# Health care system design

## Tasks count:

5 Tasks

**Note:** each resource takes one task in my design to enhance the readability and debugging. Alert Sieren will be on event as a shared. When the event occur, the task execution time will be increased by 1ms (the execution time of Alert Sieren task)

## Tasks Periodicity:

- Task1 (LCD task): 20ms

  **Note:** one cannot touch screen in rate more than this value. Also the commands sent on UART are not dependent on the other tasks functionality so, there is no correlation in the timing

- Task2 (Blood pressure sensor): 20ms

  **Note:** period is less than the update time of sensor to ensure not to miss a new data

- Task3 (Heart beat detector): 60ms

  **Note:** period is less than the update time of sensor to ensure not to miss new data. Its known that heart beat is a critical data in medical devices so, It must be read correctly (in terms of data and time)

- Task4 (Temperature sensor): 10ms

  **Note:** period equals to the update rate of sensor's values. I assume that is acceptable here to loss some reading values. The task is not safety critical and doesn't has big effect on the overall temperature

- Task5 (Alert Serien): On event task

  **Note:** this task should execute only when any of the sensor readings come available.  Such a usage decreased the overhead on the system.

## Tasks Deadline:

All Tasks deadline = periods specified in the above section

## Tasks Priority:

- Task1 (LCD task): 2
- Task2 (Blood pressure sensor): 3
- Task3 (Heart beat detector): 1
- Task4 (Temperature sensor): 4
- Task5 (Alert Serien): The highest priority based on event

## System Tick:

System tick value = 10ms

**Note:**

The whole execution time of all tasks without event task = 9ms

**Note:** In the worst case scenario if all sensor tasks triggered the event task, the execution time may exceed 10ms (selected system tick). However this will not corrupt the system design because I assume the scheduler run in non-preemptive mode

System tick matches the lowest priority (10ms)

Tasks priorities are multiples of System Tick

## Hyperperiod:

Hyperperiod = 60ms

**Note:** Hyperperiod = LCM(Periods)

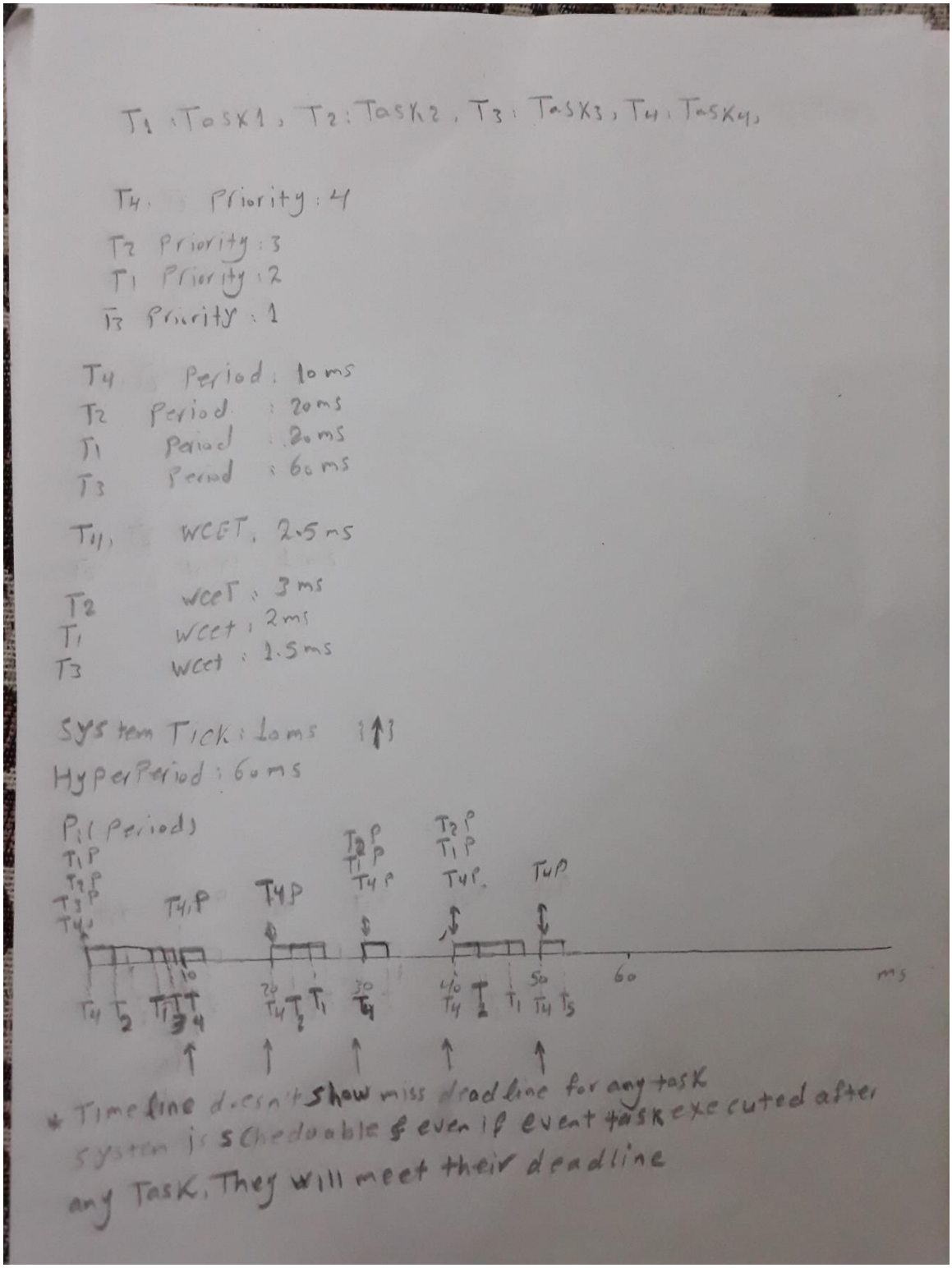
## CPU load:

