

Digital & Embedded Systems

ELEC4403

Lab Assignment 6 – Motor Control

Points: 10

EQUIPMENT: Mobile Robot with Embedded Controller
incl .sensors and motors

For both experiments:

- Display the current encoder value and motor speed on the LCD, using a suitable time interval to see the impulse response of the motor.
- Record 1,000 speed values in memory, then transfer these via USB to a PC/Mac and store as a csv-file (make sure to insert a newline after each value). Then visualize the results using Excel or similar in graph mode.

EXPERIMENT 1 (3 points)

Write a motor controller in C implementing a **Bang-Bang controller** for a single motor. The program should maintain a fixed motor speed of 50% (~10,000 ticks/s), irrespective of changing load.

Follow the algorithm and procedure outlined in the lecture notes!

Show your source file and the generated graph to the lab demonstrator.

EXPERIMENT 2 (5 points)

Write a motor controller in C, stepwise implementing a **PID controller** (P, PI, PID) for a single motor (wheel). The program should try to maintain a fixed speed value of 50, irrespective of changing load.

Follow the algorithm and procedure outlined in the lecture notes!

Submit your 3 source files and the 3 generated graphs.

- **Step A** (1 point)
P-Controller (proportional only); display the generated graph.
- **Step B** (2 points)
PI-Controller (add integral component); display the generated graph.
- **Step C** (2 points)
Full PID-Controller (add integral component); display the generated graph.

EXPERIMENT 3 (2 points)

For the PID controller, plot the motor speed in real-time as a graph on the LCD.

