Homework 1 - CSE 276A - Intro Robotics

Due: Friday, 20 October 2023, before midnight

1. A textfile "waypoints.txt" is available on the Canvas website. The structure of the file is individual lines with - x, y, angle. The x, y coordinates are in meters and the angle is in radians.
2. Using the kinematic model for the car, design an algorithm and implement it on the robot to allow it to traverse through the waypoints. This would involve the following few steps:
    - Calibrating the wheel motors of your robot. Each robot is different, therefore calibration has to be done to ensure that equal motor commands rotate all motors equally(otherwise your bot won't go straight) and also to ensure that the bot travels the desired distance for a particular motor command(this one is not too critical as this can be addressed via camera feedback as we will see later in the course).
    - Designing a kinematic model for the car. This is a model that translates desired linear and angular velocities of the car to motor commands for the wheels and vice-versa. You can use this reference as a starting point.
    - Come up with an algorithm that can compute these desired linear and angular velocities needed to traverse these waypoints. For eg. if we want to go from Point A to Point B, what is the velocity needed at each timestep to achieve this motion.
3. Implement the algorithm in python or ROS on the rb5/mbot platform.
4. Provide a report that briefly describes your algorithm, your control algorithm, your code. Comment on the performance of your algorithm. Pack report and code into zip file and upload.
5. Include a link to an (unlisted) youtube video with a recording of an example run on your robot in your report. Not the video, but the URL to the video.

Hints:

- One easy way to get started with calibration is to make your robot go in a straight line, if it veers to the left, that means the left motors are running slower than the right ones and their speeds need to be boosted.
- You can take a look at the python file "mpi_control.py" in the rb5_control/src directory to get a feel for how to control the motors.