TECHNISCHE UNIVERSITÄT WIEN

Autonomous Racing Cars
191.119 (VU 4,0) Semester: 2022S

Lab 8: Advanced Racing 2

2022-06-14

Preface

Read all the instructions below carefully before you start working on the assignment, and before you make a submission. All sources of material and ressources must be properly cited (this also includes datasheets).

- Completeness of solution: A complete solution of a task also includes knowledge about the theory behind.
- Exercises are to be solved in teams. All team members must be indicated on the submission protocol. However, every team member must be able to explain the handed in solution. Grading is on an individual basis. Upload your solution (one per team) in TUWEL until 2022-06-28 23:59.
- For this assignment there is no exercise interview. However if submissions are unclear, students might be invited for exercise interviews.
- Additionally short presentations of every team at the *Lab 8 presentation* are part of the assignment (details see below).

Learning outcomes

The following fundamentals should be understood by the students upon completion of this lab:

- Analyse and formulate project requirements, formulate goals, plan projects and identify potential future directions.
- Work with non-fully specified/formalized project descriptions.

Deliverables and Submission

- Write a exercise report and submit it as PDF file in TUWEL until 2022-06-28 23:59. Use the provided latex template and do not forget to fill in the parts marked with "TODO". The anonymous version of the lab report (all pages except the first one with personal data) will be shared with all the teams after the submission deadline. In any case the report must meet an adequate level for layout and readability that is appropriate for the academic context. It needs to be detailed enough, so that another team could reproduce your work without additional information.
- Submit a ZIP-Archive with all the relevant source code in TUWEL until the same deadline.

Transparency of Contribution

Describe in your submission protocol briefly how you worked together. How did you structure your work distribution and collaboration? Who contributed how much effort to which part of the work? (If one, or more team members, are not able to work on this assignment, you must also transparently state this here.)
(Please do not understand this preamble wrong to somehow exaggerate your contribution estimation: If you are working together well in your team, it should anyway be no problem to briefly describe how you worked together.)

1 Advanced Topics

In the previous labs you have worked with a ROS-based simulator and learned a lot about different algorithms for autonomous racing.

In this lab you have the oportunity to further work on advanced algorithmns and strategies. By afterwards feeding all the team's outcomes together, we hope that you will all get the most advance and insights out of this lab.

For each of the topics the general lab structure should be the same, which is as follows:

a.) Based on the discussed topics for each team in the lecture on 2022-06-14, formulate a more detailed goal. State your current basis (e.g. already available implementation from previous labs) to improve on. Describe what you want to achieve. Make plans how to do this. State how you are going to measure if you have achieved your goal [1].

b.) Implement or carry out the plan that you defined in task (1.a.).

c.) Add a structured documentation of your work from task (1.b.) in your PDF protocol. The level of detail should be s.t. another team of the ARC class could reproduce the same work based on the PDF.

d.) Perform the measurement as defined by yourself (refer to last sentence of task (1.a.)). Discuss the results.

e.) Formulate directions for future work [2]. If you fully achieved your goal, describe in which directions even more improvement would be possible. If you did not achieve your goal by some margin, describe what alternative plan or modified approach could be more promising for better results. If your plan did not work at all, describe the reasons and give ideas for alternative approaches.

f.) Prepare a short (7 Minute) presentation giving an overview of your work. This should focus on:

- What was your plan to achieve the goal?
- How did you implement or carry out the plan?
- What are the results?
- Directions for future work.

Every teams should hold their presentations to share their work with all other students. (Instead of only one team presenting, as it was until now.)

[1] Since you define the goal yourself it might happen that your plan does not work at all to achieve this goal. For this lab this is of course okay. But you need in any case describe your ideas, thoughts, attempts, and implementations clearly and thoroughly. This also applies if you underestimated the workload of your attempt. Then you might show the partial work and progress by the end of lab 8. But please make sure to also have all further subtasks (1.c.) to (1.f.) written down for your partial work.

[2] This lab already deals with the directions you identified as future work in the previous lab. As you continue working on some topic it happens in most cases that new future directions/improvements arise. Therefore we ask you again to identify and formulate future work directions here. There is of couse no need to work on this future directions, but it helps to identify them and make them clear, s.t. others can continue on your work in a meaningful direction. This is also common practice in science.

Appendix

Grading

The following points can be achieved for each task of this exercise sheet:

Exercise	Points
1.a.	10
1.b.	43
1.c.	10
1.d.	7
1.e.	10
1.f.	20
Subtotal	100
Grand Total	100

Acknowledgments

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