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An Ordinal Logistic Regression Model for Bridge Component Deterioration

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ABSTRACT

Accurate estimation of bridge future condition is fundamental information for determining well-informed maintenance, repair and rehabilitation (MRR) decisions for highway bridges. The National Bridge Inventory (NBI) condition rating is a major source of bridge condition data in the United States. In this study, a type of generalized linear model (GLM), the ordinal logistic statistical model, is presented and compared with the traditional regression model. The proposed model is evaluated in terms of reliability (the ability of a model to accurately predict bridge component ratings or the agreement between predictions and actual observations) and model fitness. Five criteria were used for evaluation and comparison: prediction error, bias, accuracy, out-of-range forecasts, Akaike’s Information Criteria (AIC), and log likelihood (LL). The method that allows modeling ordinal and
discrete dependent variable consistently shows better model fitness and prediction performance.

**KEYWORDS:** Regression model, bridge rating, logistics, bridge condition forecasting
BOT+EPC模式公路工程中的应用

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摘 要: 结合我国交通基础设施建设发展现状和趋势, 分析了BOT+EPC模式产生的背景及其内涵, 依据有关法律规定, 分析BOT+EPC模式的法律基础, 认为BOT+EPC模式并非BOT和EPC的简单叠加, 而是在现有法律框架下, 按照一定的要求和条件, 将BOT和EPC模式有机融合而形成的基础设施投资、建设、运营一体化模式, 与传统BOT项目模式相比, 更有利于降低项目各参与方之间的利益冲突, 实现项目各方风险共担、利益共享, 有利于更好更快地实现项目的目标。BOT+EPC模式应用于高速公路工程实践, 在破解资金瓶颈、加快项目推进、减少设计变更、提高管理效率等取得良好效果, 经济效益和社会效益显著。

关键词: BOT+EPC; 项目管理效率; 效益

中图分类号: U4-9; U415 文献标志码: A

Application of BOT+EPC Model in Highway Projects

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Abstract: Based on the present situation and the development trend of the transportation infrastructure in China, the background and meaning of BOT+EPC model is explained, which is not simply a put-together, but a rational integration, of BOT and EPC model according to some certain requirements under the law. Compared with traditional BOT projects, BOT+EPC model facilitates proper sharing of project risks as well as interests among the participating parties. By applying the BOT+EPC model in Gucheng Branch of Heng-De Expressway, this model is proved to be successful in ensuring smooth progress of the project, reducing design variations and improving management efficiency.
Key words: BOT+EPC; project management efficiency; benefits

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Developing an Ex Post Risk Management Model for PPP Infrastructure Projects

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ABSTRACT

Public Private Partnerships (PPP) have been widely used in infrastructure development in the past 30 years. However, a number of PPP projects have suffered serious risk scenarios and ended up with project failures. Thus, ex ante risk management plans are no longer enough. This study aims to propose ex post risk management strategies, including renegotiations and early terminations. This study attempts to develop a quantitative ex post risk management model based on the private sector’s financial equilibrium. The application of this model begins with risk impact evaluation, then ex post risk response measures assessment, selection and enforcement. The measures in concession renegotiation includes toll adjustment, contract extension, annual subsidy or unitary payment adjustment, tax waiver, and reduction in contractor’s investment obligations; and the common measures in early termination are based on the book value and market value, respectively. The outputs of this study would facilitate governments’ decision-making in PPP projects under serious risk scenarios.

KEYWORDS: Public-private partnerships; Risks; Concession renegotiation; Early termination
轨道交通产业市场分析及经济效益评价研究
——以宜宾市轨道交通产业为例

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摘 要: 现阶段我国正处于快速发展轨道交通关键期，大量轨道交通建设将为轨道交通产业发展奠定良好的市场基础。本文以宜宾市为例，通过市场调研数据分析轨道交通规划及建设情况，并基于内外部竞争环境下，系统运用SWOT分析法对轨道交通产业优势、劣势、机遇及威胁进行分析，以确定轨道交通产业市场发展前景；运用财务效益与费用分析法对项目经济效益进行评价，以确定项目投资建设可行性。

关键字: 宜宾市; 轨道交通产业; 经济效益评价; 灵敏度分析

中图分类号: U2-9

Research on Market Analysis and Economic Benefit Evaluation of Rail Transit Industry: Taking Yibin Rail Transit Industry as an Example

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Abstract: At present, as China is in a period of rapid development of rail transit, a large number of the rail transit construction will lay a good market foundation for the development of rail transit industry. Taking Yibin City as an example, this paper analyzes the planning and construction of rail transit by the data of market research. Based on the internal and external competitive environment, the SWOT analysis method is used to analyze the advantages, disadvantages, opportunities and threats of the rail transit industry to determine the development prospect of the rail transit industry. The financial efficiency and cost analysis method is used to evaluate the economic benefits of the project to determine the feasibility of project investment and construction.
**Key words:** Yibin; rail transit industry; economic benefit evaluation; sensitivity analysis

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Considering Deterioration Propagation in Civil Infrastructure Maintenance Planning

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ABSTRACT

Civil infrastructure system maintenance planning is to determine which facility should be repaired, when and how maintenance should be carried out, and what treatment should be used under budget and other resource constraints. In the existing literature, various simulation and optimization models have been developed to help select the optimal maintenance plan. However, the developed models overlooked the deterioration propagation between adjacent connected facilities of the network infrastructure system. For instance, a facility receiving zero maintenance or having a failure of maintenance treatment affects not only the condition of itself, but also the deterioration rate of its neighboring facilities. This raises the call for taking the deterioration propagation into consideration when developing optimization models and capture to which extent it can affect the optimal maintenance plan. Therefore, in this paper, an infrastructure maintenance planning model considering the deterioration propagation between facilities is formulated as a mixed integer linear programming problem. A heuristic algorithm was proposed to solve the problem efficiently. Example networks were
tested for the performance comparison between CPLEX and the heuristic algorithm. The results of the optimization models with and without the deterioration propagation effect were compared and discussed.

**KEYWORDS:** Deterioration Propagation, Infrastructure Interdependence, Maintenance Planning, Infrastructure Management, Optimization
Data Envelopment Analysis (DEA) Based Benchmarking of Highway Asset Investment

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ABSTRACT
Highway agencies have been using many of the elements of asset management with the support of various decision making tools. To determine the most effective investment strategy with scarce resources, the integration, and hence better utilization, of these existing tools and practices across asset classes is generally lacking. This paper applies Data Envelopment Analysis (DEA) to benchmark different investment scenarios of highway assets using existing or data readily available through existing models. Three assets, pavements, bridges, and traffic signage, are included. Analysis results from the HERS-ST application, PONTIS system, and purpose-built traffic signage spreadsheet are obtained to capture the changes in performance measures under various budget scenarios and are used in the DEA process to benchmark the scenarios for each individual asset. Subsequently, the performance measures and budgets are assembled in Asset Manager-NT, whose results are input into DEA to benchmark cross-assets resource allocation scenarios. This study has established an implementable framework of highway asset management by linking DEA approach and current available tools to help decision makers make more efficient investments within and cross-assets.
KEYWORDS: highway asset management; resource allocation; Data Envelopment Analysis (DEA); decision making tools
Identifying the Factors in Determining the Level of Transportation PPP Enabling Legislation in the US

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ABSTRACT

Public agencies have set a number of goals toward improving the quality and performance of transportation infrastructure over the project lifecycle. Efforts focused on the engineering aspect for achieving the agency goals are abundant. However, financial deficiency is a critical issue that limits the implementation of the advanced engineering improvements. Lacking involvement of operation and maintenance considerations in early planning stage also affects the lifecycle performance of the facilities delivered by traditional methods. Public-Private Partnership (PPP) is increasingly used to fill the financial gap by involving the private sector in managing and financing infrastructure as well as to provide the services of facility operation and maintenance. PPP enabling legislation is the critical prerequisite to PPP implementation since it grants an agency the authority to enter into PPP transactions and defines the scope of that authority. In the United States, there are three levels of PPP enabling legislation, including broad, limited, and no PPP permission. The government with different situations (i.e. financial status) would have various extents of aspiration to implement PPP, which leads to the differences in the levels of enabling legislation. This study aims to identify the factors that affect the public agencies’ decision on which level of PPP enabling legislation they will choose. A comprehensive literature review identifies ten potential factors and a principal component analysis (PCA) groups eight of them into three dimensions, including transportation demand, economic health, and investment intention. The fourth dimension, referred as the political preference, is consisted of the rest two factors which are excluded from the PCA. The regression analysis reveals that the
transportation demands and the political parties’ PPP preference are statistically significant in affecting the decision-making regarding PPP enabling legislation.

KEYWORDS: public-private partnership, transportation infrastructure, and public-private partnership enabling legislation
直线电机运载系统研发与应用效果研究

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摘 要：文章以奥运工程北京机场快轨为依托，论述了直线电机运载系统研究自2001年7月启动，至2007年9月首列车辆下线、2008年7月在机场快轨工程成功应用并建成运营的艰难历程，总结了北京机场快轨直线电机车辆的关键技术和创新点；介绍了为降低车辆运行噪音，实现系统设计功能，进行列车车门和受流器滑靴国产化改造方案。文章对北京机场快轨建成8年多以来的客流情况、线路运营、车辆维护、牵引能耗等应用效果进行了全面的分析与评价，对后续直线电机线路改造和新建项目的设计、建设具有广泛的参考价值。

关键词：北京机场快轨 直线电机 研发 应用效果

A Research on Development and Application of Liner Motor System

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Abstract: With Beijing Airport Express Rail- a Beijing Olympic project – as the reference, the paper looks back the whole hard journey from the kicking off of the Liner motor system project in July 2001 to the unveiling of the first vehicle in September 2009 and its successful operation on the Beijing Airport Express line. Key technical and innovation points of Beijing Airport Express Liner motor vehicles are summarized. To reduce the operation noise and fully realize the system design functions, the car doors and current collectors are localized to meet the requirement. The paper makes a comprehensive analysis and evaluation of the passenger flow, track operation, vehicle maintenance...
and traction power consumption. It can be a valuable reference for follow up liner motor track recon-
struction and new project design and construction.

**Key words:** Beijing Airport Express Rail, Liner motor, R&D , Application effect

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A Methodology for Trade-off Analysis in Integrated Transportation Asset Management

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ABSTRACT

Investment decision-making in integrated transportation asset management is typically characterized by a wide diversity of asset types for purposes of optimization at overall system level. In such problems, trade-off analysis can help decision-makers to not only quantify how different resource allocations affect system performance but also investigate the trade-off relationships between cost and performance measures and between different performance measures. This paper provides techniques for efficient trade-off analysis as a part of multiobjective optimization for integrated transportation asset management. The multiobjective optimization problem is first formulated by establishing the objectives expressed in terms of network-level performance measures under deterministic situation.
Then, the chance-constrained multi-objective optimization programming is applied to incorporates performance uncertainties into the TAM multi-objective optimization problem. Next, Pareto frontiers are generated for the purpose of conducting trade-off analysis. Using a case study, trade-off analysis between cost and performance measures and between performance measures, under both deterministic and uncertainty cases, are demonstrated.

**KEYWORDS:** integrated transportation asset management, multiobjective optimization
Research and Development of Urban Rail Transit Utilizing PPP Strategy in China

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Abstract: PPP (Public Private Partnership) has been utilized in Urban Rail Transit in China since early 20 century. In this paper, the definition of PPP is introduced, together with a summary of development of Urban Rail Transit in China. Four typical case studies are provided in the paper, followed by a summary of modern development of PPP in Urban Rail Transit in China. The research provides good reference for further studies of PPP rail projects in China.

key words: PPP, Urban Rail Transit, Rail Transportation, China PPP
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摘 要：出行成本是表现交通系统可达性、可持续性等方面的重要微观指标，对城乡间出行成本的调控可以促进城乡一体化交通系统的构建。基于局部均衡理论，将影响城乡间出行成本的交通系统内外部的因素与要求转为经济指标并建立模型，获得城乡间交通出行均衡成本。根据均衡出行成本，对比现有出行成本情况，建立调控策略集，为推进城乡交通一体化建设提供政策参考。

关键词：交通工程；城乡交通一体化；出行成本；局部均衡理论

Research on the Regulating Strategies of Trip Cost between the Urban and the Rural Base on Partial Equilibrium Theory

Abstract: The trip cost is one of the most important indicators of the accessibility and sustainability of transportation system and the regulation for trip cost between the urban and the rural can facilitate the developing process of urban-rural integrated transportation system. In order to reveal the equilibrium cost between the urban and the rural, the internal and external factors of trip cost changes are expressed as economic parameters to develop a model based on partial equilibrium theory. According to the difference between existing trip cost and equilibrium cost, a series of regulating strategies are addressed as references for the further development of urban-rural integrated transportation system.
key words: traffic engineering; trip between the urban and the rural; trip cost; partial equilibrium theory

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多购买时间点条件下的最优瓶颈通行权分配方式

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摘 要: 本文是对可交易的瓶颈通行权制度(Tradable Bottleneck Permit，TBP)的扩展研究，目的是求解在多个（瓶颈通行权）购买时间点（多个交易市场）条件下的最优瓶颈通行权的分配方式。为此，建立了基于出行者对于各时间段通行权评价额度的社会福利最大化模型，此模型是由每个时间点交易市场的通行权分配方式与每个时间点的通行权发行总量2个变量构成的整数规划问题，为得到最优通行权分配方式，研究采用Benders分解算法进行求解，而后，通过算例确认此算法求解模型的有效性。研究结果表明：相较于单一购买时间点，多购买时间点的设定可实现更高的社会福利；对于每个购买时间点的交易市场，利用竞拍机制可以实现通行权的最优分配；利用Benders分解算法求解模型可使得在有限调整次数内求解到多购买时间点条件下的最优瓶颈通行权分配方式；利用Benders分解算法对模型进行求解会使的政策在较少步骤内实现较高的社会福利（社会福利最大值的95%以上）。

关键词: 交通工程; 交通需求管理; 瓶颈通行权; 多购买时间点市场; Benders分解算法; 竞拍机制

中图分类号: U491.1

Optimal Allocation of Bottleneck Permits with Multiple Purchase Opportunities

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\textbf{Abstract}: This paper is an extension study for the Tradable Bottleneck Permit (TBP), its purpose is to clarify the optimal allocation of bottleneck permits with multiple purchase opportunities (multiple tradable markets). To achieve this, we establish an optimal allocation problem that maximums the
social welfare which is based on all users’ valuation for permits of all time periods. The problem is an integer programming problem which consists of two parameters that are permit allocation and number of permits for each period purchase market. To obtain the optimal allocation for multiple period purchase markets, we apply the Benders decomposition and confirm its validity throughout a numerical experiment. The result reveals the following: the multiple period purchase markets can achieve higher social welfare allocation than one single period purchase market; the auction mechanism can achieve the optimal allocation of permits for each period purchase market; using the Benders decomposition, we can get the optimal allocation of bottleneck permits in a finite number of iterations; the Benders decomposition can achieve high social welfare in a few of steps (more than 95% of maximal social welfare).

