Mobile Robot Challenge

Due May 9th 2022

The main goal of the Mobile Robot Challenge is to program the mobile robot such that it is capable to drive in a sequence of straight lines and is able to return at the starting position, thereby avoiding any obstacles that can be placed on the trajectory.
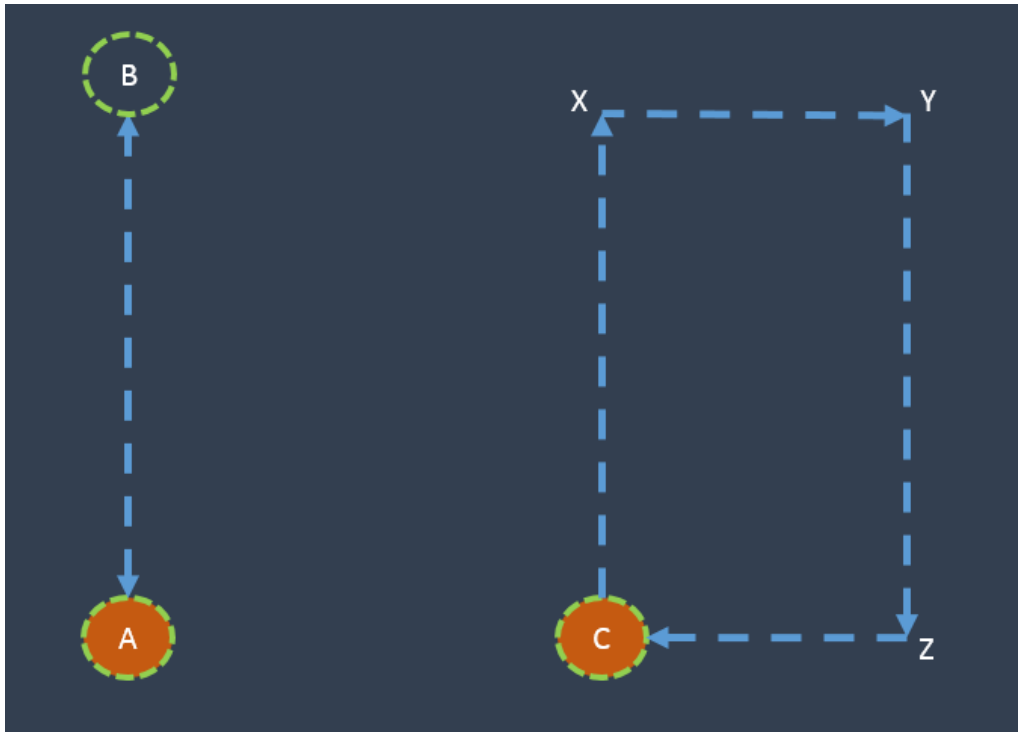
Challenge I Trajectory Repeatability

Figure 1: Trajectories without obstacles.

1. Manually drive your robot to the start position A indicated by a marker (see Notes).
2. Run your program. The robot should automatically run trajectory A -> B -> A. The distance between A and B is 2m. Note that position B is not marked.
3. Manually drive to start position C, again indicated by a marker (see Notes).
4. Run your second program. The robot should automatically run trajectory C -> X -> Y-> Z -> C. The distance between C and X is 2m, the distance between X and Y is 1m, the distance between Y and Z is 2m and the distance between Z and C is 1m. Positions X, Y, and Z are not marked.

