

{Learn, Create, Innovate};

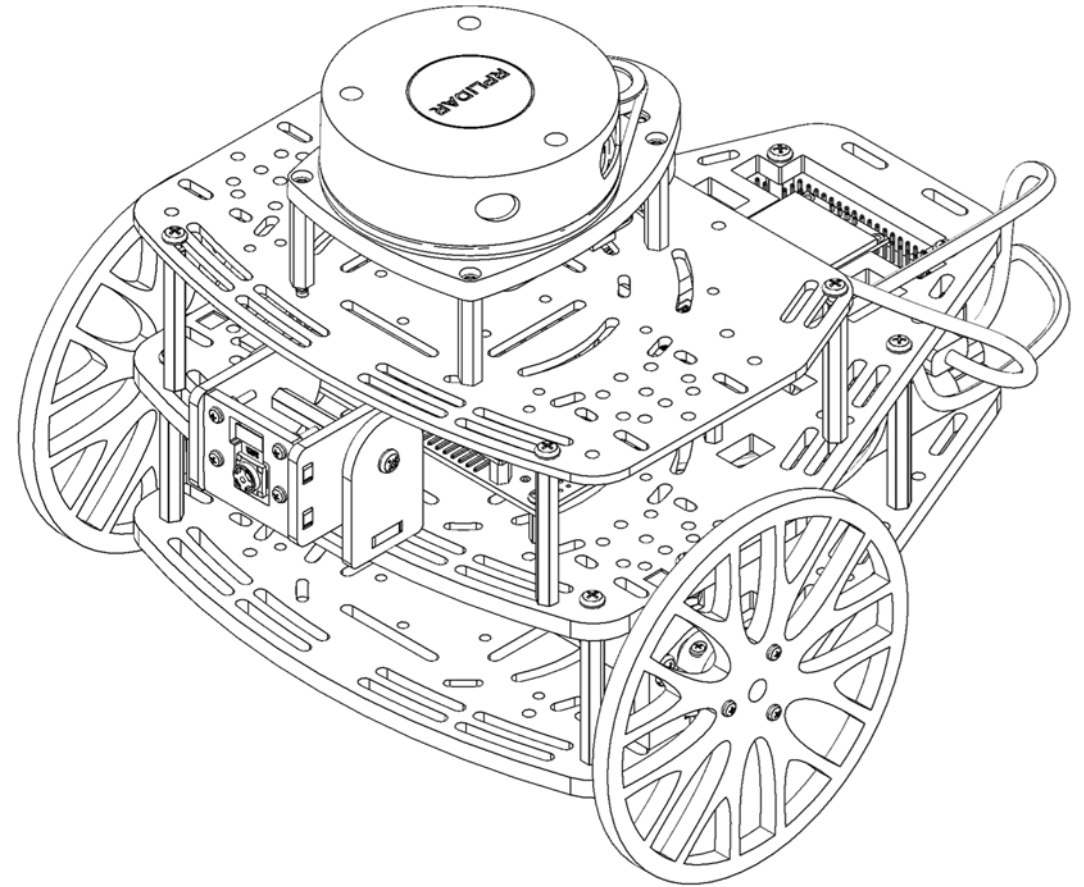
Challenges

Line follower



Line following

- This challenge is intended for the student to review the concepts introduced in this week.
- This challenge aims to show the behaviour of vision systems in mobile robotics.



Activity: Edge Detection

- Using a method of your choice, write a node that can observe the lines on the track follow the path in front of it.



- You will find that many methods are still imperfect, as noise can add phantom edges. Try to achieve the best performance by fine-tuning your thresholds and other parameters.



