School of Mechanical Engineering, Tel-Aviv University

Final assignment

Robotics instructional lab

Spring 2022

Your final assignment would be a participation in a robotic football tournament. Each team would develop an algorithm to deliver a sliding disc (of diameter 70 mm) to beyond the goal line at the opponent's side. A sketch of the field is seen in Figure 1.

1 Sensing

Each team has access to the following:

- `p_r` - Pose of its own robot.
- `p_o` - Pose of the opponent's robot.
- `p_d` - Pose of the disc.

Poses are relative to the field coordinate frame and are in the form homogeneous matrices. These are accessible with the following functions:

```
p_r, p_o, p_d = field_status()
```

2 Rules of a game

1. A point is given to a team that the delivers the disc beyond the goal line of the opponent.
2. Each game consists of three rounds.
3. A round begins when the disc is at the center of the field and the robots are on their goal lines, and ends when a team scores a point.
4. The maximal time for a round is 4 minutes. If no team was able to deliver the disc, a point will be given to the team that has the disc at the opponent's half side.
5. A team can ask for 5 minutes time-off between rounds to modify their code.
6. The team with the most points wins a game and moves on to the next level of the tournament.

The tournament would be in a knockout format: Quarter finals, Semi final, Final.

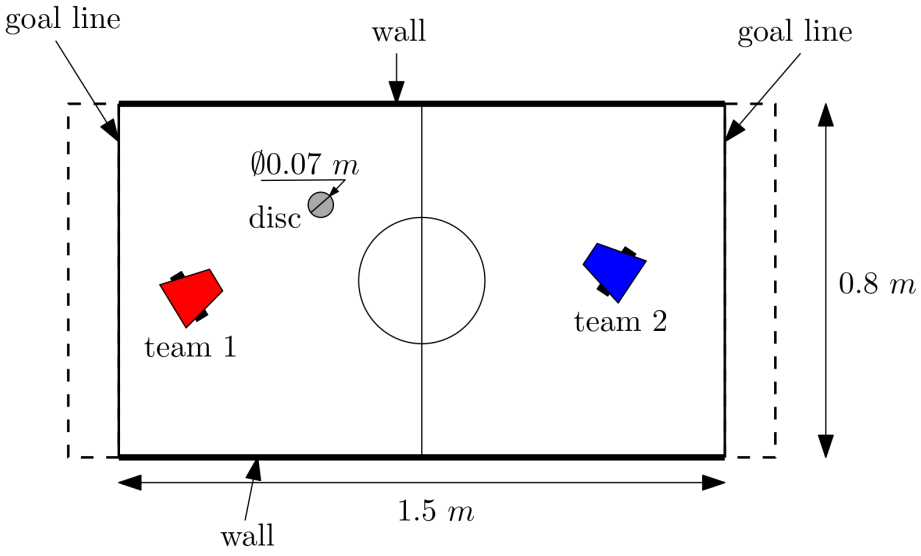

Figure 1: Tournament field.

3 Available functions

- `calc_motor_command(angle)` - Returns left and right motor command to align car orientation to the input angle w.r.t the origin.
- All of the function from the mobile robot planning lab.

4 Goal

The team is required to write a code which would use the above functions such that the robot will **autonomously** overcome the opponent and deliver the disk. The teams are free to choose any desired strategy for the robot as long as it would work autonomously.

5 Report

Each team should submit a report including the following:

- Detailed description of their planning and control algorithm.
- Code.
- Description of each team member's part in the work.

Grade would be given based on the report, code, instructors questions to the team members and assessment of robot performance. Bonuses would be given according to winnings in the tournament:

- 5 points for winning one game.

- 10 points for winning two games.
- 15 points for winning the tournament.

6 Other remarks

- The tournament will be held on June 8^{th} during the lab hours. Details would be published before.
- Time would be scheduled for the teams to come test and debug their code in the lab.
- All team members must take part in the assignment.
- Code must be original and cannot be shared between teams. This would be checked!