Middle East Technical University
Uluç Saranlı

Homework 2 - Potential Fields

Assigned - Nov 14, 2023, **Due - Nov 26, 2023 (midnight)**

For this homework, you are required to implement repulsive+attractive potential fields for a planar point robot in a 2D polygonal world with a range sensor simulated by the Matlab scripts that you have used for your first homework. Your submission is expected to be a detailed report, describing the structure and design of your implementation, as well as various algorithmic components that you have implemented in the meantime. More importantly, your report should include results on how your implementations work, provide both positive and negative example environments with different complexities. Your report should not include any code, except maybe small code snippets to support your descriptions if really necessary. Overall, your report should be structured like a good technical report or paper and be submitted as a PDF file together with your Matlab source files and any supporting media files such as videos. Please do not collaborate with your classmates except exchanging ideas and other inspirational materials.

The following steps can guide you through the implementation and the structure of your report.

- Implement a potential field planner with attractive and repulsive fields for the 2D p[olygonal world based on the range sensor data provided by the Matlab simulation. As discussed in class, you should investigate two different ways of simulating the outcome, one with a discrete step as in the first homework, and next, using the ode45() function from Matlab to numerically integrate the continuous system. Investigate and report on the operation and performance of both cases. Ideally, your potential field computation code components should be common and only the integration part should be separate for these cases.

- Construct a number of example settings with different number of obstacles and apply both methods to these domains. Compare the two implementations with respect to their performance and/or other issues you think are relevant. Feel free to propose/implement improvements on algorithms based on your observations.

Once again, please make sure that your report is well organized into meaningful sections, with figures and captions properly references from within the text and an adequate number of citations to relevant resources from the literature. Note that using Matlab for visualization will probably a good idea.

Submission

name and student ID. You should submit the following files on METU Class before the submission deadline: *lastname-firstname-report.pdf*, *lastname-firstname-sources.zip* with the ZIP file containing both the sources and the figures for your report as well as your implementation code and any other supporting material you might have. Your report should include your derivations, simulation results in the form of plots and detailed discussion on your findings and should be structured as a well-structured academic report or paper. **Late submissions will not be accepted except under special circumstances that you can document.**