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Universidade de Aveiro
Real Time Operating Systems

Tutorial 3

Use of the Zephyr RTOS for Embedded Micro-controller-based RT Applications

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In order to implement a distance detector system, we decided to create 3 tasks: one that is periodic (**sensor task**) with a period of 1000 ms. The other 2 tasks (**processing task** and **output task**) are sporadic and are activated by semaphores.

The sensor and the processing tasks share a memory called ‘sensor_processing’, while the processing and output tasks share a memory called ‘processing_output’. Each of these memories is managed by its corresponding semaphore.

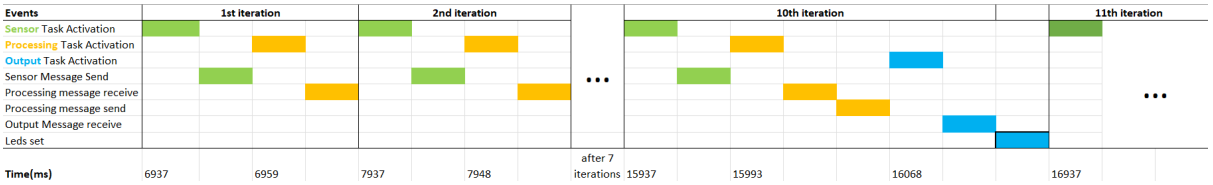
The flow of the application should follow this order:

- **Sensor task** activates, reads potentiometer data, stores value on the sensor_processing memory and then gives the sensor_processing semaphore.

- Consequently, the **processing task** takes the sensor_processing semaphore (activates), reads the value stored on the sensor_processing memory, filters the value (computing the moving average filter of 10 samples), stores the value on the processing_output memory, and gives the processing_output semaphore.

- Finally, the **output task** takes the processing_output semaphore (activates), reads the number stored on the processing_output memory and configures the board leds according to its value.

We considered the following relevant events: activation time and all the shared memory operations performed by every task. The diagram below shows the process of reading 10 sensor values, processing 1 average and showing the first filtered value through the board’s leds. We omitted the initial activation of the processing and output tasks before blocking while waiting for their respective semaphore.



It is also important to mention that on the first 9 iterations, the output task will not be called/executed because the processing task needs to accumulate 10 values in order to compute the average.