**key words:** traffic engineering; transportation demand management; tradable bottleneck permits; multiple period markets; Benders decomposition; auction mechanism

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基于可靠度的多起讫点危险货物运输网络多目标双层鲁棒优化模型与算法

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摘 要: 为寻求一个安全、快捷的危险货物运输网络, 研究了多起讫点危险货物运输网络双层鲁棒优化问题。首先构建了危险货物运输网络中节点和路段的应急可靠度模型; 然后根据 Bertsimas 鲁棒离散优化理论建立了考虑应急可靠度的危险货物运输网络多目标双层鲁棒优化模型, 进而运用多目标遗传算法和Frank-Wolfe相融合的算法对模型进行求解; 最后进行了案例研究。研究结果表明: 在多起讫点条件下, 采用论文建立的危险货物运输网络双层鲁棒优化方法, 能快速得到具有较好鲁棒性和应急可靠性的危险货物运输网络。

关键词: 危险货物运输; 应急可靠度; 鲁棒优化; 多目标遗传算法; Frank-Wolfe算法

中图分类号: U492.3

文献标识码: A

Robust Optimization Model and Algorithm of Hazardous Materials Transportation Network with Multi-origin-destination Based on the Reliability

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Abstract: In order to find a safe and fast transportation network of hazardous materials, the bi-level robust optimization problem of multi-origin-destination hazardous materials transportation(HMT) is
studied. Firstly, the emergency reliability model of nodes and sections in HMT network is established. Then, according to Bertsimas robust discrete optimization theory, a multi-objective bi-level robust optimization model of HMT is established, which is based on emergency reliability, and a hybrid algorithm which mixes multi-objective genetic algorithm and Frank-Wolfe is designed to solve the model. Finally, a case study is given, and the study results show that the bi-level robust optimization model and algorithm of HMT can quickly get a better robustness and emergency reliability transportation network for hazardous materials.

**Key Words:** Hazardous materials transportation, Emergency reliability, Robust optimization, Multi-objective genetic algorithm, Frank-Wolfe algorithm

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基于FCM快速路交通状态判别加权指数研究

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摘 要：加权指数 $m$ 是影响模糊C-均值聚类（Fuzzy C-means, FCM）的一个关键参数，为提高快速路交通状态模糊判别性能，针对 $m$ 取值的问题，提出了一种兼顾算法判别精度和聚类效果的优选方法。该方法以流量、速度为交通状态评价参数，在不同加权指数 $m$ 和样本量 $n$ 下进行聚类分析，从算法判别精度、类内间距、类间间距、目标函数收敛性四个方面对 $m$ 的最优取值进行了深入研究。以某市快速路为例，利用MATLAB模糊逻辑工具箱分析实验数据的隶属度和聚类中心，对以上四个方面在 $n \times m$ 种组合情形下综合分析，得出快速路交通状态模糊判别 $m$ 的最优取值，并进一步验证了该方法的可行性。实验结果表明，以流量、速度为状态评价参数的快速路交通状态模糊判别，加权指数 $m$ 的最佳取值为2.25。

关键词：交通工程; 加权指数; 模糊C-均值聚类; 交通状态判别; 快速路

中图分类号: U491

A Study of Weighting Exponent in Expressway Traffic State Estimation Based on Fuzzy C-Means

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Abstract: Weighting exponent $m$ is an important parameter in fuzzy c-means (FCM) algorithm for improving the performance of fuzzy expressway traffic state estimation, an method for accuracy of algorithm and clustering effect was proposed to optimal choice of $m$. In this method, flow and velocity were selected as traffic state evaluation parameters, cluster analysis was operated under different weighting exponent $m$ and sample size $n$, and then an further study on optimal choice of $m$ was made from algorithm accuracy, distance of simples to corresponding clustering centers, class distance,
convergence of the objective function four aspects. Taken urban expressway as an example, MATLAB fuzzy logic of toolboxes was used to analysis membership and clustering center both of test data. A comprehensive analysis of the above four aspects was made under n by m kinds of combination cases, after that optimal choice of m was determined, and then it was verified to estimate the feasibility of the method. Experimental results show that the flow and velocity as evaluation parameters of expressway traffic state fuzzy estimation, the optimal choice of weighting exponent m is 2.25.

**key words:** traffic engineering; weighting exponent; fuzzy-c-means; traffic state estimation; expressway

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Measure Dynamic Individual Spatial-temporal Accessibility by Public Transit: Integrating Time-table and Passenger Departure Time

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ABSTRACT

Spatial-temporal accessibility by a transport system assesses spatial-temporal constraints faced by individuals based on their fixed activities and the transport system’s ability to facilitate trading time for space in movement. As opposed to previous studies that either measured individual spatial-temporal
accessibility by a general transport network or measured place-based accessibility by public transit through only computing the bottom of the full network time prism, this paper measures individual spatial-temporal accessibility by public transit through integrating time-table and passenger departure time and computing the full network time prism for a public transit network. A public transit network is modelled as a time-dependent weighted directed graph in which every single directed arc is associated with a time-dependent travel time to represent the linkage between any two adjacent stops on a transit route. The time-dependent travel time assigned to arcs is determined according to timetables, which is particularly assigned to infinite when no transit service is available between the two stops. Based on the time-dependent weighted directed graph, a modified network potential path area (N-PPA) algorithm is employed to produce a potential path area for an individual’s activity participation within a public transit network. As a case study, the proposed methodology is applied to measure individual spatial-temporal connectivity by the Salt Lake City TRAX system. Results indicate that the outcome of the proposed methodology is sensitive to passenger departure time. The results of this study provide suggestions on potential improvement of bus/rail line layout and timetables, and may aid trip planning for passengers.

**KEYWORDS:** Public transit operation; Public transit planning; Trip planning; Sustainable transport; Land use
面向拥堵缓解的城市大型活动期间干线协调控制研究

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摘 要：为了缓解城市大型活动期间的道路交通拥堵，针对活动期间交通拥堵特征和演化规律，提出了以精细化管控为导向的、基于红波和绿波理念的干线协调控制方法，并重点研究了相位差的计算模型。结合2个真实路段对方法和模型进行了仿真测试，结果表明：提出的方法可均分交通压力，瓶颈交叉口拥堵得到缓解，干线交通流有序性得到增强，有利于提升路网运行效率、改善活动参与者和居民出行品质。

关键词：交通工程；大型活动；交通拥堵；协调控制；相位差

中图分类号：U491.54

Urban Arterial Coordinated Control for Traffic Congestion Mitigating during Special Events

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Abstract: In order to mitigate the urban road traffic congestion during special events, a detailed management and control oriented arterial coordinated control methodology was proposed based on red wave and green wave concept, and the determination of offset was emphatically studied. The methodology and model were tested in simulations utilizing two real arteries. The results show that the proposed method can divide the traffic pressures equally, mitigate the congestion of bottleneck intersection, and strengthen the orderliness of arterial traffic. Also, the method will benefit in increasing the road network efficiency and improving the trip qualities of participants and residents.
key words: trafficengineering; specialevents; trafficcongestion; coordinated control; offset

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基于手机信令的复杂人群属性区域常驻人口识别方法研究

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摘  要:利用手机信令数据进行居民职住地分布研究和常驻人口识别是当前行业研究热点,现有研究主要是以特定时间段内用户的驻留时长和出现频率来作为常驻人口识别依据,然而该类方法无法在综合交通枢纽、商圈等复杂人群属性区域得到有效应用。在对复杂人群属性区域内的常驻人口人群属性和出行-活动特征进行深入分析的基础上,确定了复杂人群属性区域常驻人口的识别规则和相关参数,提出了一种基于观察周期内用户驻留地累计停留时长排名的常驻人口识别方法,并对算法的实现过程进行了描述。研究成果为解决复杂人群属性区域普遍存在的24小时轮班制和特定时期工作人群的调动背景下常驻人口识别提供了一种新的思路。通过在重庆北站进行实例应用,并利用2017年4月27日重庆北站常驻人口实际数据对算法识别结果进行了验证,上午10:00~12:00和下午15:00~17:00两个时间段常驻人口识别准确率分别为83.1%和85.4%。

关键词: 手机信令; 复杂人群属性区域; 活动链; 常驻人口识别; 重庆北站

中图分类号: U121 文献标识码: A

Research on Resident Population Recognition in Complex Group Attribute Areas Based on the Mobile Signaling

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Abstract: Using the phone signaling data to identify resident population and investigate the distribution of residence and workplace has been a hot spot in current research. Existing studies were mainly based on the user’s residence time and frequency in a specific period of time as the recognition basis of resident population. However, this rule cannot be effectively used in complex group attribute areas
such as integrated transport hubs, business districts and scenic spots. On the basis of attributes of resident population and characteristics of their travel activities in complex group attribute areas, this paper determined recognition rules and related parameters of the resident population in complex group attribute areas, and proposed a recognition algorithm of resident population based on the ranking of the user’s cumulative residence time on the observation period. The result provided a new way for resident population recognition in complex group properties areas in the consideration of ubiquitous 24-hour shifts and the mobilization of working groups in specific periods. Finally, an example (Chongqing North Railway Station) was given to verify the feasibility and effectiveness of the algorithm, the results show the accuracy rate of resident identification in the two time periods (on April 27, 2017, from 10:00 to 12:00 and 15:00 to 17:00) was 83.1% and 85.4% respectively.

**Keywords**: Mobile Signaling; Complex Group Attribute Area; Activity Chain; Resident Population Recognition; Chongqing North Railway Station

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基于浮动车数据的大规模城市路网交通状态时空特征分析

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摘 要: 为宏观把握网络层级城市道路的时空变化特征，本文基于降维和聚类分析，以浮动车数据为研究对象，提出一种针对大规模城市路网交通状态的表达和分析方法。将高维度的路网交通状态投射到低维空间中，深入挖掘路网交通状态的时空特征，并进行可视化表达。并以北京市三环内路网为例，对方法的适用性和有效性进行验证。结果表明相应的时间演化分析和空间结构分析对路网的交通状态变化具有较高的解释性，为大规模路网的交通状态分析提供了一种有效方法。

关键词: 大规模; 城市路网; 交通状态; 时空特征

中图分类号: U491

Spatial-temporal Analysis of Traffic Patterns in Large Scale Network Using Floating Car Data

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Abstract: Based on the dimensionality reduction and clustering analysis, this paper presents a method to express and analyze the traffic state of large-scale urban road network using floating car data. The high-dimensional network-level traffic conditions are projected into a feature space of much less dimensionality and visualized to grasp the temporal and spatial of urban road network. The method is tested on the 3rd Ring Road Network of Beijing to validate the applicability and effectiveness. The results show that the corresponding time evolution analysis and spatial structure analysis have high interpretability for the traffic state change of urban road network, and provide an effective method for the analysis of
the network-level traffic states.

**key words:** largescale; network; traffic state; spatial-temporal patterns

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基于博弈论组合赋权法的机场飞行区设施保障效能评价指标权重确定

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摘 要: 针对现有军用机场飞行区设施保障效能评价指标权重确定偏于主观且指标间难以比较的问题，引入基于博弈论的组合赋权思想，寻求基于改进层次分析法的主观权值和基于熵权法的客观权值之间的最优组合来确定最终权重。以某些机场场站为例，用组合赋权法计算飞行区设施保障效能评价指标的权重，判断各指标对保障效能的影响程度。结果表明：所提方法具有科学性、可行性。

关键词: 博弈论; 主观赋权法; 客观赋权法; 组合赋权法; 设施保障效能评价

中图分类号: [TU279.7+1] 文献识别码: A

Determination of Military Airports Flight Area Facility Support Effectiveness Evaluation Index’s Weight Basing on Combination Weighting Approach of Game Theory

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Abstract: Aiming at the existing problem of determination of military airports flight area facility support effectiveness evaluation index’s weight that’s partial to subjectivity and difficult to compare between indicators, the paper lead into the combination weighting approach based on the game theory and seek the best combination between the subjective weight based on improved analytic hierarchy process and the objective weight based on entropy weight method to determine final weight. It takes some air force station for example, calculates the weight of flight area facility support effectiveness
evaluation index’s with combination weighting method, and judge the influence degree of each index on support effectiveness. The results show that the proposed method is scientific and feasible.

