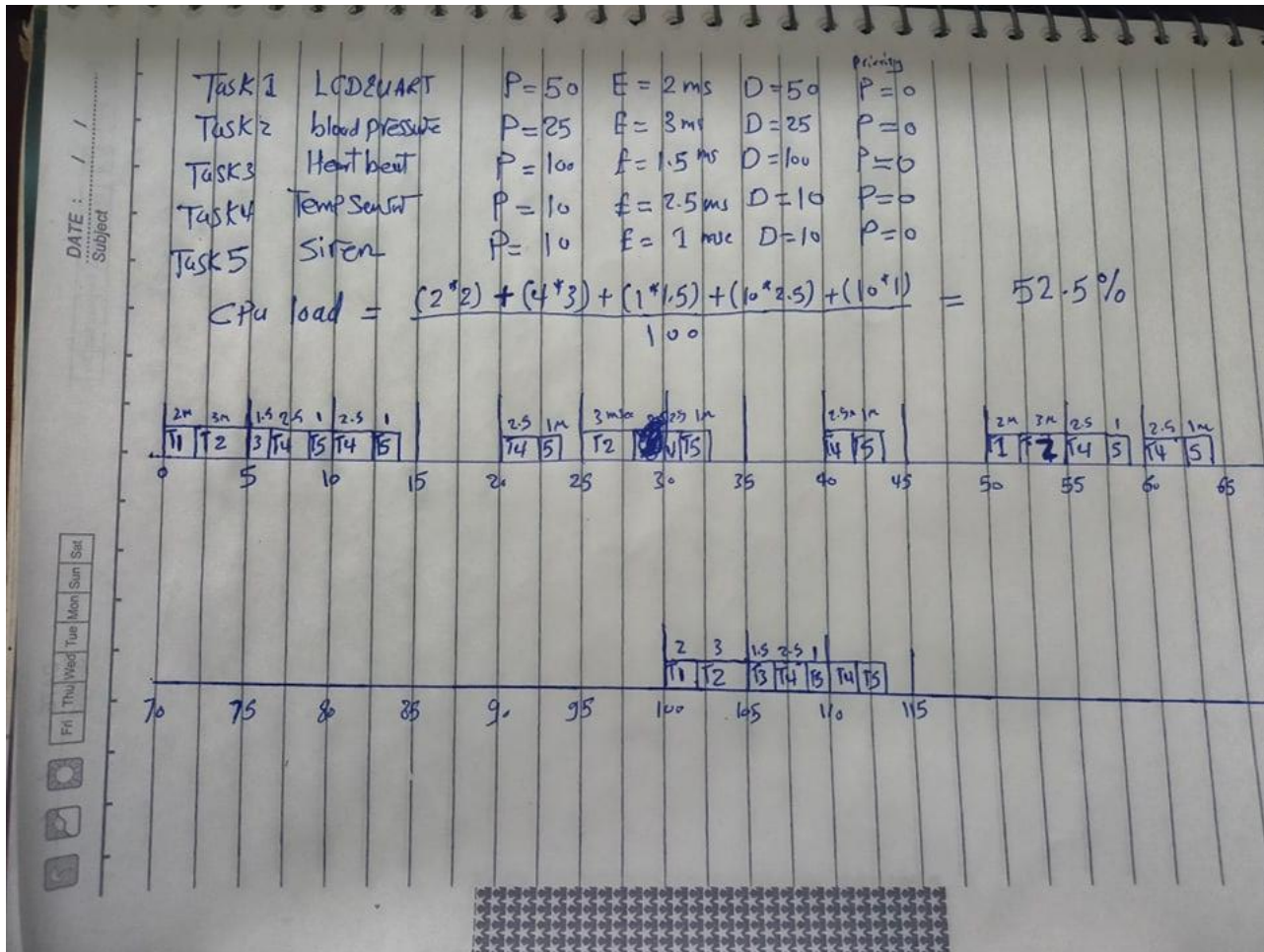
Periodicity: 10 msec.

Execution Time: 1 msec.

Deadline: 10 msec.

Priority: 1

I made a manual design for the tasks as shown in photo.



