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Online Trajectory Planning of multiple fleets of robots using Model Predictive Control

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Abstract

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Basics of Path Planning

Path planning is the problem of finding a sequence of *actions* to transform a system from an initial state to a goal state. The planning problem has been studied extensively in various fields like robotics, artificial intelligence, and control theory. In this chapter, we discuss the fundamentals of path planning.

The configuration space of a robot is the set of all configurations that could be achieved by it. For instance, let us consider a 2D robot that operates on a plane. Its configuration space is the 3D space defined by the special Euclidean group SE(2).

1.1 Terminology

Each distinct situation of a world is called a *state*, x, and the set of all possible states is called a *state space*, X. The state, x, can be transformed to x', by applying an *action*, u, as specified by a *state transition function*, f, such that:

$$x' = f(x, u) \tag{1.1}$$

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