Keywords: Game theory; Subjective weighting method; Objective weighting method; Combination weighting method; Facility support effectiveness evaluation

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Application of an Innovative Data-filtration Technique for Three-dimensional Pavement Imaging

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ABSTRACT
Data filtering of three-dimensional (3D) pavement imagery is necessary in detecting road
surface distress and reconstructing road surfaces. In the field of 3D pavement-image data filtering, maintaining a highly functional pavement surface is very important. After analysing the 3D pavement data and considering the pavement primary profile characteristics, a new filtering method based on curve fitting and biphasic standard deviation is developed for assessing 3D pavement data. Pilot experiments were conducted using the new technique proposed in this paper and the results were compared with those obtained using existing methods. The results showed that the proposed method can extract the primary profile automatically and remove noise without changing the road characteristic information.

**KEYWORDS:** pavement 3D data; digital image processing; filtering; curve fitting
高速公路建设对地区经济发展的影响研究

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摘 要: 高速公路的建设对社会经济具有显著影响，本文选取福建省高速公路及经济社会相关数据作为基础，建立并分析高速公路对社会经济影响的指标体系，建立系统动力学因果关系图及系统动力学流图，并对其进行模拟仿真，全面、准确地评价和测算高速公路建设对社会经济发展的影响，对高速公路发展存在的问题进行分析，针对性地提出高速公路发展的相关建议，可为公路发展规划以及建设项目决策分析和后评估提供理论方法，为制订和完善公路交通发展政策提供依据和支撑。本项目研究对于促进高速公路快速健康发展、推动经济社会可持续发展具有重要意义。

关键词: 高速公路经济效益社会效益系统动力学

中图分类号: U4-9
文献标志码: A

Research on System Dynamics of Expressway Construction Effects on Socio-economic

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Abstract: Highway construction obviously led to the social and economic. The paper selects social and economic data of Fujian Province as the foundation data. Index system and analyze the impact of the economic and social of the highway, establish and simulation the system dynamics causal diagram and system dynamics flow diagram. Researching the effects of expressway construction on the socio-economic within the system dynamic framework, proposed development and construction of the highway project proposals. Provide theoretical support of relevant policy recommendations to promote economic and social development to give full play to highway function.
Key words: Highway, Economic Benefits, Social Benefit, System Dynamics

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基于GA-WNN的时空特性交通数据融合

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摘 要：针对交通数据的单点性等不全面问题，分析交通数据的时间特性与空间特性，提出基于遗传算法-小波神经网络（GA-WNN）的数据融合模型。通过分析交通数据的时空特性，利用遗传算法的群体搜索技术及小波神经网络的更强学习能力，得到最优的时空数据序列，继而用最小二乘法进行数据融合得到全面可靠的交通数据。最后，利用MAE、MRE和MSE三个指标进行数据序列的优劣对比分析，从而确保交通数据的可用性和可靠性。

关键字：遗传算法，小波神经网络，时空特性，数据融合

中图分类号：U238

Based on the Space-time Characteristics of GA-WNN Traffic Data Fusion

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Abstract: In view of the traffic data of single point sexual problems, such as not comprehensive analysis of traffic data characteristics of time and space, put forward based on the genetic algorithm, wavelet neural network (WNN) GA data fusion model. Through the analysis of the characteristics of time and space of traffic data, the techniques about searching for group which was using the genetic algorithm and wavelet neural network stronger ability to learn, to get the optimal sequence of spatio-temporal data, then data fusion using least squares method fully reliable traffic data. Finally, MAE, MRE and MSE three indexes data sequence and comparative analysis, to ensure the availability and reliability of traffic data.
Key words: genetic algorithm, wavelet neural network, the characteristics of time and space, data fusion

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改进的灰色模型在公路货运量预测中的应用

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摘 要：灰色系统理论已成功运用于工业、农业、经济、能源、交通等专业领域[1]。针对传统GM(1,1)灰色预测模型在公路货运量拟合及预测中存在的不足，借助混合蛙跳算法优化平滑系数、紧邻均值、残差优化等方法，提出了改进的GM(1,1)公路货运量预测模型，以求能够更加合理地对公路货运量的未来发展走势作出预测。最终对比测试结果表明：改进的GM(1,1)预测模型相对传统GM(1,1)预测模型，可以有效提高公路货物运输量的预测精度，能够为政府管理部门的公路网规划和公路建设等宏观控制提供可靠的决策依据，有助于我国交通运输行业、汽车、能源等行业的市场决策。

关键词：货运量预测; 改进GM(1,1); 混合蛙跳算法

中图分类号: U492.313

Application of Improved GM(1,1) Forecasting Model in Prediction of Highway Freight Volume

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Abstract: The grey system theory has been successfully applied in agriculture, economy, energy, transportation, and other professional areas. Aiming at the deficiency of the traditional GM(1,1) forecasting model for fitting and predicting freight transportation volume, an improved GM(1,1) forecasting model was proposed by using SFLA to optimize the background value and smoothing coefficient, finding optimal definite condition, and correcting residual error. Example application has showed that the prediction accuracy of the improved GM(1,1) forecasting model is greatly improved compared with the traditional GM(1,1), which could provide government administration for reliable
decision basis on highway network planning and highway construction, and other macro control, and be helpful to market decisions for transportation industry, automotive industry, and energy industry.

Key words: freight transportation volume prediction; improved GM(1,1); SFLA

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Determining Time-of-Day Breakpoints of Intersection Signal Control by Optimal Timing Parameters

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ABSTRACT

A data-driven methodology for signal timing plan development was re-examined and a new approach of determining time-of-day breakpoints of intersection signal control by optimal timing parameters is proposed. In order to accommodate the variance in vehicle's travel time due to diverse driving behaviors, the many-to-many mapping relationship was established from several factors, such as the traffic flow structure at the intersection, intersection's channelization pattern and intersection's control parameters, to vehicles’ expected travel time on a road segment. The relationships of the equivalence and superiority between the two groups of intersection control parameters were defined based on the $\beta$-measurement under the same factors, such as the same traffic flow structure and intersection’s channelization pattern. Using the same intersections’ channel...
lizations scheme, the relationship of the adjustable and irreconcilable between two traffic flow structures were given under the optimal signal parameters. We also determined the adjustable and irreconcilable relationship of two different traffic flow structures on condition of adjustment of intersection channelization and signal parameters. The appropriateness of the length of the traffic flow during the process of data analysis was measured using the standard deviation of a vehicle’s travel time on a road segment. The time-of-day breakpoints were obtained by means of the k-means clustering method, which depended on the optimal control parameters that were relevant to the traffic flow structure with the appropriate time length. The new method implemented can covert the potential efficiency of previous one lost and makes the timing parameter optimization more standardized than ever.

**KEYWORDS:** signal timing; link travel time distribution; limited dependent variable model; mixed distribution
Optimization on Freight of Less than Container Load Transshipping at Port Container Rail-Sea Intermodal Terminal

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ABSTRACT

This study developed an integer programming optimization model to improve freight of Less than Container Load (LCL) transportation efficiency and benefits of transportation enterprise by designing rational departure time to reduce the railway container transport delay cost and increase the container utilization rate at a railway container intermodal terminal (RCIT). The objective function is to maximize the profit of the seaport operator considering the total transportation fee of suitable goods, the total transportation cost of the block container trains, and the storage cost of goods on the storage yard. Unloading and reloading time constraint was introduced in the constraint considering the goods arrival time and departure time of a block container train, and unload and reload mass, unload and reload volume were also considered in the constraints. The effectiveness of the model was tested by a case study at Qingdao Port in China. The computational solution obtained from the General Algebraic Modeling System (GAMS) computational software showed that the optimum departure time of the block container train could be found and profit or deficit for the seaport operator could be found by unit transportation fee analysis at break-even point.

KEYWORDS: Intermodal transportation, freight transshipment, optimization, integer programming
基于AIS数据的多船会遇态势识别

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摘 要: 识别多船会遇态势对改善船舶交通服务、避免船舶碰撞事故具有重要意义。描述基于AIS数据的多船会遇概念, 介绍AIS数据的时间切片化方法, 借鉴时空聚类理念在DBSCAN算法基础上提出多船会遇识别算法, 并结合宁波舟山港的AIS数据进行了实例研究, VTS监控回放记录证实了方法有效性。

关键词: 船舶自动识别系统; DBSCAN算法; 聚类分析; 多船会遇

中图分类号: U675.79 TP391

Multi-ship Encounter Situation Recognition Based on AIS Data

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Abstract: To recognize multi-ship encounters situation which is of great significance for improving vessel traffic services and avoiding collision accidents. The concept of AIS-based multi-ship encounter and the time-slicing method of AIS data were described. The recognition algorithm of multi-ship encounter was proposed based on the improved spatio-temporal DBSCAN clustering. And a case study was made on the AIS data of Ningbo Zhoushan port. VTS playback recordings has confirmed the method effective.

Keywords: AIS; DBSCAN Algorism; Clustering Analysis; multi-ships encounter

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An Improved Method for Bogie’s Rotational Resistance Coefficient Analysis Based on Novel Parallel Mechanism

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ABSTRACT:

In this paper, a novel parallel mechanism which can be used to evaluate body-to-bogie yaw torque is proposed. It can satisfy experimental testing for Rotation Resistance Coefficient (RRC) with a different bogie, different rotational speed, and a different state of air spring. Aiming at the problem that computing speed of newton iterative method for solving rotational angle is incompetence to meet the real-time requirements, and also that other method adopting physical device such as laser displacement sensor to solve rotational angle possess larger measurement error, using the analytical techniques method for solving rotational angle is presented. Finally, by using the upper-single-6-DOF motion platform as an authentic urging means to simulate a real vehicle, the test was carried out under the speed of 0.2°/s and 1°/s, with the air spring at inflated state and deflated state, respectively. The results show that the RRC of the bogie under various conditions is less than 0.06, which meets the standard requirement EN-14363. It was also found that the speed of vehicles moving along curves and the state of air spring were key factors influencing the RRC. The feasibility of this model and test method is verified in this study.

KEYWORDS: Railway vehicle; Rotation resistance coefficient; Subway bogie; Forward kinematics; Air spring.
水上货物运输风险演化及其系统动力学仿真

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摘要: 利用系统动力学思想和建模理论，结合风险演化的相关理论，以“人、机、环、管、货”五个子系统为基础，建立运输风险指标体系；并分析各个子系统间的因果关系和反馈回路，建立各个子系统以及总系统的SD模型；利用层次分析法，信息熵法以及最小二乘法对系统间因素进行定性、定量分析，对船舶运输风险的演化过程进行了动态仿真研究，模拟系统风险水平随时间的变化趋势。

关键词: 系统动力学, 风险演化, 仿真

Water Transportation Risk Evolution and its System Dynamics Simulation

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Abstract: Using the thought of system dynamics, combing with the relevant theory of risk evolution to build transport risk index system on the basis of five subsystems ,which consists of man, machine, environment, management and cargo; and analyze the causal relationship between the various subsystems and feedback loop, establish various subsystems and the total system SD model; quantitative analysis of the inter-system factors is carried out by using AHP, Entropy and LSM to make a dynamic simulation research for the processes of the shipping container transport and predict the level of risk trends.

Key words: evolution of risk, system dynamics, simulation

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A New Approach to Particle Size Distribution using the Skeleton Extraction Method and SVM Classification

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ABSTRACT
Measuring particle size with high accuracy and efficiency has significant importance for ensuring the quality of pavement construction, which directly affects the performance of the pavement in the longrun. This paper proposed a new approach for the evaluating the distribution of particle size combining skeleton extraction and Support Vector Machine(SVM) algorithms. At first, particles’ images were captured using a designed image acquisition system. After that, the images skeleton were extracted under the NI environment following image segmentation process. Next, the skeleton repairing
algorithm was designed to repair the fractured skeleton images. Finally, the distribution of particle size was estimated employing SVM method. Experimental results show that skeleton method combining the following repairing process performs satisfactory for the extraction of the key information of particle images. Meanwhile, the nonlinear SVM with kernel rbf can distinguish the particle sieve size effectively, which verified that the machine learning classification method has great potential for estimating the particle size distribution.

**KEYWORDS:** particle, size distribution, skeleton, SVM
高速公路短时行程时间组合预测模型

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摘 要：关于高速公路短时行程预测的研究范围较广，不少研究提出了人工智能算法和统计学法相结合的组合预测模型，却鲜有研究关注二者结合后产生的过拟合问题。过拟合带来的噪声会降低高峰时段内行程时间的预测精度及稳定性。本文提出的组合模型将行程时间数据分解成三个部分：(1) 周期性部分，通过小波神经网络进行初步预测(2) 残差值部分，通过马尔可夫链进行相对误差修正(3) 波动部分，通过基于波动性分析的噪声修正模型—GJR-GARCH模型进行过拟合修正，并采用平均绝对误差(MAE)、平均绝对百分比误差(MAPE)、均方根误差(RMSE)三个指标评价模型预测精度。结果表明，本文提出的组合模型相比较现有模型具有更高的预测稳定性和预测精度。

关键词：交通工程；高速公路；短时行程时间预测；小波神经网络；马尔可夫链；过拟合修正

A Hybrid Model for Freeway Short-term Travel Time Prediction

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Abstract: Despite several short-term travel time prediction approaches for freeway have been proposed in the past decade, especially for a few number of hybrid models which consist of Artificial Intelligence (AI) models and statistic models, few studies put focus on the over-fitting problem brought by hybrid models. The over-fitting problem lower the prediction accuracy especially during peak hours. The methodology proposed in the paper predicts travel time by decomposing travel time data into
three components: a periodic trend presented by a modified Wavelet Neural Network (WNN), a residual part modeled by Markov Chain, and the volatility part estimated by the modified generalized autoregressive conditional heteroscedasticity (GJR-GARCH) model, which is based on volatility analysis. The forecasting performance of the proposed hybrid model is investigated with freeway travel time data from Houston, Texas and examined by three measures: mean absolute error (MAE), mean absolute percentage error (MAPE), and root mean square error (RMSE). The results show that the travel times predicted by the WNN-MAR-VOA method are the most robust and accurate.

