



# Autonomous Driving Challenge

31/05/2022

# Introduction

- The challenge consists of autonomously driving the PuzzleBot on a predefined track.
- The track consists on different MDF pieces assembled together to form a “b” shape.
- The PuzzleBot must follow a pre-defined route while obeying the traffic signals and traffic lights in order to complete the track.

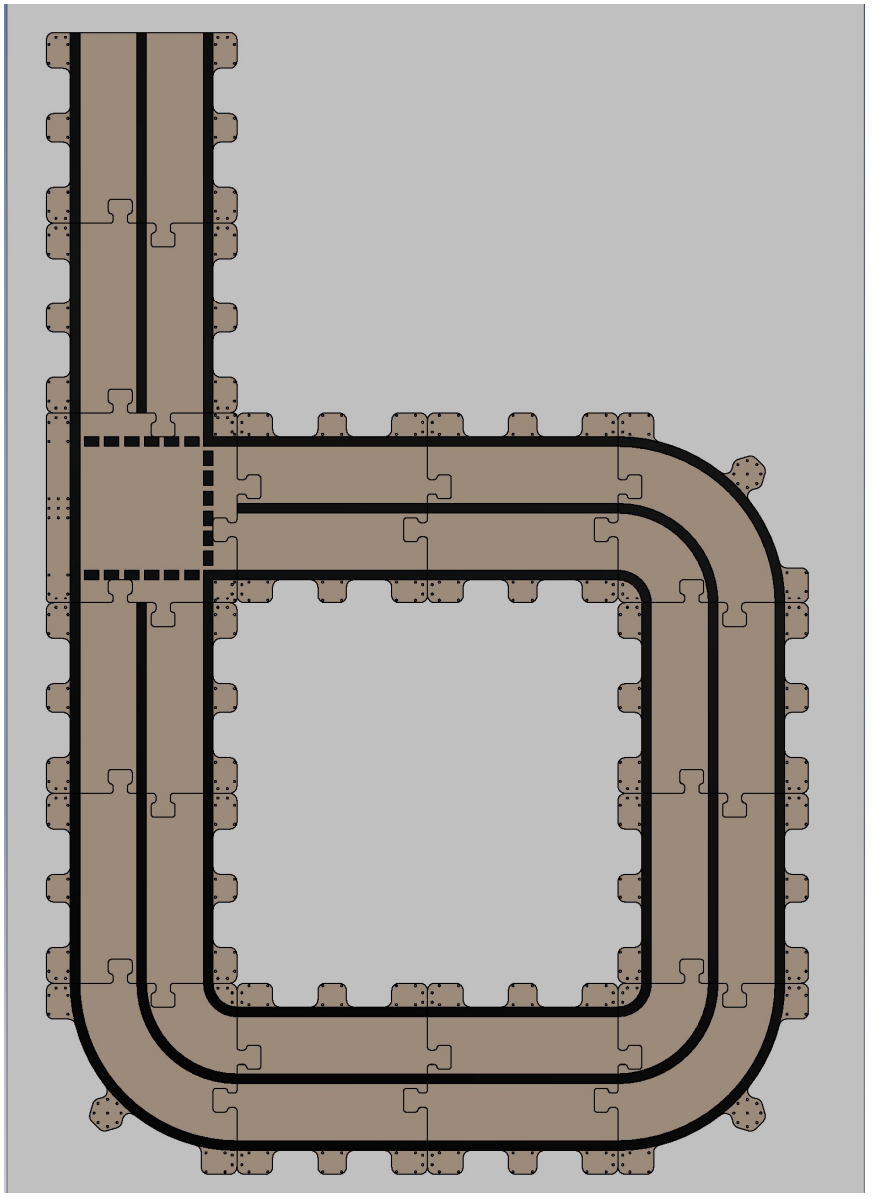
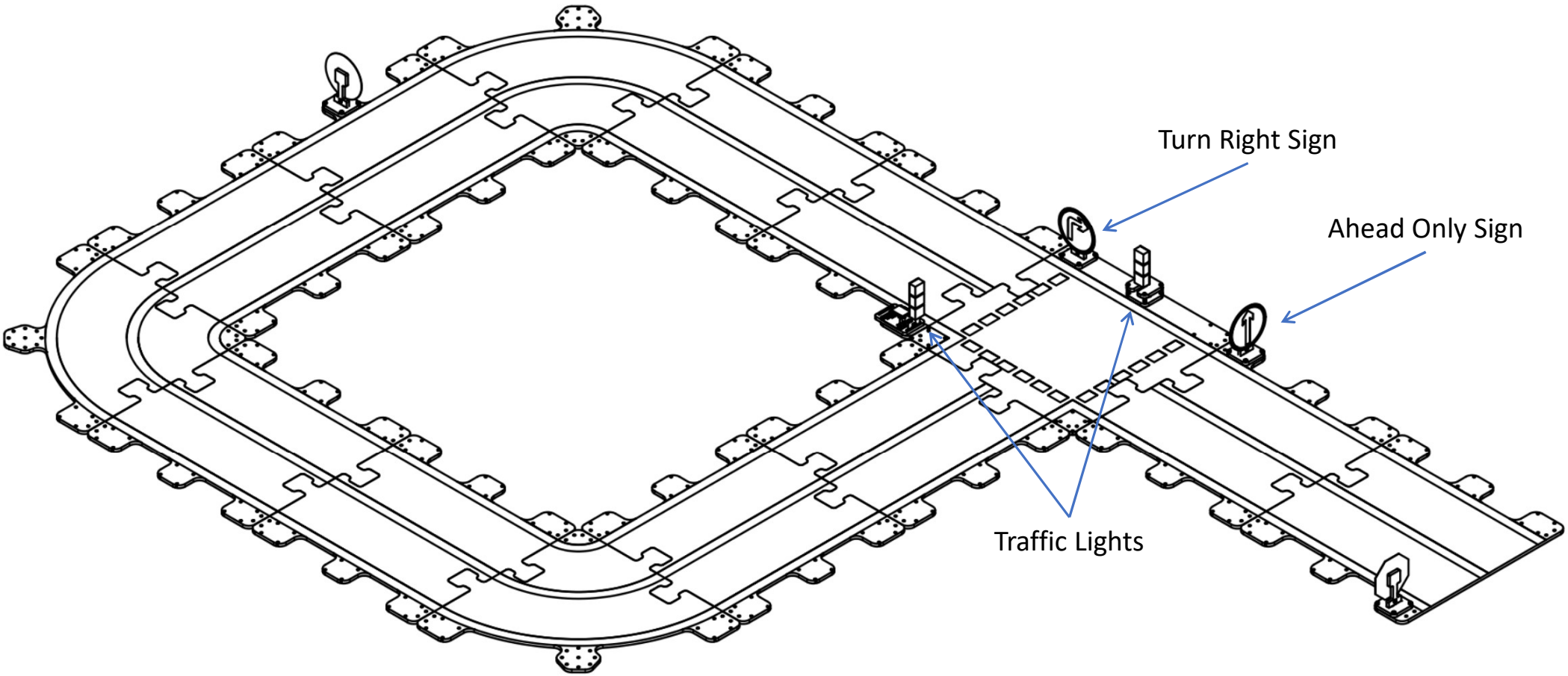
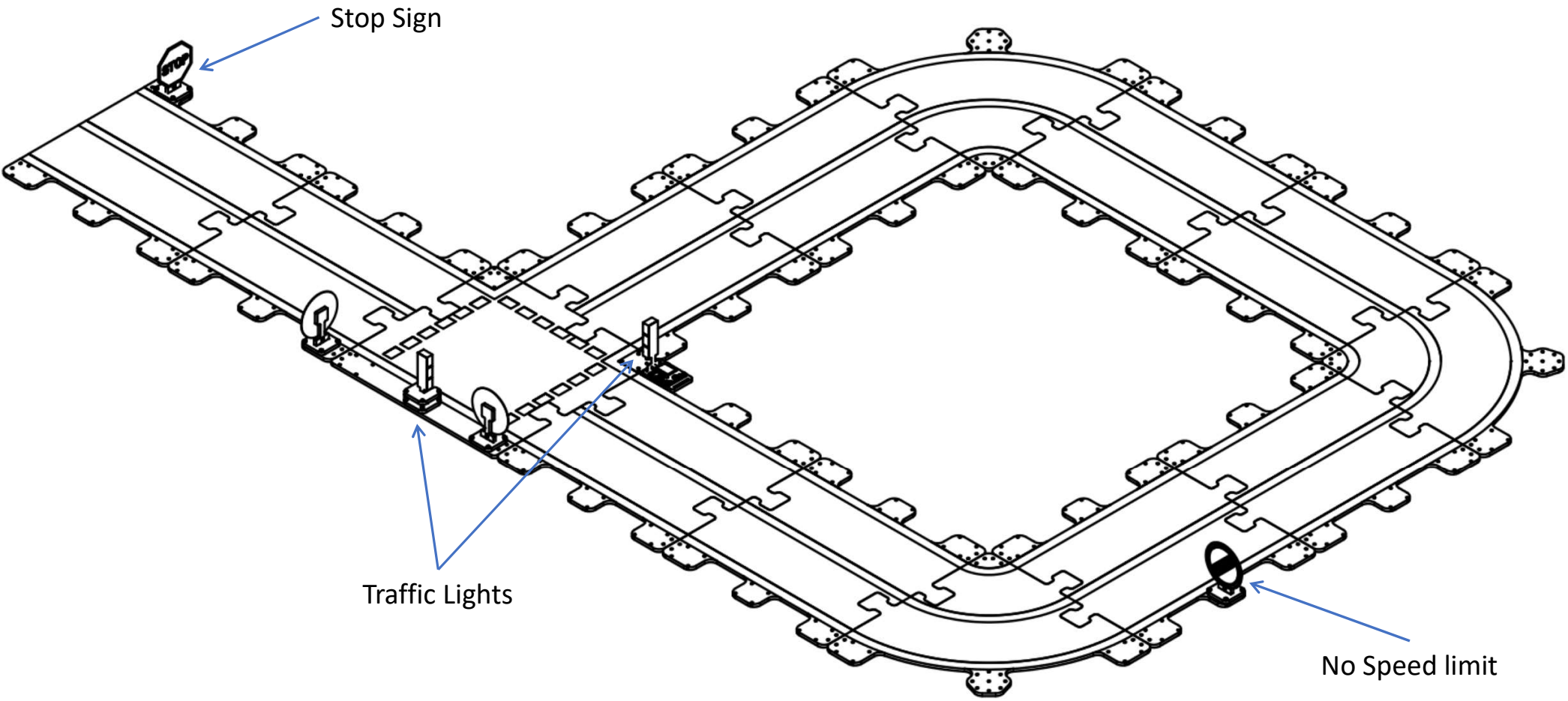