Activity: Better Line Detection



- Implement a selection of processing methods to determine where the center of the track is.
- Your code should output a single value to identify if the camera is centralized with respect to the track
- It can also output an image that shows where lines are detected.
 - This point is recommended for debugging



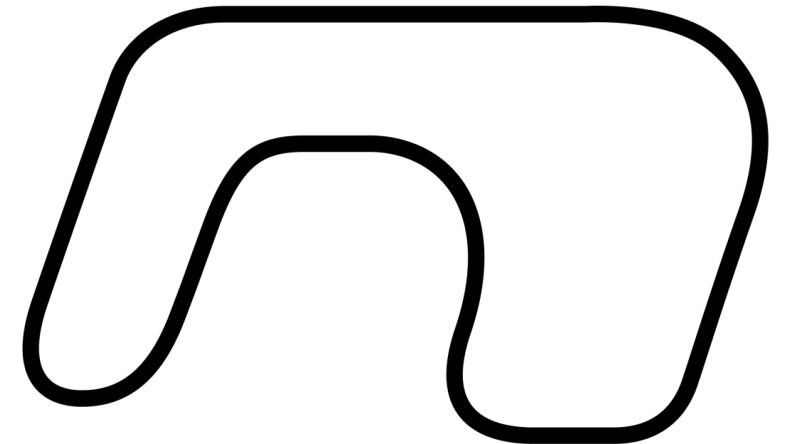
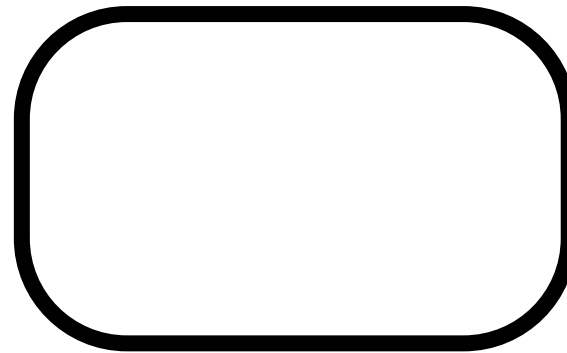
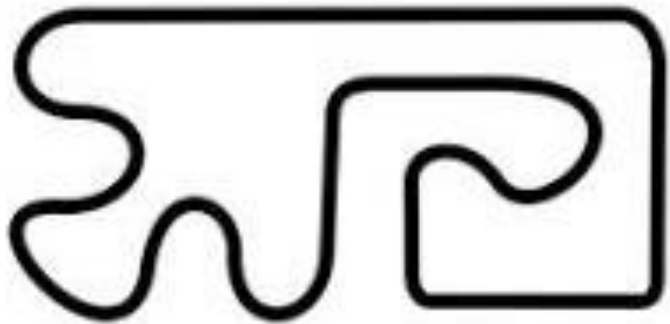
The Controller



- A PID controller should be sufficient
 - Input is our line position as determined earlier
 - Our control variable is ω
 - v can just be fixed for now. It will be controlled by external factors such as traffic lights and signs.
- Error handling
 - We also need the controller to be able to cope when our line detection fails.
 - Suggested method, allow a fixed amount of time where the controller continues at its current speed and turn rate. After that time has elapsed, stop.

Activity: Line following

- Implement a controller such that your robot can follow the track
- The forward speed can be fixed for now.
- Implement at least two approaches.
- Compare their performance.
- Get creative!!!





Exception Handling



- There might be times where the camera detects no image.
- This will cause a cascade of errors.
- Use exception handling, such that an error value is returned, or a default behavior performed if the value for the center of the line cannot be found.



Rules



- This is 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 questions contains partially or totally an answer.
- The students are welcomed to ask only about the theoretical aspect of the classed.
- No remote control or any other form of human interaction with the simulator or ROS is allowed (except at the start when launching the files).
- It is **forbidden** to use any other internet libraires with the exception of standard libraires or NumPy.
- If in doubt about libraires please ask any teaching assistant.
- Improvements to the algorithms are encouraged and may be used as long as the students provide the reasons and a detailed explanation on the improvements.
- All the students must be respectful towards each other and abide by the previously defined rules.
- Manchester robotics reserves the right to provide any form of grading. Grading and grading methodology are done by the professor in charge of the unit.

