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# HEALTH CARE SYSTEM DESIGN

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RTOS TASK



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## Overview

This is a simple design for a Healthcare system using RTOS (real-time operating system) with the following Requirements.

1. A touch LCD is an input that controls the system and gives commands. Every LCD command is represented in 4 bytes. LCD is connected to the microcontroller through UART with a speed of 9600 bps [Bit per second]. (Reading 4 bytes and processing the command takes 2 ms)
2. Blood pressure sensor with new data every 25ms. (Reading the sensor and processing its data takes 3 ms)
3. Heartbeat detector with new data every 100ms. (Reading the sensor and processing its data takes 1.5 ms)
4. Temperature sensor with new data every 10ms. (Reading the sensor and processing its data takes 2.5 ms)
5. Alert siren. (Activate or deactivate the siren takes 1 ms)

## Goals

- determine how many tasks are needed the system.
- determine the specification of each task (Deadline - periodicity - priority) decide the systick rate
- calculate
  - hyperperiod
  - CPU load
- Draw the timeline manually the expected schedulability of the system Model the system in Simso

## Tasks in system

The following table 1 is shown the tasks with each (Periodicity, Deadline, Priority)  
The task with Higher number has higher priority.

Task id	Periodicity	Deadline	Priority
T1_TLCD	100	100	4
T2_BLD_PR	25	25	2
T3_HEART_RATE	100	100	3
T4_TEMP_SEN	10	10	1
T5_ALEART	10	10	0

*Table 1 Tasks Parameters*

## System Tick Rate

Systick rate we must calculate the TotalExecutionTime.

$$\text{TotalExecutionTime} = (2+3+1.5+2.5+1) = 10\text{ms}$$

So TotalExecutionTime is 10ms.

## Hyperperiod

$$\text{Hyperperiod} = \text{LCM}(\text{tasks periodicity}) = \text{LCM}(100, 25, 10) = 100$$

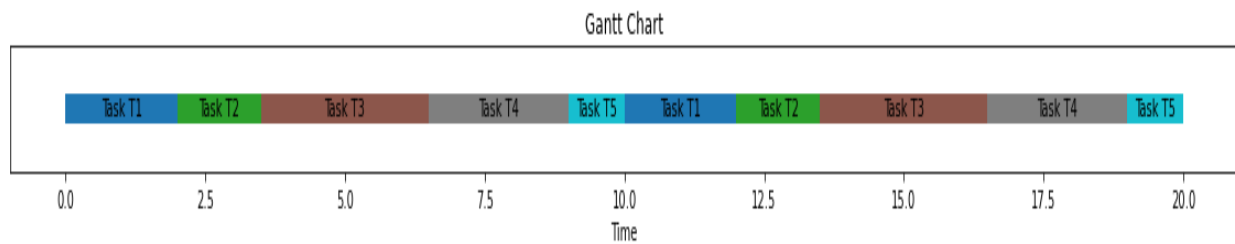
## CPU Load

Task id	Periodicity(ms)	Execution Time(ms)	Busy time ( $E \cdot (H/P)$ )
T1_TLCD	100	2	2
T2_BLD_PR	25	3	12
T3_HEART_RATE	100	1.5	1.5
T4_TEMP_SEN	10	2.5	25
T5_ALEART	10	1	10
TOTAL			50.5 ms

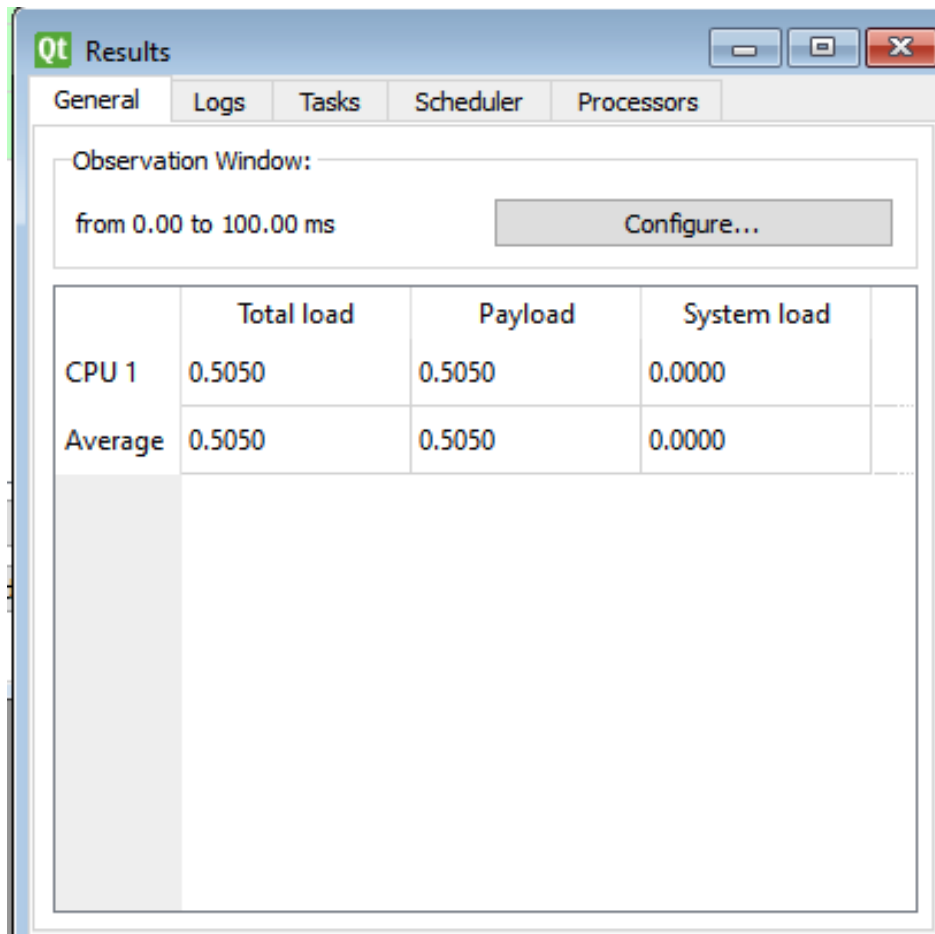
Table 2 task busy time

CPU load = (Total busy time / Hyperperiod) = (50.5 / 100 ) = 0.505 = **5.05%**

## Timeline and Stimulability



## Simso



Qt 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 checked="" type="checkbox"/> Yes	0	100	-	100	2		4
2	TASK T2	Periodic	<input checked="" type="checkbox"/> Yes	0	25	-	25	3		2
3	TASK T3	Periodic	<input checked="" type="checkbox"/> Yes	0	100	-	100	1.5		3
4	TASK T4	Periodic	<input checked="" type="checkbox"/> Yes	0	10	-	10	2.5		1
5	TASK T5	Periodic	<input checked="" type="checkbox"/> Yes	0	10	-	10	1		0

Edit data fields...