53%

**Note:** CPU load = Sum(Tasks execution time inside Hyperperiod) / Hyperperiod =

(3*2 + 3*3 + 1*1.5 + 6*2.5) / 60 = 0.53

## Verifying tasks schedulability manually:



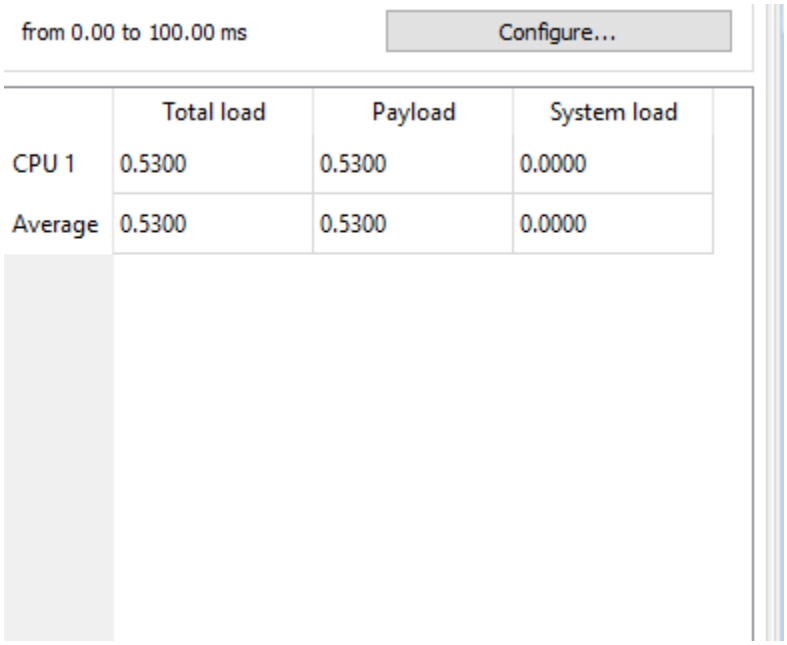
## Verifying tasks schedulability using tool:

