



Assignment 3

Assignment issued on Thursday, April 19, 2018

Honor code: Work on the assignments is to be carried out in the assigned groups of two or three students. You're welcome to talk to classmates about assignments conceptually, but the implementation must be your own unless otherwise noted. For example, speaking with a classmate about why some bug might be present in your program is okay as long as your classmate doesn't share with you a program that fixes your bug. You should not use any existing code that we don't supply, whether it is online or otherwise. Further, copying code from places like Stack Exchange is prohibited: you will learn much more if you write your own programs.

3.1 Ultrasonic Sensors

The MC Mobile robot includes three front-mounted ultrasonic sensors SRF-05 to measure the robot's distance to obstacles in its path.

Documentation on the sensors can be found in moode as well as at the URL

<https://www.robot-electronics.co.uk/htm/srf05tech.htm>

The sensors are operated in the "single pin for both trigger and echo" mode. To determine distances, an ultrasonic signal is generated and your software has to measure the time it takes for the signal's echo to arrive back at the sensor.

- Develop functions to measure the distance for each of the three ultrasonic sensors. You can write three separate functions or – preferably – a single function that takes a parameter indicating which sensor to query.

Hinweise:

- The sensors use one single I/O pin for the outgoing and incoming (echo) signal. Accordingly, you have to switch the direction of the related I/O pins to output or input in time.
- Only measure using one sensor at a time, since the signal sent out by one sensor might interfere with signals received by the others.
- Use the LPC1778 timers (UM10470 chapter 24) to measure the time, *do not use timing loops*. For now, you can use the timers in polling mode, thus you do not need to setup interrupts for this assignment.
- Display the measured *distances* to obstacles graphically (e.g., as bar graphs) on the LC display. Calibrate the measurements to convert the echo time to an actual distance in cm. Update the display continuously.