We have a healthy system with following characteristics

- 1- CPU load is good 52.5% and that is an indicator for the system performance.
- 2- The system is highly responsive because the siren task repeats each 10msec that means it will response for the most frequent task: temperature task.
- 3- **Theoretically** the system is feasible but under some conditions I have a critical part in ticks 0,100,200,300 etc.

As all tasks will be ready at these ticks so the tasks 4 and 5 maybe miss their deadlines (10 msec) in this part if the system delayed for less than 1msec for any reasons.

SimSo:

SimSo: Real-Time Scheduling Simulator

File View Help

* Unsaved

Model data

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	TASK T1	Periodic	<input type="checkbox"/> No	0	50	-	50	2	▼	1
2	TASK T2	Periodic	<input type="checkbox"/> No	0	25	-	25	3	▼	1
3	TASK T3	Periodic	<input type="checkbox"/> No	0	100	-	100	1.5	▼	1
4	TASK T4	Periodic	<input type="checkbox"/> No	0	10	-	10	2.5	▼	1
5	TASK T5	Periodic	<input type="checkbox"/> No	0	10	-	10	1	▼	1

Edit data fields...

Remove selected task(s)

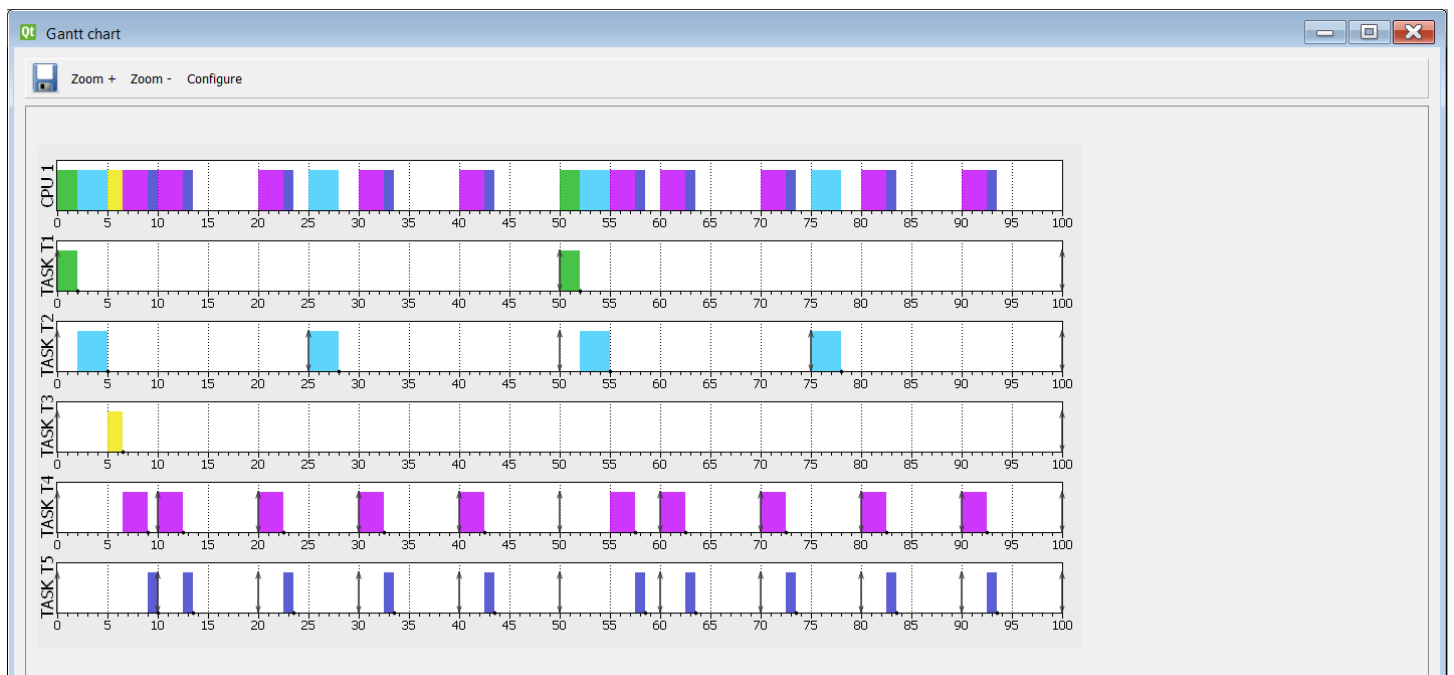
Results

General Logs Tasks Scheduler Processors

Observation Window:
from 0.00 to 100.00 ms Configure...

