



## 基于损失时间的单点交叉口信号相序优化模型

### Phase Sequencing Model for Signalized Isolated Intersection Based on Lost Time

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英文关键词: [lost time](#) [isolated intersection](#) [signal phase sequence](#) [signal group](#) [mixed traffic](#)

作者	单位
<a href="#">马万经</a>	<a href="#">同济大学 道路与交通工程教育部重点实验室, 上海 201804</a>
<a href="#">聂磊</a>	<a href="#">上海交通投资咨询公司, 上海 200030</a>
<a href="#">杨晓光</a>	<a href="#">同济大学 道路与交通工程教育部重点实验室, 上海 201804</a>

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#### 中文摘要

以定时控制交叉口混合交通流为对象, 重点研究如何通过相序优化降低交叉口损失时间的问题. 首先提出了基于信号灯组(包括机动车灯组VG、非机动车和行人灯组PG)的绿灯间隔矩阵、相位相序、相位最大间隔矩阵、相位间隔和矩阵, 以及矩阵之间元素相互关系的数学表达. 然后, 建立了以VG损失时间之和、VG最大间隔时间之和、VG和PG所有损失时间之和, 以及VG和PG最大损失时间之和等四类相位损失时间最少为目标的相序优化模型. 通过一个四相位信号控制十字交叉口的实际数据验证: 相序组合不同, 交叉口的损失时间不同; 是否考虑行人、自行车交通, 对于最佳相序的影响较大. 该模型可以求得面向混合交通流多种目标下的最佳相序解. 还进一步地分析了四类优化目标下信号损失时间的设置模式, 以及通过基于信号灯组设置信号间隔时间以降低交叉口损失时间的方法.

#### 英文摘要

The problem of phase sequencing with the objective of minimizing lost time was modeled based on mixed traffic characteristics. The matrixes of intergreen time, phase sequence, maximum intergreen time and sum of intergreen time were built and the mathematical relationship between matrixes was modeled based on signal groups including motor traffic signal groups (VG), pedestrian and bicycle signal groups (PG). The phase sequence optimization model was built based on the proposed matrixes and four kinds of objectives were considered: minimum total lost time of VG; lost time of VG; minimum total lost time of VG and PG, maximum lost time of VG and PG. A case study of a signalized four-stage intersection of Zhangjiagang City validated the model. The results show that the lost time of intersection varies with different phase sequences. The PG dramatically affects the optimal phase sequence. The proposed model can output optimal solution of phase sequence based on different objectives with the consideration of mixed traffic characteristics. The intergreen modules under different objectives were analyzed and the signal group-based intergreen design method was proposed to minimize lost time of intersection.

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地址: 上海四平路1239号 邮编: 200092 电话: 021-65982344 E-mail: zrx@tongji.edu.cn

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