**key words:** traffic engineering; freeway; short-term travel time prediction; wavelet neural network; Markov Chain; over-fitting correction

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“LED+智能”在公路隧道照明的应用

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摘要：公路隧道提供24 h不间断照明来保障行车安全，本文概述“LED+智能”照明系统在公路隧道照明的典型应用及介绍隧道照明质量要求与设计要点，并展望“LED+智能”在公路隧道照明的推广应用。

关键词：LED隧道灯；智能控制；系统；应用；节能

Application of Intelligent LED in Highway Tunnel Illumination

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Abstract: There are 24 hours of uninterrupted lighting to protect traffic safety in highway tunnel. This paper summarizes the typical application of intelligent LED lighting system in highway tunnel illumination and further introduces its requirements and design essentials, and then looks forward to the widespread use of intelligent LED in the highway tunnel illumination.

Key words: LED tunnel lamp; intelligent control; system; application; energy saving

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Intrinsic Self-sensing Concrete Pavement for Traffic Detection

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ABSTRACT

The intrinsic self-sensing concrete (ISSC) can be used for traffic detection because of its advantages such as high sensitivity, easy installation and maintenance, long service life and wide detection area. The intrinsic self-sensing CNT concrete with piezo-resistive properties used for self-monitoring pavement is proposed and investigated through laboratory tests and road tests in this paper. Experimental results show that the intrinsic self-sensing CNT concrete presents sensitive and stable response to repeated compressive loadings and impulsive loadings. The intrinsic self-sensing CNT concrete pavement can accurately detect the passing of different vehicles under different vehicular speeds and test environments. These findings indicate that the ISSC pavement has great potential for traffic monitoring such as traffic flow detection, weigh-in-motion detection and vehicle speed detection.

KEYWORDS: Intrinsic self-sensing concrete; CNT concrete pavement; Sensing capability; Traffic detection
合芜高速二坝（长安）互通立交改造工程水泥石灰联合处理软基搅拌桩
分析研究

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摘要：水泥搅拌桩处理作为处理软土地基的常用方式之一，因处理效果较好被广泛应用，作为搅拌桩主要
材料的水泥至今仍一直单独被沿用，本项目结合现场实际情况，引进与水泥性能较接近的石灰等材料，依托
合芜高速在建工程，进一步论证联合处理搅拌桩的实际效果，为拓展软基处理方法提供新的思路和参考。

关键词：改造工程；软土地基；地基处理；水泥石灰联合处理；分析研究；

Hefei Wuhu Expressway Two Dam (Chang’an) Interchange Reconstruction
Project of Cement Lime Pile in Soft Foundation Treatment Combined with
Analysis of Mixing

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Abstract：As one of the most commonly used method in soft soil foundation treatment of cement
mixing pile for treatment, better treatment effect is widely used as the main materials of cement
mixing pile still has been used alone, this project is based on the actual situation, the introduction is
close to the performance of cement lime and other materials, relying on the Hefei Wuhu expressway
construction project, combined treatment the actual effect of mixing pile further demonstrate, provides
new ideas and references for the development of soft ground treatment methods.

Keyword：Reconstruction project; soft soil foundation; foundation treatment; combined treatment of
cement and lime; analysis and research;
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基于GIS的秦皇岛市旅游资源空间分布及交通便捷性研究

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摘 要：利用GIS的数据处理和空间分析功能，获取秦皇岛市旅游资源分布概况，分别建立火车站、汽车站、高速公路的多重缓冲区，统计不同缓冲半径内的景点个数，综合评价秦皇岛市旅游业的交通便捷性。结果表明，秦皇岛市的旅游资源具有沿高速公路呈带状分布的特征，基于火车站和汽车站的交通便捷性差异不大，自驾游具有明显优势。

关键词：旅游资源；缓冲区；空间分布；交通便捷性；秦皇岛市

Analysis on Spatial Distribution and Traffic Convenience for Tourism Resources in Qinhuangdao City Based on GIS

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Abstract: Using GIS data processing and spatial analysis technology ,acquires the distribution situation of Qinhuangdao tourism resources, establishes multiple buffers of the railway stations, bus stations, and the highways, then statics the number of tourism resources in different buffer radius, and evaluates the traffic convenience in tourism industry. The result shows that tourism resources are distributed along the highways, the difference of traffic convenience between railway stations and bus stations is not big, self-driving travel has obvious advantage.

Key words: Tourism Resource; Buffer; Spatial Distribution; Traffic Convenience; Qinhuangdao City

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Dynamic Distribution of Mobile Medical Vehicle in City: Taking Shanghai Baoshan District as an Example

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ABSTRACT
Mobile health is an important part of modern emergency medical service system; its purpose is to arrive at the scene as soon as possible in order to reduce the mortality and disability rate of patients with critical illness. At present, the fixed medical service can’t reach all areas in the best time for
there is an urgent need for the development of mobile health. Taking Shanghai Baoshan District as an example for detailed analysis, the factors which affect the dynamic distribution of mobile medical vehicle have been researched, and using analysis of variance and significant differences to confirm the influence on dynamic distribution by related factors. Models can be built on the basis of these conditions, and solutions can be made under the constraint conditions of the maximum coverage. Combined with the commute population density to make a layout adjustment, thereby getting the optimal solution of dynamic distribution of mobile medical vehicles in Shanghai Baoshan District, and then determine the mobile path selection model for mobile medical vehicle. Finally, through the analysis above, a scientific and reliable method has been put forward for dynamic distribution of mobile medical vehicle in cities.

KEYWORDS: mobile health; first aid; significant differences; selection model; path selection;
Demand-Responsive Customized Bus Systems: An Overview and Emerging Research Needs

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ABSTRACT

With the rapid development of the multimodal transit systems in metropolises of China, the travel demand for diversified and high-quality transit service is dramatically increasing. As a kind of demand-responsive transit, the customized bus has become one of the effective methods to tackle the “last-mile problem”. This paper aims to present a comprehensive review of the existing studies concerning with the demand-responsive customized bus worldwide, including its development history and state-of-the-art studies from strategic, tactical and operational levels. Finally, we expose recent context evolutions and identify some trends for future research.

KEYWORDS: demand-responsive customized bus, research review, network design, operation strategy, pricing strategy
Robust Evaluation for Transportation Network Capacity under Demand Certainty

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ABSTRACT
When evaluating the capacity of a transportation system, the prescribed origin and destination (O-D) matrix for existing travel demand has been noticed to have a significant effect on the results of network capacity models. However, the exact data of the existing O-D demand are usually hard to be obtained in practice. Considering the fluctuation of the real travel demand in transportation networks, the existing travel demand is represented as uncertain parameters which are defined within a bounded set. Thus, a robust reserve network capacity (RRNC) model using min-max optimization is formulated based on the demand uncertainty. An effective heuristic approach utilizing cutting plane method and sensitivity analysis is proposed for the solution of the RRNC problem. Computational experiments
and simulations are implemented to demonstrate the validity and performance of the proposed robust model.

**KEYWORDS:** Transportation network capacity; demand uncertainty; robust optimization; heuristic algorithm; min-max models
Simulation-based Adaptive Traffic Signal Control Algorithm for Urban Road Network

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ABSTRACT

This paper studies a simulation-based adaptive traffic signal control problem for a highly congested urban network with multimodal traffic, numerous signalized intersections, short links and a grid-type topology. The adaptive traffic signal plan strategy is embedded within the micro-simulator. We build different demand scenarios in the simulator and use a simulation-based optimization (SO) algorithm to design the most appropriate signal plan for each demand level, where the objective function explicitly accounts for queue-length information. We then use this simulation-based adaptive traffic signal control algorithm to identify the signal plans for an area in eastern Manhattan (New York City, USA), where spillbacks frequently occur and impact the flows on major arterials as well as on the access/egress to the highly congested Queensboro Bridge. We compare the performance of the proposed signal plans to that of the prevailing signal plan in the field. The proposed plan indeed improves traffic conditions as measured by a variety of performance metrics.

KEYWORDS: Adaptive signal control, simulation-based optimization
高速公路服务区未来发展趋势研究

冯美军

摘 要：本文从高速公路服务区产业发展的现状出发，对高速公路服务区的开发进行了较为系统的理论研究。在分析了高速公路服务区基础设施、服务功能和人员素质的基础上，提出了高速公路服务区新业态发展的几个新的维度；基于高速公路服务区的发展战略，提出了高速公路服务区产业的功能定位；从产业关联和产业生命周期角度，对新时代下高速公路服务区产业的发展趋势进行了分类研究。同时，针对典型的高速公路服务区新兴产业项目提出了具体的发展思路：围绕“服务区+现代服务业”建设旅游类服务区、市场类服务区、新能源类和物流类服务区；围绕“服务区+互联网”建设智慧服务区。

关键词：高速公路；服务区；新趋势；现代服务业；互联网

Study on Future Development Trend of Expressway Service Area

Abstract: This paper study on the new trend of the expressway service area, from the present conditions of expressway service area development. The paper shows the background of the research, the infrastructure, the service function and the quality of personnel in the expressway service area. On the basis of the research on the industrial characteristic if the expressway service area, the paper puts up several new dimensions of the development of the new format in expressway service area. The paper brings forward the functional location of the expressway service area. Then, from the angle of industry association, this paper try to do some classification research on the new trend of expressway service area in the new era. Meanwhile, in the light of emerging industry projects in expressway service area, put up the specific development ideas: around “expressway service area + modern service industry” to build the service area of tourism, market, new energy class and logistics class; around “expressway service area + internet” to build the intelligent service area.

Keywords: expressway; service area; new trend; modern service industry; internet

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A New Approach to Particle Size Distribution Using the Skeleton Extraction Method and SVM Classification

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ABSTRACT

A new kind of particle size measurement based on the skeleton extraction is presented in this paper. Particle’s images was captured using a designed image acquisition system. After the image segmentation stage, the images skeleton were extracted under the NI environment. For the purpose of repair the fractured skeleton image, the skeleton repair algorithm was designed. With the skeleton images, a new kind of particle size measurement method was presented. Experiment results showed that this method is effective for particle size distribution. The SVM classification was used to estimate the particle size distribution. the dataset with seven particle features was trained, the experiment showed that the nonliear SVM with kernel rbf can distinguished the particle sieve size effectively. It
seems that the machine learning classification method has great potential to become a very useful technique in the particle size distribution estimation.

**KEYWORDS:** particle, size distribution, skeleton, SVM
城市轨道交通列车运行图协调性评估体系构建与系统研究

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摘 要：从不同尺度对城市轨道交通列车运行图进行协调性分析与评估，是实现城市轨道交通网络化运营协调与优化的重要基础。本文首先选取了大量的指标数据进行归纳总结，提取了运营协调决策中的共性需求，构建了适应运营管理的城市轨道交通列车运行图协调性评估指标新体系。其次基于该指标体系，本文开发了完整的城市轨道交通列车运行图协调性评估系统，可以对点（车站）、线（运行线）与面（运行图）进行全面综合评估。最后，以北京市实际路网运营情况为例，在10秒内完成各项指标计算，计算结果得到了北京市交通信息中心与北京地铁运营有限公司的专家认可，可以为列车运行图进一步优化编制提供有效地支撑。

关键词：城市轨道交通；列车运行图；协调性；指标体系；评估系统

中图分类号：U238

Research on Compatibility Evaluation Index Framework and System of Train Diagram in Urban Rail Transit

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Abstract: It is important to analyze and evaluate the compatibility of train diagram from different scales in order to realize the coordination and optimization of urban rail transit network operation. Firstly, this paper constructs a new compatibility evaluation index framework of train diagram in urban rail transit adapted to operation and management by selecting index from a lot of data and extracting common demand from coordination decision-making. Then develops a complete computer system for evaluating spot (station), line (running line) and plane (train diagram) in all directions based on the index framework. Finally, results are accomplished within 10 seconds by taking the case of actual network.
operation in Beijing The results are recognized by the experts from Beijing Traffic Information Center and Beijing Subway, also provides effective support for the further optimization of train diagram.

**key words:** Urban Rail Transit; Train Diagram; Compatibility; Index Framework; System

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Multi-level Mixed Logit Method for the Generalized Overlapping Problem in Multi-Modal Route Choice Modeling

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ABSTRACT

In this paper, a structure of super-network is designed to represent the multi-modal transport system in a unified network. When modeling the route choices in the context of multi-modal networks, alternative routes are corrected not only because of the overlapping of physical links, but also because of the overlapping of modes. We define this problem as the generalized overlap problem. To address the generalized overlap problem, a multi-level mixed logit model is proposed to explicitly consider the correlations of unobserved utilities of generalized routes. Based on this model, the stochastic user equilibrium on multi-model transport networks is represented as a fixed point problem. The solution algorithm is also proposed for this problem. Numerical studies are designed to illustrate the effects of incorporating generalized overlap problem on disaggregated route choice prediction and aggregated traffic flow assignment. With different settings of physical link and mode specific error terms, the variations of disaggregated route choice predictions and aggregated traffic flows are discussed. It is found that, the generalized overlap problem can be captured by the proposed model and significantly affect both the route choice predictions and equilibrated traffic flows.

