# Third Milestone

## The problem

The goal of the milestone 3 was to implement an algorithm for detecting the field width, finding the absolute position and heading of the robot on the field and create a driving algorithm that uses the position and heading information to keep the robot inside of the field.

## Our approach

### Field width detections

The field width is calculated in the field\_width\_node which takes as an input the final map from the map\_node and calculates based on that the field width.

The field width detection has following steps:

- Receive map of the environment.

- Remove all other points in the map than green.

- Check if there are enough green points, otherwise stop.

- Find first line using PCL RANSAC and remove it from the original cloud.

- Find second line if there are still enough points left.

- Calculate distance and angle between found lines, check if lines are parallel and distance makes sense.

- Publish width as a vector3 message.

- Calculate average of individual width measurement and stop after 30 samples (after that it will publish always the same width since the width of the field is constant).

### Location detection

### Driving algorithm

The driving algorithm was implement so that the robot has five different states: drive\_to, drive\_random, rotate, move, stop). The drive\_to state tries to move the robot to a specific point on the field, it does not use any path planning so it does not find the best routes to a position. The drive \_random mode works as the drive\_to mode, except that it does not drive to a specific location.

Drive\_to and drive\_random modes use collision avoidance which is based on the lidar data and on the closest wall distance. Based on the closest obstacle the robot rotates in the opposing direction and decreases speed as the obstacle gets closer.

Rotate and move modes are for moving the robot without collision avoidance and are needed in the initialization process when the location of the robot is unknown. In the stop state the robot does not move.

## Work division

The tasks were divided in the following way for this milestone:

Bálint: Field width detection

Reza: Location detections

Jaakob: Driving algorithm