- **Simso tasks Configurations:**

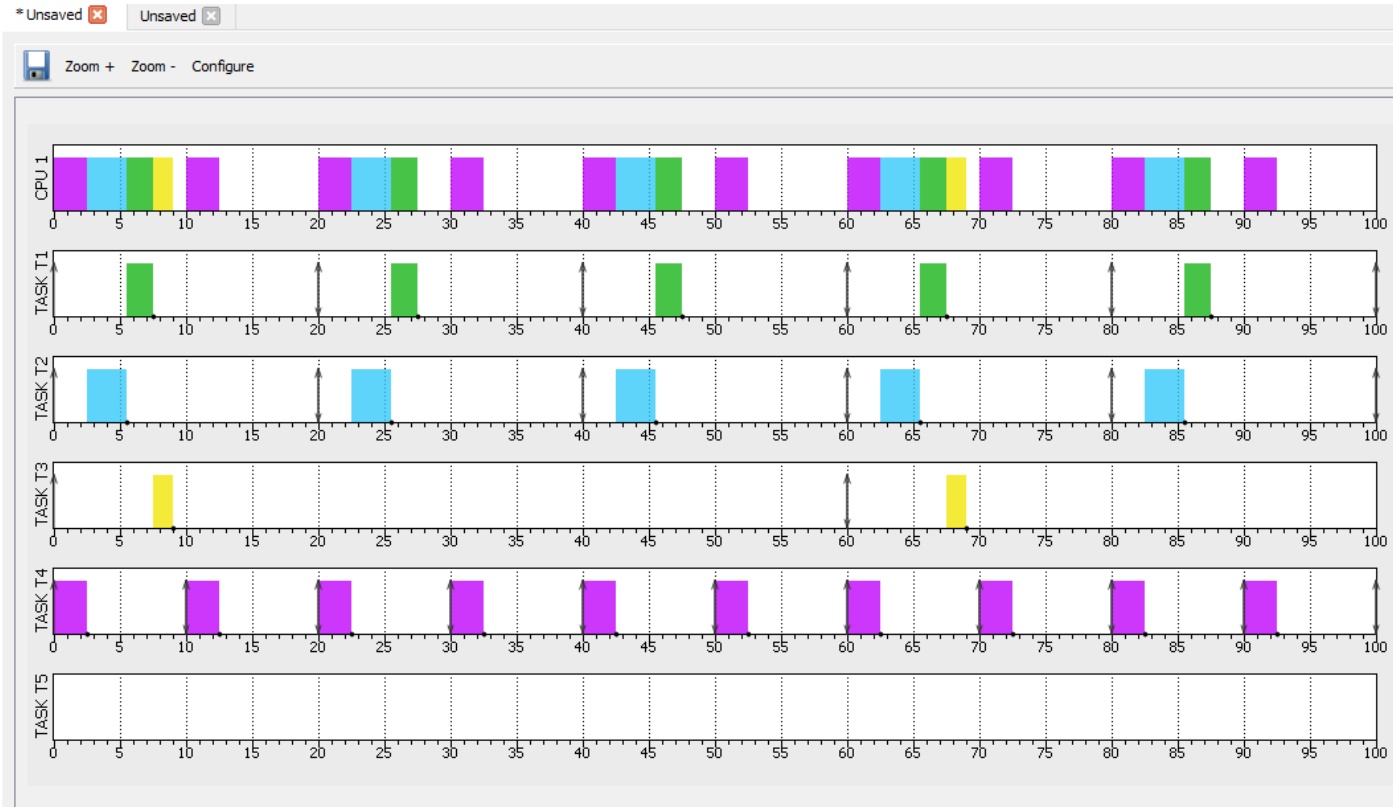
General | Scheduler | Processors | Tasks

| 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 | TASK T1 | Periodic | No | 0 | 20 | - | 20 | 2.0 | | 2 |
| 2 | TASK T2 | Periodic | No | 0 | 20 | - | 20 | 3 | | 3 |
| 3 | TASK T3 | Periodic | No | 0 | 60 | - | 60 | 1.5 | | 1 |
| 4 | TASK T4 | Periodic | No | 0 | 10 | - | 10 | 2.5 | | 4 |
| 5 | TASK T5 | Sporadic | No | - | - | | 1 | 1.0 | | 5 |

**Simso results:**



**Simso Gantt chart:**




- **Gantt chart verifies schedulability of the systems. It doesn't show miss deadline for any task. Even if event task executed after any of sensor tasks they will meet their deadline**