Exercise and assignment on getting the robot to move

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First experiments

Take the sample program file TestMotors2.java that you find on moodle

1. Go through the program line for line and check in the API for each method call, what it is supposed to do and what the parameters mean (including assumed unit).
2. For testing the program, you first need to build a robot with two independently controllable drive wheels and a caster wheel, so that it is capable of steering in straight and curved lines.
3. Test different variations of the program on your robot, with and without the two `setAcceleration` calls, with and without the two `rotate` calls, and with and without the call `Motor.A.rotateTo(Motor.B.getTachoCount())`. Explain to yourself the observed physical behaviour of the robot in the different sample runs.

Assignment 1

The assignments should be handed in using the “Assignment 1” button you find in the moodle pages. **Deadline is September 20, 2016 at 13:00.**

You can use the robot that you developed for the previous experiments. The purpose is to get more experience with the different ways of driving and navigation of the robot and to observe the precision (or lack of such).

Design first on paper a closed route put together by curves and straight lines in such a way that – in theory – the robot after driving along the route, would end up in exactly the same position heading in exactly the same direction. The total length route should be at least two metres.

Notice that your robot should have no sensors, so there is no reason to indicate the route on the floor – you should be testing your robot’s ability to navigate under conditions comparable to heavy fog (and having forgotten GPS, compass, etc. at home).

You should make three versions of a program that makes your robot follow the route.

1. Using the `Motor` class only for steering the robot, which means that you must calculate manually the rotation speed for each motor and time to run for each part of the route.

2. Using the `MovePilot` class.

3. Using the `Navigator` class. Notice that `Navigator` does not have explicit methods for following curves. Instead you can build a path by indicating points to be visited along the route, and the `Navigator` class finds out itself how to visit the points. You can use the `addWaypoint` method for defining these points.[1] It is suggested that you select the points on you original route in a "strategic" way so that the `Navigator` would end up following a route close to the original one.

You are expected to hand in a report of at most 5–7 pages, containing the following.

1. a picture of the robot and a discussions of its design,

2. a drawing showing the route, including also the selected points for version 3.

3. the programs (with short explanation),

4. experimental measurements showing the accuracy of the runs, with various speeds, surfaces and perhaps with multiple laps,

5. a brief discussion of the results.

You can develop the robot and the programs in your small groups, but the report must be written and uploaded to moodle individually by each student. **Deadline is March 14, 2018 at 8:15 – before the course starts that day.**

[1] We did not mention this way of using `Navigator` in the lecture; look here for more information: `http://www.lejos.org/ev3/docs/lejos/robotics/navigation/Navigator.html`.