1DT301 – Lab assignment 4: C-programming with interrupts

Goal for this lab:
- Gain some experience in using the C language to program the Pico.
- Learn to use timer interrupts to make a counter.
- Learn to use GPIO interrupts to register inputs.

Presentation of results:
This is the final lab in the course and there will be no more lab sessions in the course. Because of this, you are required to **make a video to present all tasks.** The video has to meet the following requirements:

- Start by presenting all group members with group number, and all group members present themselves by name.
- Show both the hardware configuration, the function and explain some of the code in each task. **All group members must be active during the presentation of the hardware and the code**!
- The video can be uploaded on MyMoodle together with the report, if the file is not too large. You can also upload the video to an online service, such as YouTube, and submit the link on MyMoodle.

To complete the lab, you also need to submit the code on Moodle, as a .pdf file. Each group must submit solutions to all lab tasks, and **the names of all group members must be in the header of every file**. Use the following header:
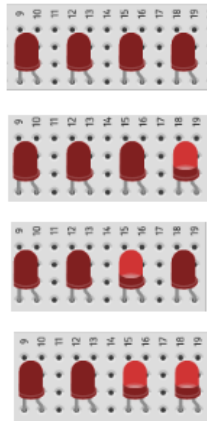*Course 1dt301: Computer Technologi 1*
Lab Assignment 4, 2023
Names of BOTH members in the lab group

Tasks

Task 1: Binary counter
Connect four LEDs in a row to make a binary counter. The counter should count from 0000 to 1111. The picture below shows the counter counting from 0000 to 0011.

The LEDs should be connected to ports GP1, GP2, GP3 and GP4.

Connect one button to GP5 and one button to GP6 with the following functions:

- Let the button on GP5 increment the counter (increase one step). If increase button is pressed when counter value is 15, nothing should happen!
- Let the button on GP6 decrement the counter (decrease one step). If decrease button is pressed when counter value is 0, nothing should happen!

Let the counter start at value 0. You must use interrupts to handle the inputs from the buttons! There will probably be problems with bouncing buttons (one button press counts as many) but you can ignore this problem.

Task 2: Binary counter with reset button
Use the same counter setup as in the previos task, but this time, let the counter increase automatically using a timer interrupt. Also, connect a button to GP0 to reset the counter. You don't need to use the buttons at GP5 and GP6 in this task.

Requirements:

- There should be 1 second time interval between the counter values.
- Stop the count when the counter reaches its maximum value 1111.
- At any time, the Reset button should reset the counter to 0000 and after that, the counter shall resume its counting.
- The counting must be implemented with a timer interrupt and you have to use GPIO interrupts to handle the signals from the buttons!