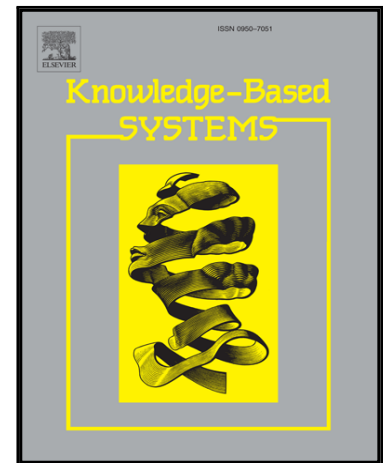


Spatio-temporal decomposition: a knowledge-based initialization strategy for parallel parking motion optimization

Bai Li , Youmin Zhang , Zhijiang Shao

PII: S0950-7051(16)30171-X
DOI: [10.1016/j.knosys.2016.06.008](https://doi.org/10.1016/j.knosys.2016.06.008)
Reference: KNOSYS 3563



To appear in: *Knowledge-Based Systems*

Received date: 29 January 2016
Revised date: 27 April 2016

Please cite this article as: Bai Li , Youmin Zhang , Zhijiang Shao , Spatio-temporal decomposition: a knowledge-based initialization strategy for parallel parking motion optimization, *Knowledge-Based Systems* (2016), doi: [10.1016/j.knosys.2016.06.008](https://doi.org/10.1016/j.knosys.2016.06.008)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Spatio-temporal decomposition: a knowledge-based initialization strategy for parallel parking motion optimization

Bai Li ^{a*}, Youmin Zhang ^{b c}, and Zhijiang Shao ^{a d}

a. College of Control Science and Engineering, Zhejiang University, Hangzhou, China

b. Department of Mechanical and Industrial Engineering, Concordia University, Montreal, Canada

c. Concordia Institute of Aerospace Design and Innovation, Concordia University, Montreal, Canada

d. State Key Laboratory of Industrial Control Technology, Hangzhou, China

*Corresponding author, Tel. +86 15700080810

libai@zju.edu.cn, libaioutstanding@163.com (B. Li); youmin.zhang@concordia.ca (Y. Zhang); szj@zju.edu.cn (Z. Shao).

Abstract

Motion planning methodologies for parallel parking have been well developed in the last decade. In contrast to the previous works that proposed the prevailing and emerging parking motion planners, this work provides a precise and objective description of the parking scenario and vehicle kinematics/dynamics. This is achieved by formulating a unified optimal control problem that is free of any subjective knowledge (e.g., human experiences). Such an objective knowledge based system contributes in breaking the limitation of subjective knowledge and fully utilizing a vehicle's potential. The concerned optimal control problem, when numerically converted into a large-scale nonlinear programming (NLP) problem, is extremely difficult to solve. This bottleneck has hindered many previous research efforts. Although the search domains of NLP problems are clearly defined, the majority of NLP-solving processes still require high-quality initial guesses, which accelerate the convergence process. In this work, a spatio-temporal decomposition based initialization strategy is proposed to generate reliable initial guesses and to facilitate the NLP-solving process. A series of comparative simulations verifies that the proposed initialization strategy is advantageous over its prevailing competitors, and that the proposed motion planner is promising for on-line planning missions. Theoretical analysis that supports the proposed initialization strategy is provided as well.

Download English Version:

<https://daneshyari.com/en/article/6862222>

Download Persian Version:

<https://daneshyari.com/article/6862222>

[Daneshyari.com](https://daneshyari.com)