KEYWORDS: multi-modal network; multi-level mixed logit model; route choice; stochastic user equilibrium
Analysis of Drivers’ Route Choice Behavior Considering Probability Choice Sets

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ABSTRACT

In this work, a probabilistic choice set (PCS) model is applied to route choice analysis. Route choice behavior is treated as a two-stage process consisting of a choice set generation stage and a choice making stage. In the choice set generation stage, drivers include the routes that satisfy their spatiotemporal constraints into an individual choice set from which an actual route is selected in the following stage. In the choice making stage, drivers choose the route with maximal utility.
The data used in this research is 2011 probe vehicle data collected in Toyota city, Japan. This data gives information about drivers’ choices in the choice making stage, but lacks any information about the choice set generation stage. In carrying out the computation, models for both stages are estimated simultaneously based on only drivers’ choice information.

The estimation results demonstrate that the PCS model performs well compared with the multinomial logit (MNL) model, a result that also indicates the validity of viewing route choice behavior as a two-stage process.
Traffic Volume Benchmarks for Major Arterial Widening versus Expressway Construction: An Exploratory Approach

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ABSTRACT

There exist several classes of physical interventions to address congestion at arterials, including widening (construction of additional lanes) and upgrading to expressway standards where possible. For each class of intervention, a key question is the threshold or benchmark traffic volume (BTV) at which the intervention is feasible. For long-term congestion mitigation planning for multiple arterial sections in a network and for planning-phase corridor development, agencies desire to identify BTVs for congestion mitigation interventions. The existing literature addresses this issue largely in feasibility analysis for specific projects, with little or no guidance regarding network-
level planning considerations. In addressing this gap, this paper presents a detailed network-level planning methodology that is rooted in economic efficiency. The methodology first establishes three basic alternatives (Do Nothing, Widening, and Expressway Construction) and expresses the total life-cycle cost for each alternative as a function of the current traffic volume in terms of average daily traffic (ADT). The BTV is identified as the ADT at which the life-cycle costs of any two alternatives are equal. This paper demonstrates the application of the proposed methodology using data from in-service roads, and the results indicate that the relative weights assigned to the agency and user costs significantly influence the BTVs. In addition, results are presented for the scenario where these two cost categories are assigned equal weights; for this scenario, widening is never the best option. In the probabilistic situation, it is found that, at an 80% confidence level, it is economically attractive to upgrade a 4-lane major arterial to an expressway when the ADT reaches 6,000; at the 100% confidence level, it is economically attractive to upgrade to an expressway when the ADT reaches 19,000.

**KEYWORDS:** Benchmark Traffic Volume; Major Arterial Widening; Life-Cycle Cost Analysis; Expressway; Feasibility Study
Multi-dimensional Vulnerability of Complementary Urban Public Transportation System: From the Perspective of Urban Public Services Accessibility Provided to Residence Communities

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ABSTRACT

This article proposes a framework for analyzing the vulnerability of complementary urban public transport system (CUPTS) from the perspective of how convenient residents in communities
can achieve the critical public services in urban area through CUPTS. The framework first provides a multi-layer network to model the CUPTS with the considering of complementary relationship between different public transport modes; then based on the model, the CUPTS’ performance is measured by the length- and time-based accessibilities of residence communities to achieve the five kinds of critical public services for citizen’s daily life, including urban commuting service, medical treatment service, commercial service, education service and long distance travel service; an iterative algorithm is further proposed to calculate the accessibilities with the considering of minimal transfer times between different transport modes in CUPTS. The complementary urban public transport systemin the city of Wuhan in China, composed of road system, bus system and subway system, is used as an example to illustrate how to apply the framework to analyze the vulnerability of CUPTS in a multi-dimensional way. Results of this application offer insights into how to assess complementary urban transport systems’ vulnerability based on the transport service level provided to the residents in communities, and the relationships between various performance measures.
The Research of Driving Psychological Characteristics about the Bus Stop Progress

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ABSTRACT

With the rapid development of urban public transport, bus operation has also been a wide range of social concern. The driver of the bus is the only manipulator of the vehicle, and its normal physical factors are related to the safety of the driving behavior, and the safety of the whole vehicle and the whole transportation system. In this paper, the bus stop process is selected during the special stage of bus operation. This paper designs the pilot test under actual road environment, selects 25 professional drivers to participate in the experiment, and analyzes the collected bus operation data and the driver physiological data. With using the position coordinate method, the bus docking stage is divided into four stages: the pit preparation phase, the inbound phase, the outbound phase and the outbound end phase. Analyzing the change rule of the driver’s heart rate and respiration rate in the process of entering and leaving the station. It is concluded that the driver's heart rate increases with the complexity of the environment and the difficulty of the operation. The driver's breathing rate decreases with the complexity of the environment and the difficulty of the operation.

KEYWORDS: Bus; entrance and exit station; real vehicle test; physiological factors; data analysis.

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旅客联程运输发展现状与对策

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摘 要：对国内外联程联运研究和发展现状进行了回顾与梳理，分析了当前我国推进旅客联程运输需要解决的体制机制和关键技术方面的问题，从提升发展理念，完善法规政策保障，重视市场调节，充分发挥票价机制的促进作用、推进联程信息一体化和接驳交通关键技术、落实联程运输检查监督机制等方面提出了具体的解决途径和建议。

关键词：联程运输; 政策机制; 关键技术; 信息一体化; 接驳交通

Current Situation and Countermeasures of Passenger Connecting Transport Development

Abstract: This paper reviewed researches of passenger connecting transportation and current development situation both at home and abroad, analyzed hindering factors that need to be solved in politic systems, mechanisms, and in key technologies, put forward specific solutions and suggestions such as to promote the development idea, to perfect regulation and policy guarantee, to pay attention to the role of market, to give full play to the price mechanism, to promote the information integration and key technology of shuttle transportation, to implement the evaluation and supervision mechanism.

Key words: connecting transport; policy mechanism; key technology; information integration; shuttle transportation

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火车站售票厅与候车室空气中多种污染物分析研究

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摘要：为了解火车站室内空气品质污染状况，于2016年5月采用便携式快速检测仪对西安火车站售票厅、候车室及广场的CO、CO2、TVOC、甲醛和颗粒物的污染水平进行了监测。结果表明：CO、甲醛和TVOC浓度均未超标；售票厅CO2和PM10浓度在晚上出现最大值，平均值分别为0.11mg/m3、0.18mg/m3；超标率分别为10%、20%，候车室也存在该问题。空气质量综合指数在一天内具有很好的一致性（即综合指数值晚上>上午>下午），空气质量总体良好。售票厅和候车室中的PM10与CO2有强烈的相关性；售票厅PM2.5/PM10、PM1.0/PM2.5比值的平均值高达0.68、0.81，候车室PM2.5/PM10、PM1.0/PM2.5比值为0.70、0.84，细颗粒PM2.5、PM1.0所占的比重较大。

关键词：火车站；室内空气品质；CO2；空气质量综合指数；PM10；PM2.5

中图分类号：X5
文献标识码：A

Analysis and Research on Several Kinds of Pollutants in the Air of Railway Station Ticket Office and Waiting Room

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Abstract: In order to learn the indoor air pollution in the railway station, a test for the ticket office, waiting room and square was made, include the parameter of CO, CO2, TVOC, HCHO and particulate matter in May, 2016 in Xi’an. Test results show that the concentration of CO, HCHO and TVOC are not exceeded; the concentration of CO2 and PM10 have the maximum value in the evening, the average value are 0.11mg/m3 and 0.18mg/m3; the exceed standard rate are 10% and 20%. The
waiting room also has the problem. The air quality index has a good consistency in one day (the value of the air quality index: the night > the morning > the afternoon), the air quality is good. There is a strong correlation between PM10 and CO2 in the ticket office and waiting room; The average value of PM2.5/PM10 and PM1.0/PM2.5 in the ticket office is up to 0.68, 0.81, the PM1.0/PM2.5, PM2.5/PM10 ratio in Waiting room is 0.70, 0.84, the fine particles PM2.5, PM1.0 accounted for a large proportion.

**Key words:** railway station, indoor air quality, CO2, air quality index, PM10, PM2.5

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面向“海绵城市”的跨河域桥梁LID系统构建

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摘 要：针对跨河域桥梁雨水径流污染问题，着重从桥面渗透性铺装、桥面雨水收集运输系统、桥下雨水净化排放系统建立跨河域桥梁低影响开发系统。首先，根据不同区域年径流总量控制率对应的设计降雨量，对桥面雨水径流进行分析，最终得出面向海绵城市的渗透性铺装厚度设计标准，同时基于交通荷载等级要求提出2种渗透性铺装结构；接着，根据铺装层不同渗透形式，构建了桥面透水管、明沟、暗沟纵向排水系统；最后，通过分析跨河域桥梁的区域特点，提出相应的低影响开发策略及典型方案。

关键词：海绵城市；跨河域桥梁；低影响开发；径流污染处理

中图分类号：U442

Construction of Low-Impact Development System for the Bridge across River in Sponge City

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Abstract: To solve the bridge runoff pollution problem across river, the low-impact development system was built mainly from bridge permeable pavement, bridge rainwater collection and transportation system, rainwater purification and emission system under the bridge. First of all, according to the corresponding design precipitation of capture ratio of total annual runoff volume in the different areas, the design standard for permeable pavement thickness was proposed by analyzing the bridge rainwater runoff and two kinds of permeable pavement structures were introduced; Secondly, according to the different penetration forms of pavement, the permeable pipes, open drains, blind ditches were built; Finally, the corresponding LID strategies and typical schemes were proposed by analyzing the...
regional characteristics of the bridge across river.

**key words:** Sponge city; The bridge across river; Low-impact development; Runoff pollution treatment
海上溢油数学模型研究综述

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摘 要：总结前人在海上溢油数学模型研究相关进展，对多种溢油模型进行比较，详细介绍各种溢油模型特点和应用范围及限制，对于开展海上溢油研究具有重要意义。

关键词:海上溢油模型；溢油扩散；溢油蒸发；溢油乳化；

中图分类号:TP391

Review of Oil Spill Model and Progress at Sea

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Abstract: The progress of the research on the mathematical model of oil spill at sea is reviewed and oil spill models are discussed in details. Comprehensive introduction to the characteristics and application as well as the limitations of various oil spill models is introduced in depth. It is of great significance for the development of oil spill research and oil spill modeling.

Key words: oil spill model at sea; oilspreading; oil evaporation; oil emulsification;

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高速公路绿色服务区评价指标体系及应用研究

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摘 要：为践行绿色交通，推动绿色公路建设，服务区作为高速公路的配套设施，也应深入贯彻绿色、环保、节能、可持续发展的建设理念。本文结合我国高速公路服务区的特点，在研究高速公路绿色服务区内涵及评价原则的基础上，构建了高速公路绿色服务区评价指标体系。并采用层次分析法确定各指标的权重，最终对京哈高速的A服务区和承唐高速的B服务区进行评价。其评价结果对我国高速公路新建绿色服务区的设计建设和既有服务区的改建具有指导意义和应用价值。

关键字：高速公路，绿色服务区，评价指标，层次分析法

中图分类号：U491

Study on Green Highway Service Area Assessment System and its Application

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Abstract: Aiming at implementing green transportation, accelerating green highway construction, the highway service station should insist the concept of green, environmental protection, energy saving and the sustainable development. Based on researching the characteristics of highway service area and the connotation and assessment principle, this paper constructs the assessment index system of green highway service area. And the paper calculates the weights of each index by applying analytic hierarchy process. Finally the A service area and B service area are evaluated. The result has important significance and application value for the design and construction or the rebuilding of highway service area in our country.
Key words: Highway; Green Service Area; Assessment Index; Analytic Hierarchy Process

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Discussion on the Elements Influencing the Emission Factors of Vehicles at Intersections

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ABSTRACT

In the light of the harm to the environment and human beings, the control of vehicle exhaust emission is the key problem for the government and the people. In recent years, the research of vehicle exhaust emission has been increasing, which is of great significance to the improvement of air pollution and the sustainable development of ecological environment.

Signalized intersections are widely distributed in the urban road network, especially in the distribution of the main road, so traffic control plays an important role in the smooth and orderly operation of the vehicle and the traffic efficiency of the whole city. It can effectively reduce the traffic delay, improve the traffic congestion and other traffic problems by reasonable use of the arterial coordination control system. Therefore, it is very significant to study the factors that affect the emission of vehicles and analyze the influence of road slope and signal timing on emission factors.

KEYWORDS: road intersection, emission factors, road slope, emission model
绿色公路技术在农村公路建设管养中的创新探讨

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摘 要: 本文从实践角度出发, 通过调查分析, 研究农村公路建设制约问题, 探索绿色公路技术，科学提出农村公路绿色技术创新措施，较好地破解了农村公路发展难题。

关键词: 绿色公路 农村公路 技术创新

中图分类号: U412.362

Exploring the Innovation of Green Technology in Rural Road Construction

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Abstract: This paper investigates the rural road constraints and green technologies, and give out various innovations of green rural road technologies via practice and research. It resolves challenging issues in development to a certain degree.

Key words: Green Road, Rural Road, Technology Innovation

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Private Bike Sharing on University Campus: System Design and Performance Pre-Evaluation

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ABSTRACT

This paper includes private bikes from university students into the bike sharing model. First, a semi-intelligent system configuration and the corresponding operational process are redesigned due to changes brought by the participation of private bike suppliers. Second, a mixed user matching algorithm combining the advantages of the accurate and fuzzy matching strategies are proposed. Because of the lack of empirical data, a simulation-based evaluation model integrating Monte Carlo method is then developed to pre-evaluate system performances. The model has two parts: the user generation model generates the demanders and suppliers as well as their characteristics while the user matching model matches suppliers for each demander.