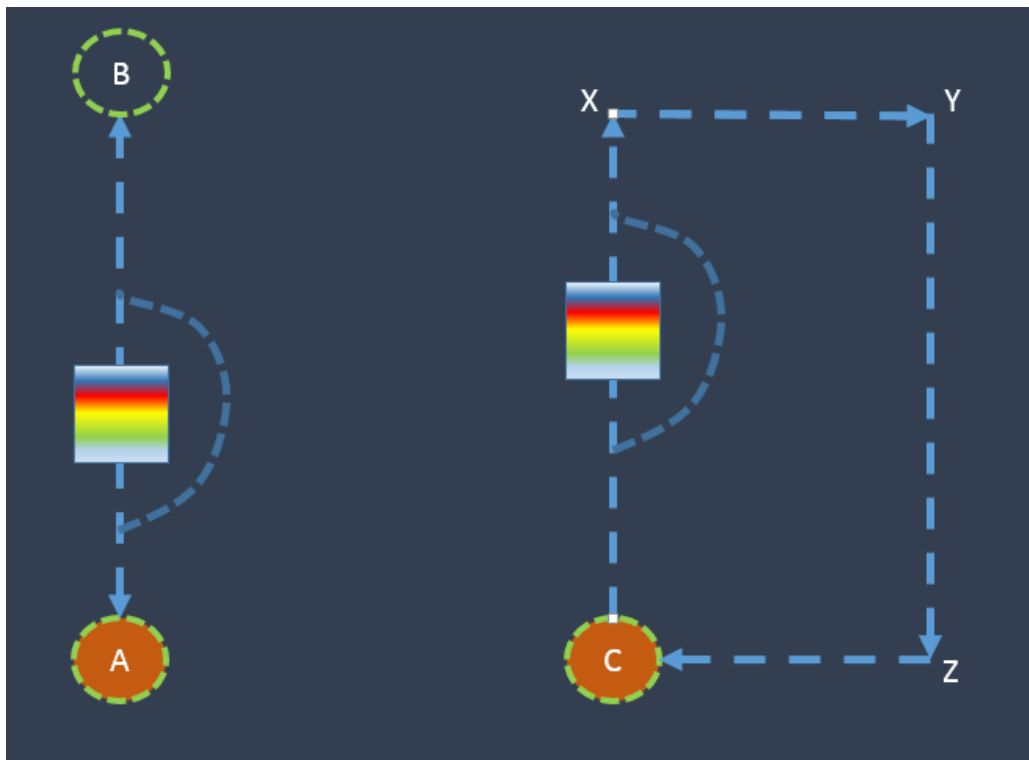**Challenge II** Trajectory Repeatability and Obstacle Avoidance

Figure 2: Trajectories with obstacles.

1. An object (the box that was handed out together with your mobile robot) is placed somewhere in the middle of the trajectory from A to B.
2. Manually drive your robot to the start position A indicated by a marker (see Notes).
3. Run your program. The robot should automatically run trajectory A -> B -> A, while avoiding the obstacle placed on the trajectory. The distance between A and B is 2m.
4. An object (the box that was handed out together with your mobile robot) is placed somewhere on the trajectory C – X – Y – Z – C, at least 40 cm from each corner.
5. Manually drive to start position C, again indicated by a marker (see Notes).
6. Run your second program. The robot should automatically run trajectory C -> X -> Y -> Z -> C, while avoiding any obstacles (the given box) placed on the trajectory. The distance between C and X is 2m, the distance between X and Y is 1m, the distance between Y and Z is 2m, the distance between Z and C is 1m. Note that positions X, y, and Z are not marked.

Notes:

- **Turning:** Indeed some mobile robots area able to turn on the spot, while other models require more space. Therefor you are allowed to use ample space to make the turn at position B.
- **Marker:** The marker is a piece of paper with a shape and uniform color of your choice. The marker should fit in an area of 8cm x 8cm. During the challenge on May 9th 2022 you should bring your own marker that will be placed flat on the floor at a designated location in Room 407 – 409.

Deliverables:

1. On May 9th 2022 every team should show in a live demo in Room 407-409 that the robot is able to pass both challenges.
2. Submit on Brightspace a zip-file containing your source-code and a pdf with a technical report (max 4 pages, font-size 12) containing a title, the name of the team, a list of all the team members a description and explanation of the methods used to solve the problems of the challenge and references to any libraries and papers used. Use a scientific writing style. Finally in an Appendix give the instructions of any dependencies of your code (i.e., extra libraries that need to be installed to get your code running) and how to execute your code to pass both challenges.
3. The final grade will be based on the originality and robustness of your methods and solutions, the performance during the challenge and the quality of your code and report.