Institute for Aerospace Studies
UNIVERSITY OF TORONTO

AER1516: Robot Motion Planning
Team Project Guide
Winter 2022

Course Project Overview

The primary deliverable for AER1516 is a project (that involves some implementation) and a comprehensive research report. The project and document should focus on one cohesive topic within the general area of robot motion planning. You and your team (of three students total) are free to propose a topic that interests you, and to discuss this with Prof. Kelly (to arrive at a mutually-agreeable choice). Topics should be selected by **February 17, 2022**; a *one-page proposal* must be submitted by this date.

Defining a Suitable Project

There are many possible project choices—your project might be related to your current research, or something completely new. As long as your project is substantially related to robot motion planning, it should be acceptable. Feel free to discuss your ideas with Prof. Kelly before submitting your proposal.

Importantly, the project must involve the *implementation* of an algorithm (or algorithms) or a comparison of existing methods, etc. You should plan (pun intended) to code something up and potentially to test in simulation or, if ambitious, on a real robot platform.

What to Include in Your Report and Video

Your research report should be about 12 pages in length (over is fine, under is not), excluding references but including any tables or figures. As a guideline, you should use a 10-point font and 1" margins. The report should have the following general structure (minor variations are ok):

- *Introduction:* Give a high-level overview of your topic—is it a technique, or a specific application? Who (worldwide) are the major players in the area? Why is the topic interesting?

- *Background and Relevance:* Describe the historical background of your topic. How did researchers in the field derive the current approach(es)? Explain the relevance of the topic to motion planning.

- *Literature Review:* Provide a *structured* review of seminal and recent work in your topic area. You should attempt to provide a (brief) taxonomy of research results, organized in such a way that someone reading your report will be able to understand common research threads.

- *Implementation:* What did you implement, and what were the results you obtained? What information is presented in the tables, figures, and diagrams you have included? This is the 'meat' of the report—when writing this section, step back and consider how best to convey the your result to someone who is new to the topic.

- *Open Problems:* Based upon your work, what are some (specific) open problems in the topic area? Are there any major obstacles to progress (e.g., insufficient compute power, unsolved theoretical issues)? Can you suggest (share your opinion about) possible ways to move forward?

The ultimate goal of the report is to provide accessible material that could be used by another student/researcher, or by yourself, as a starting point for further exploration.

In addition to your report, you should prepare a short video (about 9–10 minutes in length) to present to the class at the end of the term. The video should provide context for your report and summarize the results you obtained. *There will be prizes for the best videos!*

Grading

The course project forms 50% of your overall grade. Videos will be presented over two days during the exam period (**April 21 and 22, 2022**). Your video presentation is worth 10% of your overall grade; the video should be approximately 9–10 minutes in length. After presenting your video to the class, there will be a five-minute Q & A session.

Your written report is worth the remaining 40% of your grade. Sections of the report will be weighted as follows:

- Proper introduction, high-level overview of the topic – 4 points

- Background material, relevance, and perspective on the topic – 4 points

- Literature review (is the review well organized and thorough?) – 8 points

- Implementation details (plots, tables, summary results) – 20 points

- Clarity of presentation, including spelling, grammar, and overall style – 4 points

The mark assigned to your video will be based on its *gestalt impression*, that is, your team's ability to convey the important aspects of the project within the limited time. Reports are due by **Friday, April 22, 2022**. **Only PDF files will be accepted for the report**. We will arrange for video uploads as well.