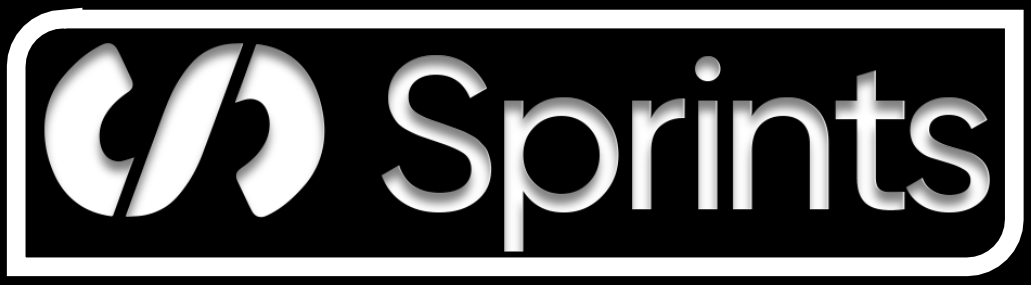

Healthcare System RTOS

Design

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2023

Contents

Figures

Tasks are Needed

This System needs' **four** Periodic tasks and **one** ON_EVENT task, so overall we need **five** Tasks

Tasks Parameter

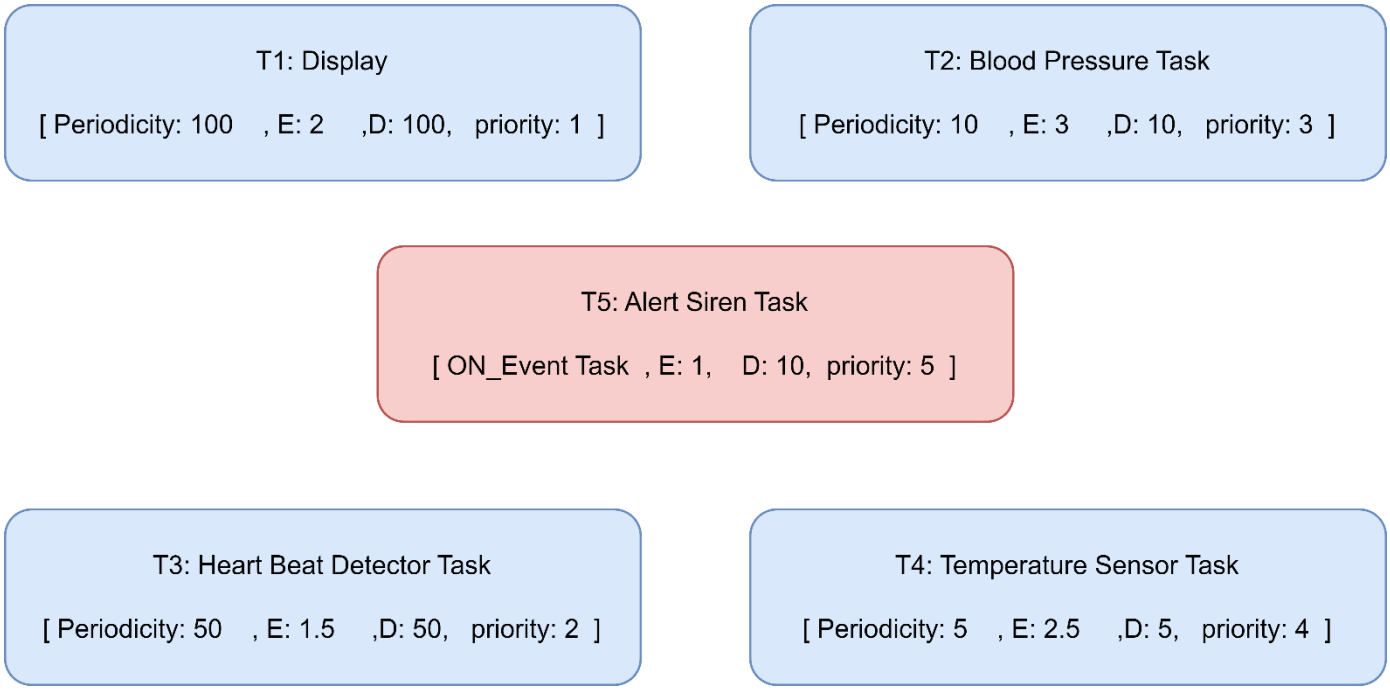

Figure 1: Tasks parameter

NOTE: The Scheduling Policy based on Rate Monotonic Mechanism, so these priorities based on periodicity {Task that having high periodicity having high priority}