Figure 1: Track

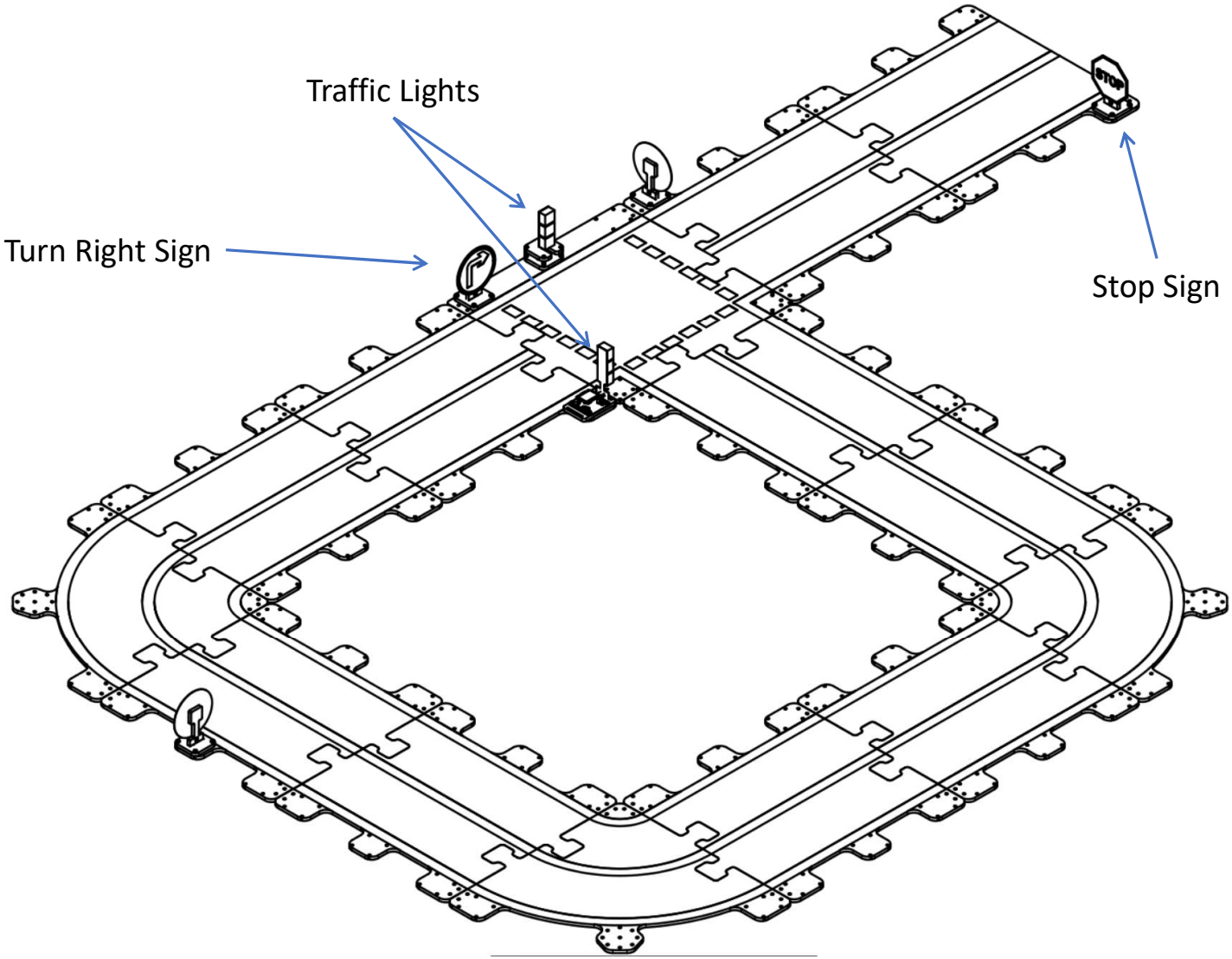
# Track



# Track



# Track



# Trajectory

- The robot must start at the top left corner, centred on the middle black line.
- The robot must then travel straight following the lane and remain centred on the middle line at all times.
- The robot crosses the intersection as stated by the traffic sign and when then the traffic light allows it (turns green).
- The robot must then continue following the trajectory, as shown on Figure 2. Keeping the robot centred on the black line and obeying the traffic signs at all time.
- The robot must cross the intersection for a second time (as shown on Figure 2) and continue as stated by the traffic sign and when then the traffic light allows it (turn green).
- The robot must stop at a “reasonable” distance from the Stop sign.

