TBD

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Abstract

To be completed...

1 Introduction

2 Problem Statement and Notations

to formalize well inspired by how this motion planning with obstacles problem is presented in other papers

Motion planning Problem description: Let there be an environment of $\mathbb{R}^d$ where $d = 2$ or 3; obstacles $\mathcal{O}_i \in \mathbb{R}^d$, $i = \{1, 2, \ldots, n\}$, a robot of geometry $\mathcal{B}$, denote the configuration of the robot as $q \in \mathbb{R}^n$, where n is the number of Degree of Freedom (DoF) of the robot. Let the robot has controls $u \in \mathcal{U}$, and let there be start $s \in \mathbb{R}^n$ and goal $g \in \mathbb{R}^n$; find a sequence of robot configurations or a sequence of controls so that the robot can go from s to g. We can assume there is an oracle function $\mathcal{F} : (q \times \cup\mathcal{O}) \rightarrow \{0, 1\}$ that can return collision detection result in a given environment for any given configuration of the robot.

One common approach is called sampling based motion planning, which is achieved through placing samples in $\mathcal{R}^n$, the configuration space, and retain valid non-collision samples in the configuration space by inquiring $\mathcal{F}$. The invalid samples are discarded (or retained in some cases), and the valid samples are connected if the path connecting the configurations is valid (pass the validity check after inquiring $\mathcal{F}$). A good set of samples will lead to solutions much faster compared to random samples, though may not always be optimal.

If we want to use a learning method to create the samples, with bias, we may be able to find paths faster.

3 Using an Energy Learning Approach

Formalize and state the learning problem.

4 Conclusion

A Appendix