

论文

信号灯控制的多阶段决策模型及其前向动态规划算法

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摘要:

为研究路口交通信号灯的实时最优控制问题,提出一种以最小化等待时间为目标的多阶段决策模型.该模型利用最短绿灯和红灯时间的结构特征,通过合理选择系统状态和控制变量压缩了模型规模,进而提出了前向动态规划算法以高效得到最优解.数值实验显示,对比于固定时长的周期性控制可以节省路口车辆的等待时间;对比基于

混合整数规划的求解方法,可以提高求解效率,满足实时控制的要求.

关键词: 交通信号灯控制;多阶段决策模型;动态规划;混合整数规划

Multi-stage decision model for signal control problems and its forward dynamic programming algorithm

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Abstract:

The real-time signal control problem of traffic intersections is studied, and a multi-stage decision model is

proposed to minimize the waiting time. The model takes advantages of the structure of the minimum green and red time,

which significantly reduces the model scale by properly choosing the system states and control actions. Additionally, a

forward dynamic programming algorithm is developed, which can efficiently obtain the optimal solutions. Numerical results

show that the waiting time can be reduced in comparison with the fixed-time periodic control policy, and computation time

can be saved in comparison with the mixed integer programming, which can satisfy the real-time control requirement.

Keywords: intersection signal control; multi-stage decision model; dynamic programming; mixed integer programming

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