	Total load	Payload	System load
CPU 1	0.5250	0.5250	0.0000
Average	0.5250	0.5250	0.0000

Add task Generate Task Set



Here we will try to enhance our design to make sure that the system will be feasible.

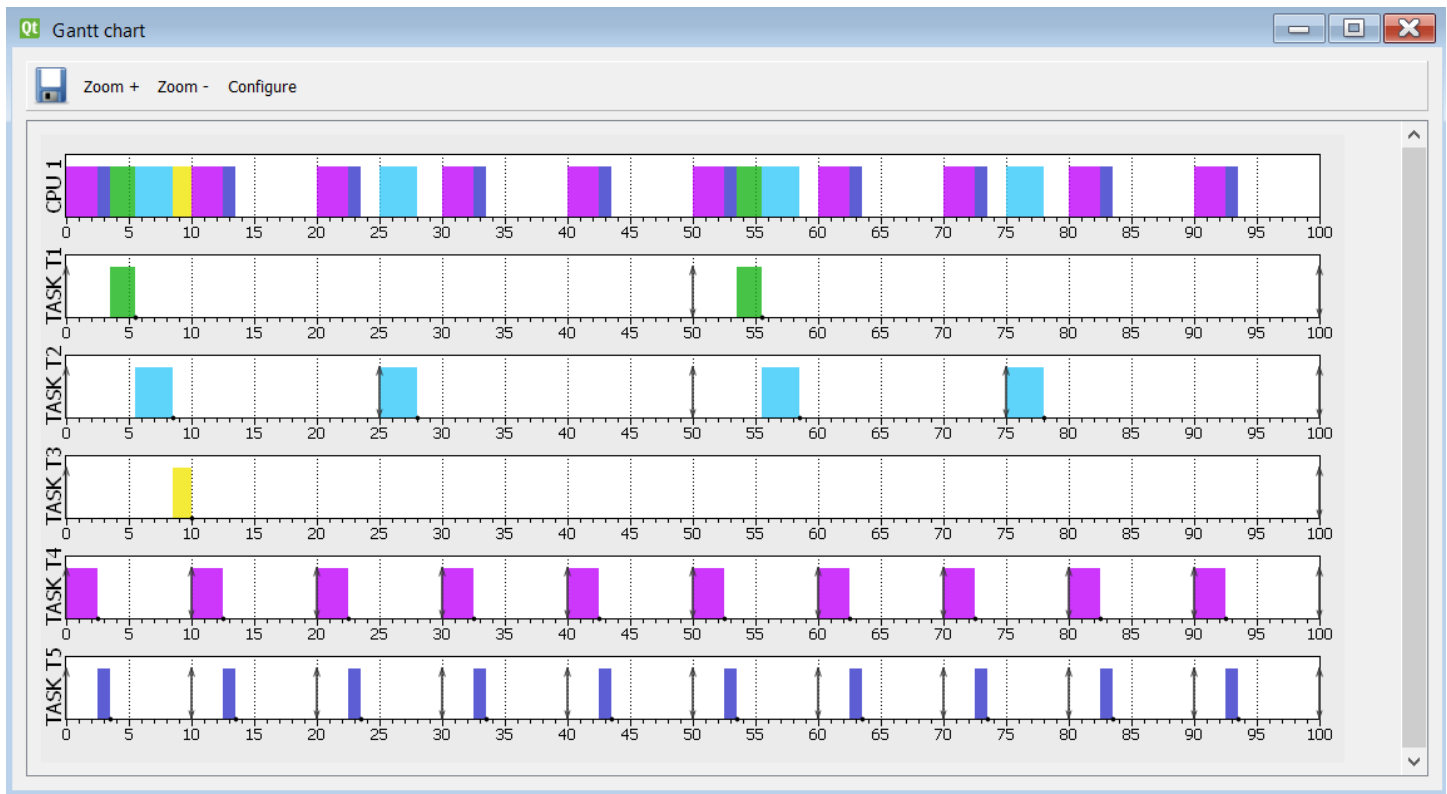
We have 2 ideas to achieve that

1- Following the rate monotonic scheduling simple rule

The high frequent tasks should have high priority and vice versa.