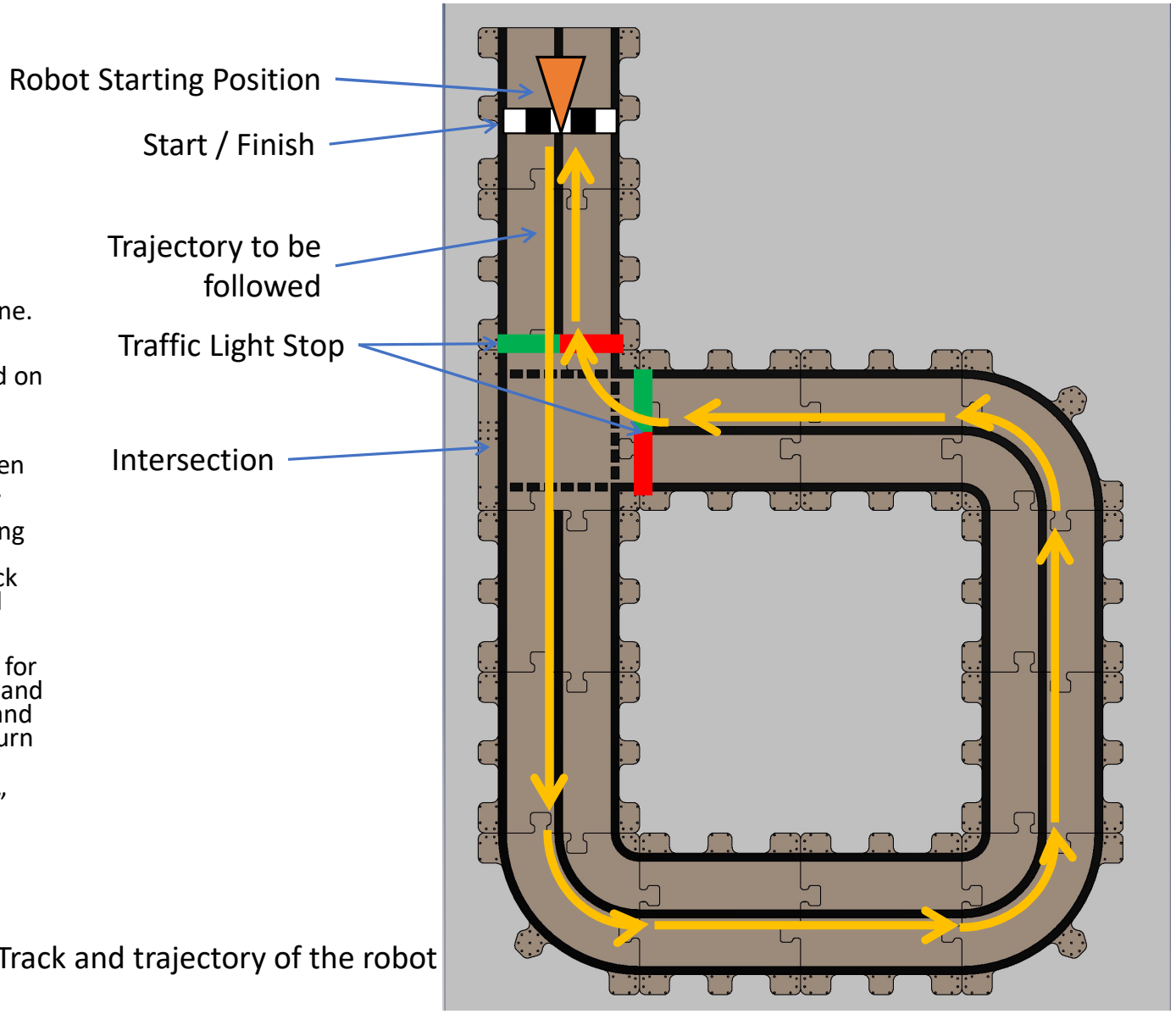



Figure 2: Track and trajectory of the robot

# Gazebo Simulator

- The students will be provided a Gazebo Simulator
- The simulator will be available in GitHub
- The camera, traffic lights and traffic signs are on the simulator.
- The students are encouraged to use the simulator to test their algorithms before testing them in the real track.
- The instruction on how to use the simulator are available on GitHub.