System Tick Rate

System tick rate > execution time of all tasks

➔ Total execution time of all tasks = 2+3+1.5+2.5 = 9 ms

According to this design I chose System Tick Rate every **10 milli second**

Hyperperiod Calculation

Every **100 milli second**

CPU load

- LCD task execute every 100 ms {E: 2ms}
- Blood pressure sensor task execute every 10 ms {E: 3ms}
- Heart beat detector task execute every 50 ms {E: 1.5ms}
- Temperature sensor task execute every 5 ms {E: 2.5ms}
- Alert siren task executes on Event {E: 1ms}

NOTE: All values above are in accordance with the Nyquist rate

CPU load without Alert siren task

$$\text{CPU load} = \frac{(2.5*20)+(3*10)+(1.5*2)+2}{100} = 0.85 = 85\%$$

CPU load when Alert siren task execute

$$\text{CPU load} = \frac{(2.5*20)+(3*10)+(1.5*2)+2+1}{100} = 0.86 = 86\%$$

Tasks timeline

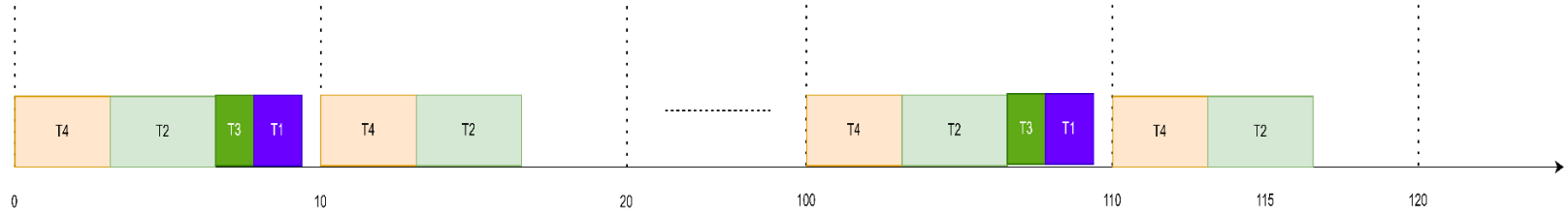

Figure 2: Tasks timeline

As we saw in figure2 that all tasks execute together every 100 ms which it called hyperperiod.

All tasks execute based on its priority according to its periodicity this schedule policy called rate-monotonic schedule.

System tick rate comes every 10 ms? To make sure that all tasks execute without any preemption.

Tasks modeled in SimSo

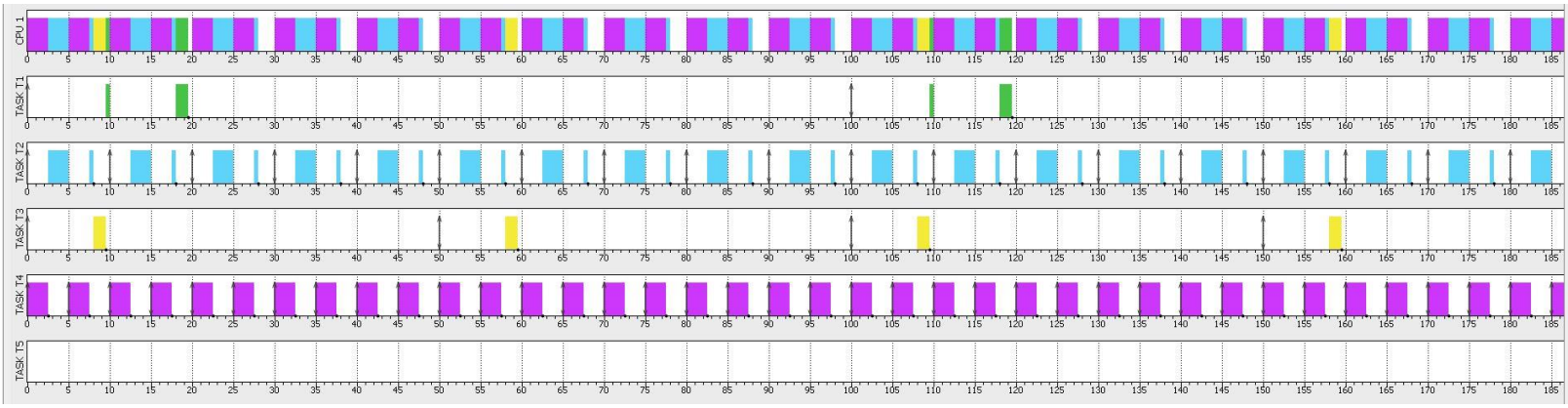

Figure 3: Tasks timeline

As **Figure2** & **Figure3** is shown on SimSo simulator we see that all tasks execute without missing their deadline and the cycle repeats every 100 ms