Finally, a case study at the north branch of South China University of Technology reaches some interesting findings: (i) The private bike sharing system using mixed user matching algorithm can largely meet students’ biking demands on university campuses, with high matching goodness and lower costs. (ii) The mixed matching strategy outperforms both the accurate and fuzzy strategies so it should be selected for the proposed model. (iii) Increasing the supply of shared private bikes can
effectively promote the performances of the private bike sharing system. The next step is to conduct a pilot experiment to collect empirical data for better understanding of this new proposed model.

**KEYWORDS:** private bike sharing; university campus, system design, Monte Carlo simulation, mixed user matching algorithm
Development Suggestions for APP-based Sharing Bicycle in China

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ABSTRACT

China used to be the famous bicycle kingdom in the world, but recent 20 years cycling trip pour down in cities. Along with the "Internet plus" and sharing economy arriving App-based sharing bicycle become the pioneer of bicycle revival. How to promote the revitalization movement from sectional management on the national level? This article analysed the development status of App-based sharing bicycle and current problems firstly, then made a deep analysis of contributing factors behind these problems. Next, policy suggestions were proposed to promote bicycle return to cities from the aspect of confirming cycling function. Final, aiming at promoting App-based bicycle developing well, three suggestions were proposed.

KEYWORDS: App-based sharing bicycle; bicycle transport; green transport; urban transport
公路服务区污水多介质生物生态协同处理技术研究与应用

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摘 要：针对公路服务区污水处理低运行成本及管理维护、全年稳定达标的实际需求，通过系统的工艺比选，筛选出曝气生物滤池与人工湿地组合工艺。从曝气生物滤池构造、载体、曝气方式等方面优化形成多介质生物滤池，从人工湿地结构、填料和运行方式等方面改良提出多介质生态湿地，二者有机组合成为多介质生物生态协同处理技术。在此基础上，扩充形成四种技术模式，以适应各种污水处理标准。开展了工程应用验证，经过三年的长期运行，处理效果一直稳定达到一级B标准。最后，为本技术进一步进行工艺优化、提升指明了方向，为采用信息化手段对处理设施开展实时监控与远程控制提出了建议。

关键词：服务区污水；多介质生物滤池；多介质生态湿地；协同处理；植物贮水塘；亚表层渗滤

Research and Application on Multi-media Biological and Ecological Synergistic Wastewater Treatment Technology in Highway Service Area

Liu Xuexin

Abstract: Aiming at the actual demand of wastewater treatment management and maintenance in highway service area at low running cost and stably reaching the standard throughout the whole year, a combination process of aerated biological filter and artificial wetland was selected based on the treatment process comparison. The multi-media bio-filter was optimized from the aeration bio-filter with aspects of structure, carrier and aeration ways. The multi-media ecological wetland was put forward from artificial wetland with the optimization of structure, filler and operation mode. Optimized bio-filter and ecological wetland were integrated to be the multi-media biological and ecological synergistic treatment (BEST) technology. On this basis, four technical models were expanded and formed to meet a variety of sewage treatment standards. The engineering application of three-year long-term operation had been carried out to validate that the outlet effect had been stably
satisfied the class B demands of Discharge standard of pollutants for municipal wastewater treatment plant (GB18918-2002). Finally, further technology optimization and improvement direction had been pointed out. Suggestions were given to the real-time monitoring and remote control of the processing facilities by means of information technology.

**Key words:** wastewater in service area; multi-media bio-filter; multi-media ecological wetland; synergistic treatment; plant storage pond; sub-surface percolation

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About the Construction of a System of Green Development of Highway Transportation Industry and Analysis

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Abstract: with the development of science and technology and the progress of the society, as practitioners of the national economic and social development, road transport industry to witness, participate in the social economy high speed development in our country, verified by the highly efficient loss also bring pollution and waste of resources and the environment around us, how to construct a low energy consumption, low pollution, low emission and low cost green low carbon transport system has caused the wide attention of the whole society. The direction of the future development road green, is constructing the system of road transportation in whole life cycle of green development and promotion of new energy, new technology in effective use of road transport industry, new energy, ground source heat pump technology, through the use of LNG, achieve the goal of road transport industry skills to reduce emissions.
Key words: green traffic; Whole life cycle; New energy sources; Energy conservation and emissions reduction

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基于熵权密切值法的交通运输节能减排评价

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摘 要：为更科学地评价交通运输节能减排效果，基于改进密切值法，构建了交通运输节能减排评价体系。对传统密切值法引入信息熵权重，并简化密切值法中数值矩阵规范化过程，将污染物排放和能耗作为负向指标，运力贡献和环境治理作为正向指标，以中国交通运输业2009-2014年数据为基础，利用改进密切值法对各指标进行计算；结果显示2010年节能减排效果最好，2014年最差，该方法继承了传统密切值法不需确定主观参量的优点，并以熵权法确定指标权重，放大了样本差异性；实例表明，评价体系可操作，评价结果客观、可靠。

关键词：交通运输；节能减排；信息熵权重；密切值法

中图分类号：U-9 文献标识码：A

Assessment of Osculating Value Method Based on Entropy Weight to Transportation Energy Conservation and Emission Reduction

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Abstract: In order to assess the energy conservation and emission reduction effectiveness on traffic and transportation, relative evaluation system was constructed based on the improved osculating value method. The paper took the information entropy weight in the traditional theory of osculating value method and simplified the numerical standardization process of the traditional method. Pollutant emission and energy consumption were defined as the negative indexes contribution to transportation
Indexes were calculated with the improved osculating value method. The results in 2010 which show the effect of energy conservation and emission reduction is at the best, while at the worst results were in 2014. The method inherits the traditional method’s advantage which does not need to determine the subjective parameters, and it applies the entropy method to determine the index weight. Therefore, it enlarges the differences of the sample. This example shows that the evaluation system is operational, and the evaluation result is objective and reliable.

**Key words:** transportation industry; energy-saving and emission reduction; entropy weight; osculating value method

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基于随机游走的分类垃圾回收最优路径规划

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摘 要: 分类垃圾回收是逆向物流的重要研究内容, 物流路径越短意味着越少的回收成本。在分类垃圾回收过程中, 通过对垃圾的回收路径进行合并可以共享运输资源从而达到节约成本的作用。本文将垃圾分类回收的路径规划问题建模为多源多目标的路径规划问题, 并给出了路径集合中不含重复边的总长度的优化模型。当网络规模增长到一定程度时, 通过精确计算方法得到模型的最优值几乎是不可能的, 为此提出了基于随机游走的最优路径集合选取算法。该算法通过合并不同路径中的相同边来减小总的路径长度, 与基于Dijkstra算法的最短路径求和算法相比不仅准确性高, 而且具有很高的执行效率。最后通过模拟实验验证了提出的方法的有效性和高效性。

关键词: 物流路径; 优化方法; 随机游走; 网络采样

Random Walk Based Optimization Method for Planning of Logistics Paths in Categorical Waste Recycling

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Abstract: Categorical waste recycling is an important research issue in reverse logistics, and the shorter the logistics paths, the lower cost of recycling. During the process of categorical waste recycling, one can reduce the recycling cost according to sharing transportation by merging recycling paths of waste. In this paper, we transform the problem of path planning during categorical waste recycling into the problem of path planning for multiple sources and targets, and present a total length optimization model that doesn’t contain any edge multiple times in the path set. While the scale of network extends to some degree, it is impossible to calculate the accurate optimal resolution for the
model, so we propose a random walk based optimal choosing algorithm of path set. The proposed algorithm reduces the total path length by merging common edges in different paths, and is more accurate and efficient than the Dijkstra based algorithm for summing up all lengths of the shortest paths. Finally, we validate the effective and efficiency of the proposed algorithm by simulation experiments.

**Key words:** logistics path; optimization method; random walk; network sampling

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Evaluation of Emissions and Fuel Consumption Generated Near Bus Bays and Curbside Bus Stops

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ABSTRACT
Bus stops are important urban public transportation facilities. The objective here is to study the impact of the bus stop on vehicle emissions and fuel consumption. The buses emissions data near bus stops were collected by using a SEMTECH-DS Portable Emission Measurement System (PEMS). And the microscopic simulation were used to estimate the emissions and fuel consumption of the whole fleet. After data processing, the non-parametric tests were used to find whether the type of bus stop had statistically significant impact on vehicle emissions and fuel consumption. The results of PEMS experiment showed that there were no significant differences of four gaseous emissions and fuel consumption of buses generated near two types of bus stops. However, the results of the simulation
showed the gasoline cars were strongly affected by buses near curbside bus stops, where the emissions and fuel consumption of the whole fleet were larger than those generated near bus bays. So it can be concluded that the bus bay performs better than curbside bus stop in this case, when the air quality and fuel consumption were taken into account.

KEYWORDS: emissions, fuel consumption, bus bays, curbside bus stops, PEMS, non-parametric tests
中国共享单车发展特点、问题及对策研究

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摘 要:为了缓解城市交通压力并克服有桩公共自行车系统局限性，更好的解决“最后一公里”出行问题，“智能共享“的共享单车进入中国的各大中城市，本文阐述了中国共享单车发展历程，并厘清共享单车性质。分析了共享单车的特点尤其是较传统有桩公共自行车存在的优势，并说明了共享单车在中国发展过程中所遇到各类问题。提出了加大对共享单车领域监管力度、重视城市慢行交通系统建设、合理宣传引导等建议。

关键词:B+R出行模式; 慢行交通; 最后一公里; 互联网+; 共享单车

Research on the Characteristics, Problems and Countermeasures of Bicycle Development in China

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Abstract:In order to alleviate the urban traffic pressure and overcome the limitations of the public bicycle system, it is better to solve the "last mile" problem. The "intelligent sharing" shared bicycle enters the major cities in China. This paper expounds the development of bicycles in China, and distinguish the nature of shared bicycle. Analyzes the characteristics of the shared bicycle, especially the advantages of the traditional public bike, and illustrates the problems encountered in the development of the shared bicycle in China. Proposed to increase the supervision of the field of shared bicycles, attention to urban slow traffic system construction, reasonable publicity and other recommendations.

Key words:B + R travel mode; slow traffic; last mile; internet+; shared bicycle
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The Study to the Main Way and Political Measure of Promoting Technological Innovation for Traffic Landscape in Jinan

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ABSTRACT

In terms of the conclusion for traffic landscape design in Jinan city, the text discusses the four following main ways: Rely on simulation of traffic landscape, virtual reality technology, energy saving control technology and so on; Take advantage of renewable energy sources; Enlarge the range of landscape materials and select recycled materials; Establish low-carbon transportation mode. It also comes up with the political measures of technological innovation: the SWOT analysis to the development of traffic landscape in Jinan city; build favorable development environment for traffic landscape; energetically cultivate the technical designer with local cultural characteristics. The text explores the main ways and political measures for technological innovation of traffic landscape in Jinan city, identifies and finds valuable natural landscape resources and cultural landscape resources along traffic lines of Jinan city. Remain the ecology landscape and human landscape resources along traffic lines of Jinan city. Set up exemplary project and fine example of basic project for urban traffic landscape, protect traffic landscape resources in Jinan and improve ecological technology ability for environmental construction. Prevent the surrounding environment and landscape of suburb traffic in Jinan city to realize sustainable development. Improve people’s comfort level and thoroughly drive the social economic increasing, which is good for “change ways, adjust structures, keep growth”. It not only can deepen the practical study for traffic environment design, but also promote Jinan into special, livable city with beautiful landscape. It has great significance for the developmental strategy of urban space, which realizes “develop east, go west, control south, extend north and dredge center” in Jinan.

KEY WORDS: technology of traffic landscape, way, political measure
Study of Influence of the Renovation Project in Chengdu Second Rind Road on Atmospheric Particulates

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ABSTRACT

In order to find out the air quality and concentration of atmospheric particulates affected by restructuring project in the Chengdu Second Ring Road, a study is under way. This article first collects
opinions of surrounding residents about influence from renovation project on the environment and their daily lives by distributing questionnaires. Next, it numerically simulates the change rule of atmospheric particulate matter in terms of time and space by applying Gaussian dispersion-deposition model and compartment model. Then, it selects the most optimized scientific scheme through the improved fuzzy analytical hierarchy process (FAHP) to provide model for the future major urban constructions. Finally, the actual emission loads of atmospheric particulates reduced after adopting our schemes are analyzed and worked out based on related articles. According to the study, it can be concluded that the concentration of atmospheric particulates increased rapidly in central Chengdu city during the renovation project in the Second Ring Road, making it the main reason for the worse air quality in Chengdu during March 2012 and March 2013. Taking related measures on energy saving and emission reduction can effectively reduce the concentration of atmospheric particulate matter and at the same time coordinate the relationship among economic construction, environmental protection and social development.

