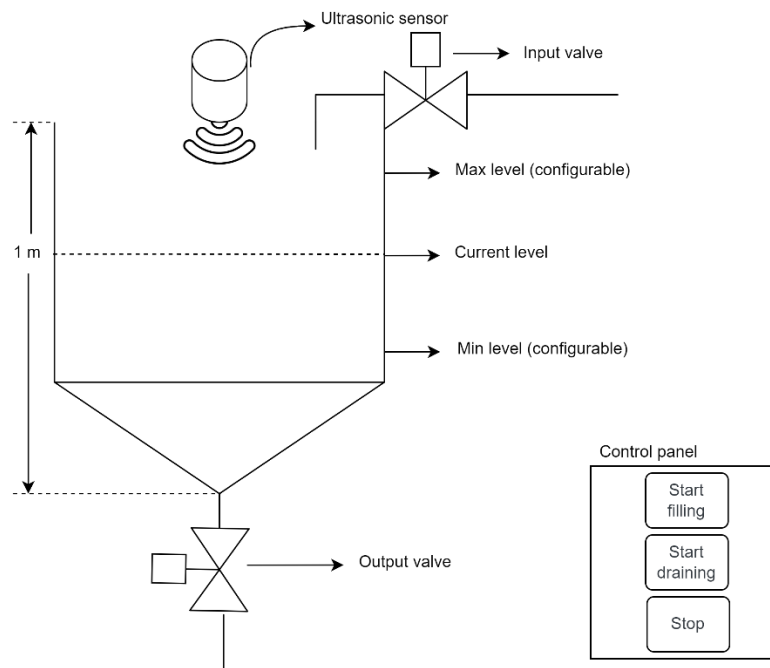


Workshop on General Purpose Input/Output in MicroPython and ESP32 (Percentage of Final Grades: 20%)

You have been hired to automate a tank's filling/draining processes that store gasoline (the tank's height is 1 meter). The system includes the following elements (Figure 1):

- Ultrasonic level sensor: This sensor is in charge of continuously measuring how full the tank is.
- Input valve: This is an on-off (digital) valve that is activated to open the pipe that brings gasoline from another plant's location, for instance, a tanker truck. It is located on the tank's top. It will be simulated with an LED.
- Output valve: This is an on-off (digital) valve that is activated to open the pipe to drain the tank. It is located in the tank's bottom. It will be simulated with an LED.
- Start filling button: A pulse-type input button must be considered to activate the input valve to start the filling subprocess. The input valve would be deactivated once the ultrasonic sensor indicates that the level is greater than or equal to the maximum level. The maximum level may be configured as a variable in the code.
- Start draining button: Another pulse-type input button must also be considered to activate the output valve to start the draining subprocess. The output valve would be deactivated once the ultrasonic sensor indicates that the level is less than or equal to the minimum level. The minimum level may be configured as a variable in the code.
- Stop button: At any moment, if the operator must stop the subprocesses of filling or draining, he/she must press this button.



A MicroPython-based software must be coded with the following features:

1. A class that allows reading the continuous level in the tank using the HC-SR04 sensor. Consider that the distance and the level must be accurate and compared with a ruler or a flexometer. This class must run in parallel to the main program.
2. A class that considers four methods: *i)* a method to control the filling subprocess using the input valve and the start-filling button, *ii)* a method to control the draining subprocess using the output valve and the start-draining button, and *iii)* a method to control the stop process using both valves and the stop button. The readings from buttons must be implemented using interruptions (IRQ).

The grading rubrics will be as follows:

- Coding the class for measuring the ultrasonic sensor and accuracy of the measurements compared with a flexometer: 25%
- Correct operation of the filling subprocess using parallel programming: 25%
- Proper operation of the draining subprocess using parallel programming: 25%
- Adequate wiring and solution aesthetics: 25%

This assignment will be graded on April 10th during class time. No prorogations allowed.