

Application of sampling-based motion planning algorithms in autonomous vehicle navigation

ABSTRACT

With the development of the autonomous driving technology, the autonomous vehicle has become one of the key issues for supporting our daily life and economical activities. One of the challenging research areas in autonomous vehicle is the development of an intelligent motion planner, which is able to guide the vehicle in dynamic changing environments. In this chapter, a novel sampling-based navigation architecture is introduced, which employs the optimal properties of RRT* planner and the low running time property of low-dispersion sampling-based algorithms. Furthermore, a novel segmentation method is proposed, which divides the sampling domain into valid and tabu segments. The resulted navigation architecture is able to guide the autonomous vehicle in complex situations such as takeover or crowded environments. The performance of the proposed method is tested through simulation in different scenarios and also by comparing the performances of RRT and RRT* algorithms. The proposed method provides near-optimal solutions with smaller trees and in lower running time.

Keyword: Autonomous vehicle; Motion planning; Sampling-based planning; Optimality; Low runtime