**Keywords:** Road, Atmospheric particulates, Gaussian dispersion-deposition model, Compartment model, Improved FAHP.
信号交叉口直行行驶工况特性研究

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摘 要：行驶工况对于计算、评估交通系统能耗和排放具有重要意义。本文对行驶工况的研究方法进行总结，并基于马尔科夫过程的原理，对信号交叉口直行车行驶工况进行解析和构建。为了更好地展现工况数据与空间位置对应关系，本文采用空间序列取代非序列时间，进行空间行驶工况的构建，构建工况表现出优良的空间跟踪性。在此基础上，以分段插值的方式，构建基于关键点的状态转移矩阵，工况构建结果表现也令人满意。

关键词：空间行驶工况；马尔科夫过程；工况构建方法

中图分类号：U238

Study on Through Vehicle Driving Cycle at Signalized Intersection

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Abstract: Driving circle weights much for energy consumption and emission of transportation system. In this paper, we summarize study methods about driving cycle, and conduct our study based on Markov process. To illustrate the correspondence between observed data and road environment, we choose spatial sequence instead of traditional time sequence to study and conduct driving circle. The results shows well enough to track spatial driving cycle. Based on the driving cycle construction, we provide a model of state transition as well as key points by piecewise interpolation method. The results also shows well.

key words: spatial driving cycle; Markov process; driving circle construction
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中小城市公交专用道实施效果评价及启示——以湖州为例

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摘 要: 公共交通在中小城市城镇化、现代化和机动化进程中发挥着不可替代的作用。本文以湖州市为例，通过比较公交行程速度、客运量等变化，分析了湖州市应用公交专用道的实际效果，提出了进一步完善公交专用道网络和公交线网的具体意见，并对中小城市更好地利用公交专用道，优化公交线网提供了参考。

关键词: 公交专用道；效果评价；建设启示

Study on Evaluation of Bus Lane for Medium and Small Cities: A Case Study of Huzhou

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Abstract: Public transport plays an irreplaceable role in process of urbanization, modernization and mechanization in medium and small cities. Taking Huzhou in Zhejiang province as an example, this paper analyzes implementation effect of bus lane by comparing buses travel speed and passenger demand. Then the authors give specific suggestions on improving the network of bus lane and optimizing urban public transit network. It provides helpful references for medium and small cities in better use of bus lane and more targeted in public transportation network optimization.

key words: Bus Lane; Effect Evaluation; Construction Enlightenments

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基于政策工具箱的中小城市绿色出行发展策略研究——以湖州市为例

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摘 要：伴随着城镇化进程的加速推进，中小城市的交通问题日益突出，从经济社会可持续发展的角度考虑，需要大力推进绿色出行。较之于大城市，中小城市的绿色出行有其自身特点，需要有针对性地提出系统化发展策略。以湖州市为例，从多个角度确立了其绿色出行总体定位，基于国内外先进经验，从促进步行、自行车、公共交通发展和促进车辆合乘、引导小汽车合理发展五个方面，构建了适用于中小城市的绿色出行政策工具箱，此基础上剖析了湖州市绿色出行的主要问题，并给出了对策建议。本文的研究将为中小城市推进绿色出行提供重要参考。

关键词：中小城市；绿色出行；发展策略

中图分类号：U121

Development Strategies of Green Travel in Medium and Small Cities Based on Policy Instruments: Taking Huzhou as an Example

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Abstract: With the accelerating process of the urbanization, traffic problems have become increasingly severe in medium and small cities. Considering the sustainable development of economic society, we should devote major efforts to promote green travel. Compared with large cities, the green travel in medium and small cities has its own characteristics, which requires corresponding systematic development strategies. Taking Huzhou as an example, the paper builds the overall positioning of green travel in many respects at first. Then, the policy instruments of green travel including promoting
walking, promoting riding, promoting public transport, promoting carpooling and developing private cars rationally, which apply medium and small cities are established based on advanced experience both here and abroad. On this basis, main problems of green travel in Huzhou are dissected, and corresponding countermeasures are proposed. This study will provide important references for promoting green travel in medium and small cities.

**key words**: medium and small cities; green travel; development strategies

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互联网专车营运模式的四方博弈分析

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摘 要: 为了研究互联网专车这一新兴服务行业的合理运营模式, 本文构建了互联网专车营运涉及的管理者 (专车营运政策制定者)、专车平台、乘客和传统出租车企业四方博弈模型, 并以广州市为研究对像进行了实地调研, 综合调研获取的网约车用户数据和出租车相关运营数据, 利用博弈模型对互联网专车几种营运模式中博弈过程与结果进行分析。结论显示采用“允许私家车运营+只允许预约（不可巡游）”的营运模式可以获得较好的社会综合福利, 研究结果可以为互联网专车管理策略研究提供参考和依据。

关键词: 互联网专车; 四方博弈; 营运模式; 出租车

The Four-sided Game Model for Management Modes of the Online Car-hailing System

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Abstract: This paper proposes a four-sided game model for management modes of the online car-hailing industry to develop reasonable management policies for this emerging industry. The proposed model considers the benefits of traffic administrators (the policy maker of the online car-hailing management), the online car-hailing industry, passengers and the traditional taxi industry. Guangzhou is taken as an example to illustrate the application of the model based on data from a survey on the online car-hailing industry and the operational data of the taxi industry. Both the game process and several management modes were analyzed through the game model. The conclusion is that “permission for private cars operation+ only permission for reservation (prohibition for cruising)” is the most appropriate management mode since it can not only achieve a better social welfare. Findings from this paper can
provide references for the policy making on online car-hailing management.

**Key words**: online car-hailing; four-sided game; management mode; taxi.

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Investigation of Fine Particulate Matter in term of Number Concentration at Urban Traffic Intersection in Hong Kong

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ABSTRACT

Fine particulate matter at urban intersection is originated from a variety of sources and influenced by plenty of meteorological conditions. The various behavior of it is dependent on many factors. The goal of this study was to identify the originality and influencing factors on fine particulate matter at urban traffic intersection. The experiment was carried out in various seasons in Hong Kong and the number concentration of fine particles larger than $0.3 \mu m$ were collected. Based on the measurements database, correlations between the number concentration of particles in different sizes, traffic volume and meteorological conditions such as temperature, humidity and wind speed were analyzed using the principal component analysis (PCA) method. The results indicate that the number concentration of particles in the range of $0.5 - 4.99 \mu m$ has a strong positive relation with traffic volume, especially diesel vehicles, implying that particles within this range are mainly emitted by diesel vehicles. PCA analyses also reveal that the number concentration of particles above $5 \mu m$ negatively relate to wind speed, which agrees with results of cross-correlation analysis and the corresponding scatter plots. It can be inferred that particles in this size range are predominantly influenced by the
wind factor. These findings are useful and significant for decision-making for reducing PM2.5 in meso-to mega-cities.

KEYWORDS: Fine particulate matter; Principal component analysis; Vehicle emission; Number concentration
轨道交通对都市圈旅游发展影响研究述评

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摘 要：旅游业是国民经济的战略性支柱产业，都市圈是旅游创新发展的战略平台，轨道交通是都市圈旅游发展的重要媒介，新型轨道交通是现代旅游业发展的重大机遇。国内外对轨道交通在都市圈旅游发展中的影响和效应的研究是要集中在中长轨道交通的都市圈外围的旅游要素组织研究、区域内轨道交通对都市圈内部空间结构的构建研究、城市内部轨道交通的旅游者效应研究等方面。对轨道交通的都市圈旅游发展效应研究的综述，有利于认识轨道交通对社会经济尤其是旅游业发展的推动作用，对都市圈有针对性地加强轨道交通规划与旅游业发展规划的结合具有重要的实践指导性。

关键词：轨道交通；都市圈；旅游；研究述评

中图分类号：F530.1

Review of Research on Tourism Development Effect of Metropolitan Area of Rail Transit

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Abstract: Tourism is a strategic pillar industry of national economy, metropolitan area is a strategic platform for tourism innovation and development, rail transit is an important medium of metropolitan tourism development, new rail transit is a great opportunity for the development of modern tourism. Domestic and international research on the influence and effect of rail transit in the development of metropolitan tourism is to focus on studying on the organization of tourism elements in peripheral of metropolitan area of medium and long rail transit, studying on the construction of regional rail transit
to inner spatial structure of metropolitan area, studying on the tourist effect of urban internal rail transit and other aspects. A review of research on tourism development effect of metropolitan area of rail transit, is conducive to understanding the role of rail transit in the development of social economy, especially tourism, has important practical guidance for targeting to strengthen the combination of rail transit planning and tourism development planning in metropolitan area.

**Key words:** rail transit; metropolitan; tourism; research review

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基于Veins的IEEE 802.11p性能仿真分析

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摘 要: 作为一种典型的VANETs（Vehicular Ad-hoc Networks）通信协议，IEEE 802.11p采用为低移动性网络设计的DCF作为基本传输机制，因此需要针对IEEE 802.11p协议对于节点具有高速移动性的VANETs通信场景的适应性进行评估分析。首先基于测试评估的需求，构建了一种典型的VANETs通信场景；其次，考虑VANETs网络特点设定了场景中的信道模型和通信流量模型；然后，基于Veins平台搭建了仿真环境，并对仿真参数进行了配置；最后，以端到端延迟、丢包率和吞吐量作为评价标准，在Veins平台上仿真研究了传输频率、车流密度、车辆速度对IEEE 802.11p网络性能的影响。仿真结果表明，网络因素和移动性因素共同影响IEEE 802.11p的延迟性和可靠性；高传输频率不利于提高IEEE 802.11p的网络性能；车辆速度对于基于IEEE 802.11p性能影响较大，而车流密度对其性能影响较小，并且在低速情况下，车流密度对IEEE 802.11p性能无显著影响。

关键词: 车辆自组织网络、IEEE 802.11p（协议）、传输频率、车流密度、车辆速度

Performance Evaluation for IEEE 802.11p Based on Veins

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Abstract: As a typical communication technology for VANETs, IEEE 802.11p uses DCF as the basic transport mechanism, which is designed for low-mobility networks. Therefore, it's hard to know whether IEEE 802.11p protocol could be applied into high-speed mobile networks, such as IEEE 802.11p, effectively. Based on above considerations we have made these researches and them as follows. Firstly,
a typical communication scenario for VANETs was constructed based on the requirement of test and evaluation. Secondly, we built the channel model and traffic flow model based on the characteristics of VANETs. Thirdly, we built a simulation environment based on Veins platform and configured the simulation parameters. Finally, we taken end to end delay, packet loss rate and throughput as the evaluation criteria and studied the effects of transmission frequency, traffic density and vehicle speed on the performance of IEEE 802.11p on the Veins platform. The results show that network factors and mobility impact the delay and reliability of IEEE 802.11p. High transmission frequency do not help to improve the performance of IEEE 802.11p. Speed has a great influence on performance of the IEEE 802.11p, while traffic density has little impacts. Traffic density has no significant effect on networks performance of IEEE 802.11p in low speed environment.

**Key words:** Vehicular Ad-hoc Networks, IEEE 802.11p, Transmission frequency, Traffic density, Speed
Research on the Standardized Cold Container System Which Based on One Vehicle with Multi-temperature Control

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ABSTRACT

This paper analyzes the current transportation requirement and product quality assurance among cold chain logistics industry, it proposes the idea of drop and pull transportation based on one vehicle with multi-temperature control, namely standard cold container system. It further elaborates the advantages of standard cold container system, which improves the transportation efficiency while cutting down the costs greatly at the same time.

KEYWORDS: cold chain logistics, standardized cold container, drop and pull transport
基于车联网环境的驾驶员反应时间研究

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摘 要：为探究车联网环境下驾驶员反应时间规律，搭建车车互联平台进行实车跟驰试验，基于高斯混合模型分析了车联网环境跟驰状态下驾驶员反应时间特征。通过对传统和车联网环境驾驶员反应时间实测数据拟合分布模型对比，验证了车联网环境高斯混合模型优于正态分布和对数正态分布模型，并进一步对车联网环境道路基本通行能力修正应用。研究结果表明：车联网环境下①简单反应时间缩短7.94%，复杂反应时间缩短25.79%，单车道基本通行能力提升15.39%；②驾驶员反应时间总体标准差降低32.99%，分布更为集中；③速度对反应时间的影响不显著。

关键词：智能交通；车联网；高斯混合模型；反应时间；基本通行能力

Research on Driver Reaction Time in an Internet of Vehicles Environment

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Abstract: To explore the characteristics of driver reaction time in an Internet of Vehicles (IOV) environment, a vehicle-to-vehicle platform was established to perform real-world driving tests. The characteristics of the following driver’s reaction time in an IOV were analyzed based on a Gaussian Mixture Model (GMM). By comparing fitted distribution models of the reaction times with the actual testing data in both traditional and networked vehicle environments, it was found that the GMM was superior to the normal distribution model and lognormal model in the IOV environment. The
simple reaction time was reduced by 7.94%, the complex reaction time was reduced by 25.79%, and single lane basic traffic capacity was improved by 15.39% in the IOV environment. Furthermore, the population standard deviation of the driver’s reaction time was reduced by 32.99% and grew more concentrated. The effects of speed on reaction time were not significant in the IOV environment.

**Keywords:** intelligent transportation; IOV; Gaussian Mixture Model; reaction time; basic traffic capacity.

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Research on the Intelligent Vehicle-cargo Matching Problem of Non-vehicle Operation Carriers

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ABSTRACT

With the development of non-vehicle operation carrier logistics mode, non-vehicle operation carriers begin to expand their target market from the business to the customer, however, the market of customers can’t follow the vehicle fleets transportation mode of business’ market because of their demand characteristics of scattered and fragmented. The paper puts forward the integrated mode of “carload+carpooling”, which is aimed at coping the fragmented transportation demand of the cargo by using the idle vehicle, the matching of the vehicle and transportation demand can be realized through the information integration and processing of the Internet platform; And the mathematical model is established to select the effective transportation routes and realize the intelligent vehicle-cargo matching in order to achieve the purpose of reducing the social logistics cost, improving the logistics efficiency and increasing the customers’ satisfaction degree. Finally, a case study is given to prove the usability of the "carload+carpool" model based on the intelligent matching of the vehicle and the
cargo.