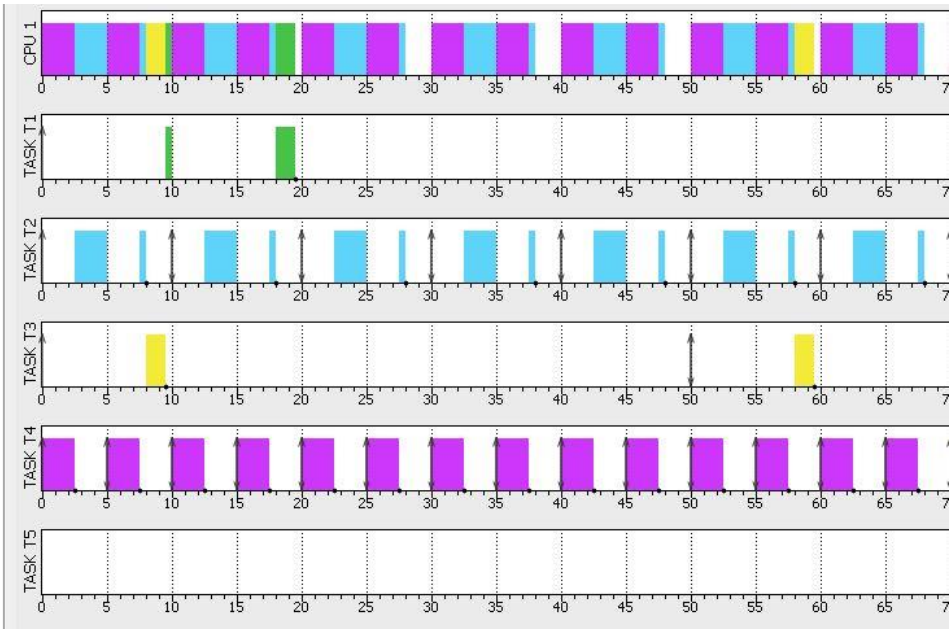

Figure 4: Zoomed tasks timeline

In **Figure4** shows system CPU load on SimSo offline simulator which CPU load utilized about 85%

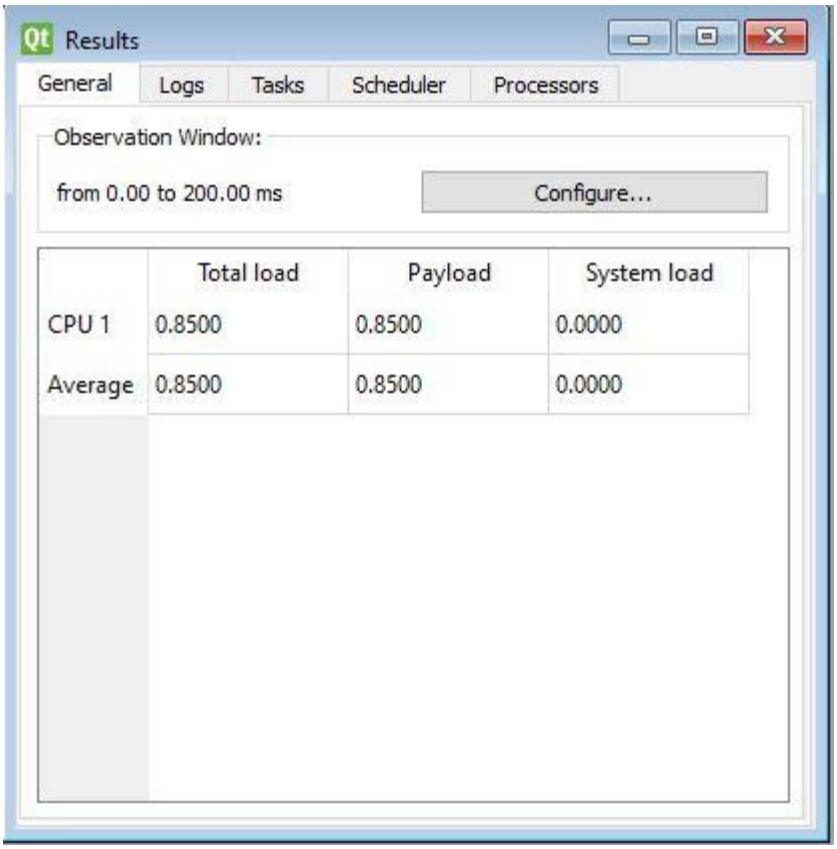

Figure 5: System CPU load