REX Opgave 1

Get Started - Driving

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Introduction

In this exercise we will learn how to do simple driving maneuvers with the robot. The main purpose of the exercise is to get familiar with the programming API for your Arlo robot.

Please start reading the **GettingStartedArlo.pdf** available at Absalon. This describes the robot, and how you communicate with it. We recommend strongly to program the robot using Python (if you are new to python, we recommend Anaconda python). Also available at Absalon you may find example code templates etc in Absalon under `Material`.

The two sub-exercises decribed below must both be approved by the teachers before you continue with Exercise 2. This generalizes to most exercises. A few sub-exercises require written upload. Please see Absalon for the **deadline** for such exercises. For this exercise no written documentation should be submitted. You will receive direct oral feedback during the course in particular at exercise approvement.

At the first exercise session we will form groups of 4 students working together throughout the course.

Please note that you must also answer the mandatory quizz at Absalon. Please see Absalon for the deadline of the quizz. You may view the quizz as training for the individual oral exam. Also it will provide some feedback on your excelency. Please see Absalon for more information.

Sub-exercise 1: Simple movement and motion calibration

When you use the command **go_diff** for translating the robot straight ahead (for say 1 meter) you must wait a certain amount of time before you stop the motion. First, you should estimate this parameter. The value may depend on the speed, i.e. the power you put on the weels. You are recommented to use a moderate (neither low nor high) speed.

To make the robot start out right make sure the small helping wheels are oriented along the driving direction. If the robot consistently turn to one side consider using unequal wheel power.

When you have estimated the translation waiting constant, do the same for rotation. Again use moderate speed. Let the wheels rotate oppositely. Estimate the time constant that you have to wait for the robot to turn 90 degrees.

Next, make the robot drive around in a square. That is, try to make the robot drive straight ahead 1 meter and then turn 90 degrees and repeat this 3 times such that you end up where you started. Mark the end position on the floor. Repeat this five (5) times. Estimate the centroid of the 5 points by eyeballing and measure the average distance from this to the end-points.

Later in the course you will navigate the robot based on visual information, e.g. turning the robot a specific angle or driving a specific distance. This requires an accurate estimate of the two constants

mentioned above. You are recommended to make solid estimations **now** rather than later where time may be limited.

When both constants are estimated try the accuracy for other distances and angles than 1 meter and 90 degrees. Can you use the estimated constants for other distances and angles? Also, you may test if the constants independent of the motor speed.

Sub-exercise 2: Continuous motion

The functionality we worked with in sub-exercise 1, works well in known environments where we can plan every movement of the robot carefully. However in most situations we are not that lucky and we need to be able to control the robots motion continuously. This is done through a continuous drive interface (let the robot move without stopping it and continuously send commands to it to change its course).

It is up to your group to come up with an example route on which you can experiment with continuous motion control. As inspiration you could consider driving along a figure 8 route. See if you can make the robot stick to the same track instead of drifting off to one side.

Please explain your strategy when you ask the teachers for approval of this sub-exercise.

Getting approval

At any time you may ask the teachers for help or approval of a (sub-) exercise. Often, approval depends on a demonstration. The teachers may ask you to improve and await another approval before you continue with the next exercise.