**KEYWORDS**: non-vehicle operation carrier; the vehicle-cargo matching; "carload+carpool" model; fragmented transportation demand; the idle vehicle
基于智能车路协同技术的应用业务通信需求分析综述

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摘 要: 在车辆应用和互联网技术领域, 车辆与车辆、车辆与道路基础设施之间, 利用新一代无线通信网络广阔的传输范围的目的是为了提高交通安全性、机动性和节能环保。本文阐述了国内外智能车路协同（V2X）发展现状及应用分类, 总结和分析了智能车路协同应用在DSRC和LTE-V两大主流通信技术的通信需求, 为我国智能车路协同系统频率划分提供了重要参考依据。

关键词: 车路协同, 专用短程通信, LTE-V

中图分类号: U491.2+5 文献标识码: A

Survey Band Analysis of Service Communication Requirements Based on Intelligent Vehicle Infrastructure Cooperative Technology

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Abstract: The field of vehicular applications and inter-networking technologies with its radio-based direct vehicle-to-vehicle and vehicle-to-infrastructure communication strives to harness the power of ubiquitous communication for the sake of traffic safety, transport efficiency and energy conservation and environmental protection. This paper expatiates Intelligent Vehicular- Infrastructure Cooperation Systems and the classification at home and abroad. The survey and summarization of communication requirements for DSRC and LTE-V can offer valuable references for V2X frequency allocation in China.
Key words: V2X, DSRC, LTE-V

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A Hybrid Approach for Variable Speed Limit Implementation under Mixed Traffic Conditions with Autonomous Vehicles

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ABSTRACT

Variable speed limits (VSL) has a potential to improve mobility and safety of motorway through harmonization of traffic flow. However, the success of VSL is highly dependent on drivers’ compliance to the displayed speed limits. Emerging technologies in the field of autonomous vehicles (AVs) is likely to revolutionize the way VSL will be operated in the near future. VSL can be integrated with AVs where AVs will automatically obey the displayed speed limits. Nevertheless, a more appealing scenario where all of vehicles are equipped with advanced automation technologies is seen as a long-term goal. At the initial stage of deployment, AVs will coexist with manually driven vehicles on motorways. This paper explores ways to implement VSL under a mixed traffic condition where AVs and manually driven vehicles coexist in the traffic stream. A hybrid approach combining particle swarm optimization (PSO) with proportional-integrated-derivative (PID) is proposed to improve VSL implementation under a range of mixed traffic conditions. Case studies with different penetration rates of AVs demonstrated the potential of the proposed approach for use in a future system.
Traffic Flow Simulation of Different Traffic Density in Tunnel Section

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ABSTRACT
A modified cellular automata model is established to study the characteristics and the spatial evolution mechanism of the traffic flow on a special section of the expressway such as expressway tunnel. Based on the model, the nucleation and dissolution of the traffic flow under different traffic density is simulated. It is found that the stop-and-go phenomenon becomes much more evident with the increase of the traffic density. The time takes by traffic nucleation to dissolution on high-speed lanes is less than that takes on the slow-speed lanes, and the visual blind are resulting from the drivers’ adaptation to luminosity at the entrance of a tunnel can apparently decrease the capacity of traffic flow at an expressway. The results of this study can serve as the theoretical basis and references for the decision makers to optimize the distribution of the road resource.

KEYWORDS: cellular automata model; expressway; traffic flow; tunnel section;
A Non-contact Dynamic Measurement Method for Vehicle Emergency Braking Stability

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ABSTRACT

Braking performance plays a vital role for the safety in vehicle operation, so the measurement of braking performance is very important. In this paper, an automatic measurement method for braking performance measurement using binocular stereo vision is proposed in order to obtain the vehicle’s braking trajectory and other performance characteristics in real time. Firstly, this paper describes the principles of stereo vision in the context of measuring vehicle braking performance. Then, it focuses on image processing algorithm for stereo vision and the 3D reconstruction algorithm. Finally, the reliability of the measurement system is verified through multiple sets of real vehicle experiments on different car models. The results show that the proposed vehicle braking performance measurement system can perform automated and non-contact measurements. The detection system presented in this paper has good detection accuracy and repeatability, and its detection time is short, so it can meet the needs of vehicle online testing.

KEYWORDS: braking performance, stereo vision, non-contact method, dynamic measurement, vehicle detection
Pre-Trip Information Impact on Trip Chain Based Choice Behaviour

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ABSTRACT

Behavioural impacts of Information and Communication Technologies (ICT) has been largely discussed in recent years. Research topics ranges from route switching to departure time choices, covering almost the whole process of activities. However, most of the existing studies are limited in the trip-based perspective. How ICT influences travel decisions in the aspect of activity has not been fully discussed. This paper aims at investigating the impact of pre-trip information on trip chain generation behavior, including choices of trip chain complexity and travel mode. A binary logit model which is capable of accommodating information environment itself and multiple information contents simultaneously is proposed. Moreover, taking the properties of hierarchy and continuity into account, a mixed model combining rule-based algorithm and probability is established to describe the trip chain travel mode choice behavior. In addition, an RP/SP fusion survey is conducted in Chengdu for model calibration and validation. The result suggests the more information a traveler obtains, the less interest in generating a complex trip chain performs. Also, some specific information contents, especially weather, reveal significant influences. When informed that the weather condition will turn to bad, the probability of generating a complex trip chain will have a 24% decrease. It illustrates the potential of using the ATIS system as an effective way in addressing traffic demand management. Besides, trip related attributes and individual factors like activity patterns and private car possessions are also fully discussed in this paper.

KEYWORDS: Behavioral impacts of information, Trip chain, Activity pattern, Trip chain complexity, Mode choice.
基于车头时距的公交相对优先感应控制建模与仿真

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摘 要：公交优先策略是交通管理环节体现以人为本的重要方面，合理采用信号交叉口公共交通优先通行技术方法能够减少公交车在交叉口的延误。参考美国交通信号控制手册（TSC）给定最大允许车头时距的值，对比公交专用进口道上检测的公交车头时距与最大允许车头时距的关系，判断是否给予公交车优先通行权，提出了基于车头时距信息的绿灯需求时间的计算方法。根据公交车到达停车线不同时刻，运用绿灯延长、红灯早断、相位插入等方法构建公交相对优先控制策略。利用VISSIM仿真得到传统感应控制与本文控制方法的公交车和社会车辆的车均延误、人均延误等指标。仿真结果表明相比于传统感应控制，本文提出的相对优先控制策略能有效提高公交车的通行效率。

关键词：公交优先；相对优先；车头时距；绿灯延长时间；VISSIM

中图分类号：U238

Modeling and Simulation of Relative Transit Priority Control Based on Headway

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Abstract: Bus priority strategy is an important aspect of traffic management, that embodies the human-centered concept, reasonable use of public traffic signal intersection priority technology and methods can reduce the delay of the buses at the intersection. The Maximum allowable headway is given according to the United States traffic signal control manual (TSC), by comparing the detected headways and the maximum allowable headway, to determine whether to give priority to the buses, a method for calculating green time extension based on headways is proposed. According to the
current phase when the buses arrive at the parking lot to use the method of green extension, red light early break, phase insertion to construct the relative priority control strategy. Through the VISSIM simulation, get the average delay per vehicle and average delay per person of the traditional actuated control and the relative priority control of the bus and other vehicles. The simulation results show that compared with the traditional actuated control, the relative priority control strategy proposed in this paper can effectively improve the efficiency of buses.

**Keywords:** bus priority; relative priority; headway; green time extension; VISSIM

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中国公众对无人驾驶汽车的态度

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摘 要：通过心理测量方式，调查中国公众对高度自动驾驶（Highly Automated Driving，HAD）和完全自动驾驶（Fully Automated Driving，FAD）的总体态度。共有效采集269份HAD问卷和278份FAD问卷。研究发现，受试者对高度自动驾驶和完全自动驾驶均持有相对中性态度，并且两者总体看法无显著差异。大约有50%受试者不确定是否应该允许或禁止高度和完全自动驾驶汽车上路。相比之下，曾经听说过高度和完全自动驾驶汽车的受试者对总体看法更为积极。另外，男性受试者对自动驾驶汽车的总体看法更为积极。

关键词：无人驾驶；高度自动驾驶；完全自动驾驶；公众态度；风险感知

Chinese Public Attitudes towards Autonomous Driving Vehicles

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Abstract: We surveyed Chinese public’s general attitudes towards highly automated driving (HAD) and fully automated driving (FAD) vehicles using psychometric techniques. We collected a total of 269 valid HAD samples and 278 valid FAD samples. It is found that the respondents had neutral attitudes towards HAD and FAD and their attitudes did not differ in HAD and FAD. Approximately 50% respondents were not sure whether HAD and FAD vehicles should be promoted or prevented on the road. Those respondents heard of HAD/FAD before the survey held more positive attitudes. Male respondents held more positive attitudes.

key words: autonomous driving; highly automated driving; fully automated driving; public attitudes;
risk perception

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Platoon Control for Connected Vehicles Based on the V2X Communications: Design and Implementation

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ABSTRACT
This study proposes a platoon control for connected vehicles under the realistic vehicle-to-vehicle/vehicle-to-infrastructure (V2X) communications. In particular, a two-level framework including
the vehicle merging and diverging is designed for the platoon control. Then, the corresponding field experiments are implemented according to the designed framework. To this end, the dedicated short range communication (DSRC) is used to facilitate the communication links. And on-board units (OBUs) and roadside units (RSUs) are developed for information exchange (i.e., position, speed and direction). In addition, the IEEE 802.11p is chosen as the protocol of DSRC. Results from the experiments validate the effectiveness of the proposed method in terms of the position trajectories and speed.

KEYWORDS: Platoon control, Connected vehicles, OBU, RSU, V2X communications, DSRC.
车车通信环境下的多车协同定位算法研究

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摘要：为解决低成本全球导航卫星系统（GNSS）定位精度不高以及信号遮挡情况下定位失效等问题，提出了一种车车通信环境下的多车协同定位算法。对于车车通信网络下的复杂信息状况，分析目标车辆周围的车辆信息环境（节点数、距离、精度等）对定位算法的影响，提出了一种邻车节点优选策略。对比分析多车协同定位、自车组合导航定位与单独使用GNSS三种方法的定位误差，仿真结果表明多车协同定位算法的定位性能优于自车组合导航定位和单独使用GNSS，提升了定位精度与稳定性，同时发现协同车辆信息的节点数和精度对于协同定位算法的结果是最有影响的，而协同车辆与目标车辆之间的位置远近对协同定位结果没有明显影响。

关键词：全球导航卫星系统；车车通信网络；协同定位；信息筛选策略

中图分类号：U495

Research on Vehicular Cooperate Positioning Algorithm in V2V Ad-hoc Networks

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Abstract: Aiming at solving the problem of gross accuracy and signal blockage of low-cost global navigation satellites system (GNSS), a vehicular cooperate positioning algorithm in V2V ad-hoc was proposed. For vehicular complex information status, a selection strategy for neighborhood vehicle nodes was designed according to the neighborhood vehicular information situation (in particular, distance and information...
accuracy). The performance of the proposed cooperate positioning method was contrasted with that of integrated navigation positioning method and GNSS single point positioning method, and the location error using these three methods was studied. The simulation results show that the precision of proposed cooperate positioning method is better than that of conventional integrated navigation and GNSS-alone mode. The amount of cooperate vehicles and information accuracy of neighborhood cooperate vehicle have a lot of influence on the proposed positioning method, whereas the distance of vehicles has no significant influence.

**key words:** global navigation satellite system; V2V ad-hoc; cooperate positioning; information selection strategy

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基于IIDM和NDO的智能网联汽车反步跟驰控制律设计

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摘 要: 基于固定安全间距或固定安全时距设计车辆自适应跟驰控制器, 难以有效保证安全性和舒适性的问题, 且不确定动力学参数严重影响跟驰车队的稳定性。为此充分利用改进的智能驾驶人模型 (IIDM) 对跟驰行为中车辆安全性和舒适性的考虑, 将IIDM 输出的加速度作为跟驰控制器需要跟踪的期望加速度, 再采用反步法设计智能网联汽车的跟驰控制律。为了确保跟驰车队对跟驰车辆参数不确定扰动的鲁棒性, 通过设计非线性干扰观测器 (NDO) 实现对集总不确定的估计, 并通过控制器补偿, 抵消不确定对跟驰队列的不良影响。仿真分析表明, 所提智能网联汽车跟驰控制律可实现平稳跟驰。

关键词: 智能网联汽车; 改进的智能驾驶人模型; 非线性干扰观测器; 跟驰控制; 反步法

中图分类号: U491

A Car-following Back Stepping Controller for Connected Autonomous Vehicle Based on IIDM and NDO

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Abstract: The car-following controller, designed based on constant vehicular gap or constant time headway, can not hold the driving safety and comfort performances effectively. At the same time, the uncertainty of the dynamics parameters threatens the string stability of the vehicle platoon. To make full use of the improved intelligent drivers’ model (IIDM) to take driving safety and comfort of the car following behavior into account, we regard the acceleration outputted by IIDM as the desired acceleration for the car-following controller needing to track. Then the car-following controller for
connected autonomous vehicle (CAV) is designed by backstepping. To ensure the robustness of the vehicle platoon against the uncertainties of the vehicle parameters, the nonlinear disturbance observers (NDO) are presented to estimate the lumped uncertainties, and then the uncertainties are counteracted by controller compensation. Simulation results show that the proposed car following control law for the connected autonomous vehicle can achieve stable and smooth car-following performance.

**key words:** Connected automated vehicle; Improved intelligent driver model (I IDM); Nonlinear disturbance observer; Car-following control; Backstepping

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