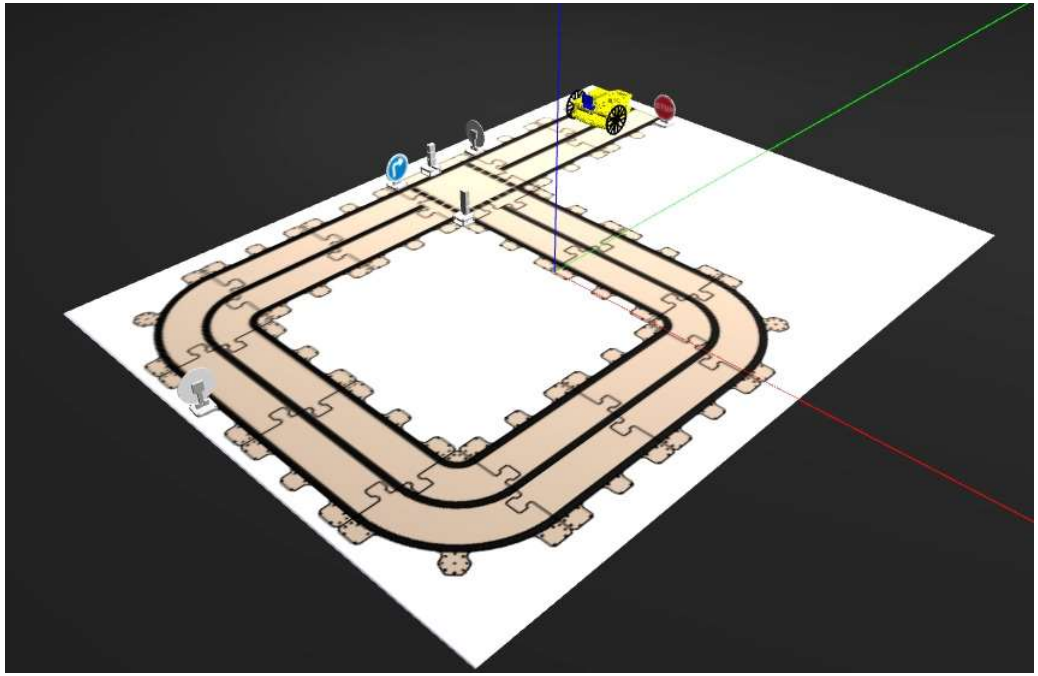


Figure 3: Gazebo Simulated Track

# Rules

- This is a challenge **not** a class. The students are encouraged to research, improve, tune, explain their algorithms by themselves.
- MCR2 (Manchester Robotics) reserves the right to answer a question if it is determined that the question contains partially or totally an answer.
- The students are welcome to ask questions **only** regarding the theoretical aspects of the classes.
- The professors at each campus are encouraged to serve only as guides for the students not revealing in any form a partial or total answer to the question.
- This task will be graded according to the rules established by the professors of each campus.
- No remote control or any other form of human interaction with the robot is allowed; except at the start/end of the track (put the robot on the track at start and remove it afterwards).
- The robot must follow the black middle line at all times (except the intersection).
- The robot must always remain bounded inside the lane at all times (between right and left black lines).
- The robot must obey all the Traffic signs and Traffic Lights.
- No other trajectory or changes in the trajectory are allowed.
- The track can be solved using any knowledge that has been acquired during the course.
- Improvements or different algorithms may be used with previous consent of your professor/supervisor and as long as they are explained properly.
- The students must only use the hardware given by Manchester Robotics.
- All teams must abide by the rules set at each campus when using the track.
- All teams must be respectful towards each other and follow the rules.
- Students are encouraged to use GitHub for questions and comments regarding the this challenge.

# Grading

- The grading system will be defined by each professor at each campus.
- Please record each of your tests and final result to  show your progress.
- The best 2 teams of each campus must deliver a 3+2 min video and Q&A explaining your algorithms and how did your team solved the challenge and which comparisons, tests, etc. were used.