So, if we assign high priorities for tasks 4 and 5, we will make sure that they will be executed first and will not shifted to the end of tasks specially in the critical part we mentioned before.

We will change the priorities to 2 and see the time line.



If we see the time line, we will find that task 4 and 5 executed first compared to the previous time line in the first design.

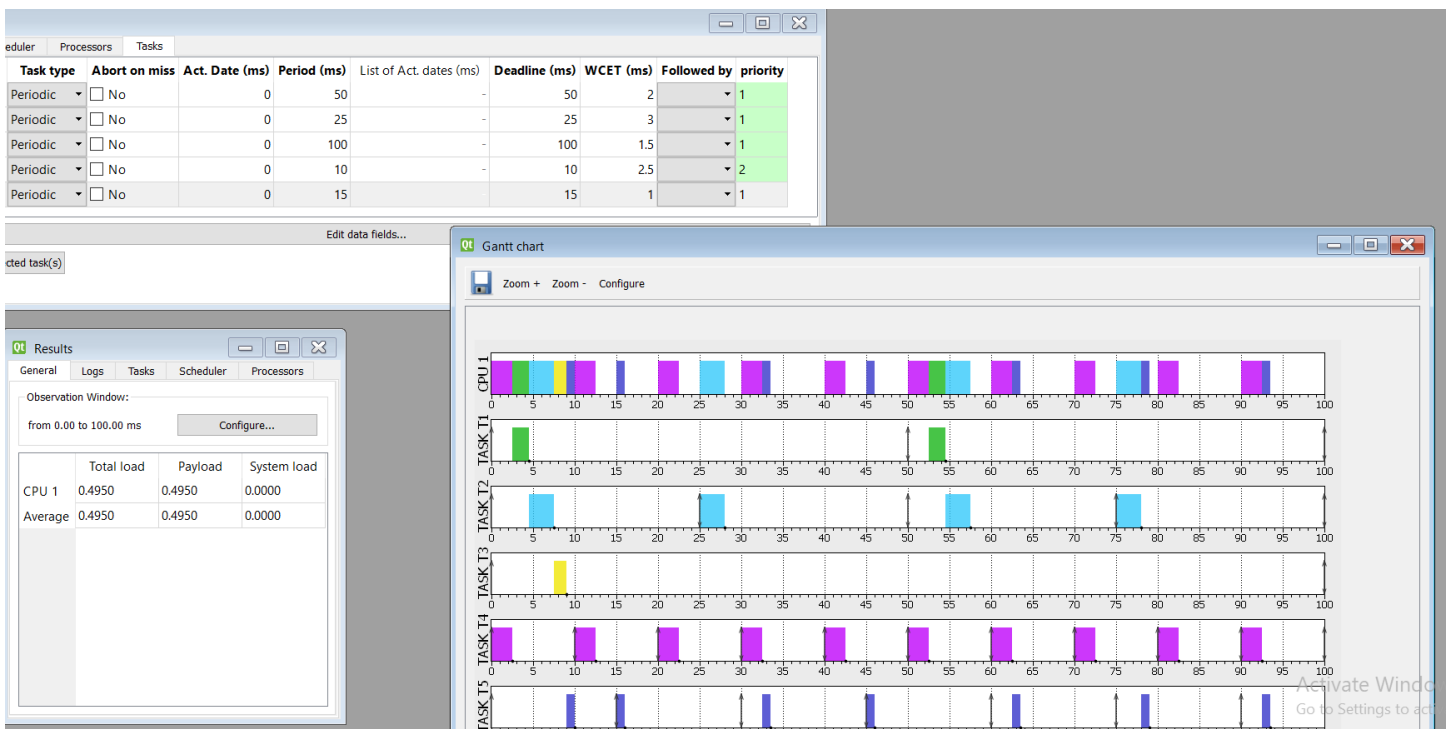
Second idea is:

2- Change the periodicity of the siren task

It will affect the responsiveness of the system by delaying the response of alert at worst case 12 msec if we assign periodicity of 15 msec instead of 10 msec in tick: 50 msec

But this delay is acceptable because the human interaction with the alert will not be as fast as 12msec.

This design also enhanced the CPU load.



Thank you

