Having been attracting extensive attention of worldwide experts and professionals, transportation plays a vital role in the development of the global economy. The transportation industry is developing extremely fast with the establishment and improvement of the ITS theory, large-scale constructions of high-speed railways and the development of urban public transport, as well as the formation of Integrated Transportation System, the application of theories on Transportation and Socio-Economic Development and the progress achieved in the domain of Modern Logistics. The themes above have also become important issues in today’s transportation research field.

As the pace of globalization has accelerated, the transportation industry and its related scientific research, technological innovations and management concepts, are inseparable from international exchanges and cooperation. Therefore, the Sixth International Conference on Transportation Engineering (ICTE 2019) provides a great platform for worldwide experts and scholars in the field of transportation, to share their findings and exchange their ideas.

The International Conference on Transportation Engineering (ICTE), which involves various forefront issues in the field of transportation engineering, has obtained significant success and very good responses. It has become a “high standard, high level and great influence” conference in the field of international traffic and transportation.

The School of Transportation and Logistics of Southwest Jiaotong University (SWJTU) has hosted the first five ICTEs in Chengdu in 2007, 2009, 2011, 2013 and 2015 respectively. More than 500 experts and scholars from all over the world attended these conferences and over 1900 conference papers have been indexed via the EI Compendex. Having promoted academic exchanges, theoretical innovation and scientific/technical development in the field of transportation engineering, the success of ICTEs has far-reaching socio-economical significance.

The Sixth International Conference on Transportation Engineering (ICTE 2019) is held in September 20-22, 2019. The motto of "ICTE 2019" is "The Belt and Road, Connection, Shared Mobility, Green and Intelligence". It is a platform of communication and discussions for worldwide experts and scholars in the field of transportation engineering. Their 127 peer-reviewed papers involve topics as follows:

1. Integrated Transportation System under the Belt and Road;
2. Smart Mobility and Shared Transportation;
3. Intelligent and Connected Transportation System Theory and Applications;
4. Transportation Planning and Resource Allocation;
5. Traffic Control and Information Technology;
6. Transportation and Socio-Economic Development;
7. Transportation Security, Environmental Protection and Sustainable Development;
8. Urban Rail Transit Network Operations Technology;
9. High-speed Railway Operation Organization and Operation Safety;
10. Modern Logistics and Supply Chain Management;
11. Road and Railway Engineering;
12. Green Transportation and Low-Carbon Transportation;
13. Transportation Big Data Application Technology;
14. Transportation Organization Optimization Theory and Method;
15. Heavy Haul Transportation Organization Technology;
16. Transportation Equipment Performance Analysis and Reliability;
17. Railway Engineering Structure and Safety Technology;
18. Disaster Assessment and Control Technology;
International Conference on
Transportation Engineering 2019

ABSTRACTS OF THE SIXTH INTERNATIONAL CONFERENCE

September 20-22, 2019
Southwest Jiaotong University
Chengdu, China

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National Engineering Laboratory of Integrated Transportation Big Data Application Technology

Editors-in-Chief:
LIU Xiaobo
PENG Qiyuan
Kelvin C.P. Wang
Preface

The Sixth International Conference 2019 of China on Transportation Engineering is held at the Sheraton Chengdu Lido Hotel of Sichuan, China. The motif is “The Belt and Road, Connection, Shared Mobility, Green and Intelligence”.

We are fortunate to have Southwest Jiaotong University (SWJTU, Chengdu, China) to host the Sixth International Conference (ICTE 2019) of China on Transportation Engineering. Transportation and Development Institute (T&DI) of the American Society of Civil Engineers (ASCE) is a key sponsor of the conference and ASCE is the publisher of the conference proceedings. SWJTU, formerly known as Tangshan Jiaotong University, is renowned for its prestigious engineering programs in various transportation related disciplines, dating back to 1896.

China has embarked a massive construction program of a high-speed rail network that will not only change the landscape of passenger transportation in China, but also impact how the world would react to the changing needs of rapid and long-distance travel of people and freight. New technologies in planning, design, construction, operation, and management are needed for the new high-speed rail network and many other modes of transportation. It is hoped that this conference would be helpful in various existing and new endeavors.

All papers in the proceedings were peer-reviewed. The conference received more than 700 abstracts. After initial reviews and subsequent invitations for papers, 385 full papers were received. Through a peer-review process that lasted several months, about 127 papers were selected for publication. The School of Transportation and Logistics of SWJTU provided various support for the conference, including soliciting abstracts and papers, organizing sessions and presentations, and managing the peer-review process.

There were a number of volunteers who reviewed the submitted papers. The conference and the editors appreciate their valuable work. The editors thank their important contributions to the conference. The diligent work by members of the Secretariat in organizing the vast number of papers is critical for the publisher to meet the deadlines.

Lastly, we would like to particularly thank ASCE T&DI Director and staff of ASCE publications for their support of this conference.

We also would like to express our gratitude to all authors for contributing their research papers to the conference.

We expect that the conference will enhance friendships, further strengthen cooperation and communications in the future, and promote the advancements and developments of transportation science and technology in the world.

We sincerely hope that you would enjoy the splendid western scenery of China.

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A SCHEDULING OPTIMIZATION MODEL OF BIKE SHARING CONSIDERING THE RECYCLING OF FAULTY BIKES

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Abstract: After several rounds of financing and such an extensive development model like excessive delivery and the reshuffle between enterprises, bike-sharing companies in China would surely step into an operating mode with appropriate scale and effective operation. In such an operating mode, the reasonable and timely scheduling in combination with demand, as well as the recycling of faulty bicycles, would be an important issue in terms of costs and benefits for company. Based on this situation, combined with the time-space changes of the demand of bike-sharing in one day and the actual demand at service point, it is considered to arrange scheduling work of bike sharing in the limit time, and at the same time, the faulty bicycles within a certain area are recycled, repaired and re-delivered. Therefore, in this paper, we established a scheduling optimization model with time windows and with the objective function of minimizing the total cost which includes scheduling cost, recycling cost, and loss cost. Then, the ant colony algorithm is used to solve the model established. Finally, a certain area is selected as an example to verify the usefulness of model.

Key words: Bike Sharing, Recycling of Faulty Bikes, Scheduling Optimization Model; Ant Colony Algorithm

NON-CAR OPERATING CARRIER MODEL BASED ON "INTERNET+"

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Abstract: At present, all kinds of resources in China's road freight market are relatively scattered, and the market entities are small and scattered. Under the traditional freight organization mode, the problems of low freight organization efficiency and high vehicle no-load rate are common. Non-Car Operating Carrier in the context of "Internet +" as a new mode of freight organization, is of great significance to solve the problem of freight market, improve the efficiency of freight organization, and promote the transformation and upgrading of China's road freight market. In this paper the business organization process and operational architecture of the Non-Car Operating Carrier model based on "Internet +" will be studied to provides reference for the development of Non-Car Operating Carriers.

Key words: Internet+, Non-Car Operating Carrier, business organization process, operational architecture
THE INTEGRATION OF PUBLIC BICYCLE AND METRO TRANSIT: A CASE STUDY IN SUZHOU, CHINA

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Abstract: Metro transit is a modern mode of transport that is effective in relieving the traffic load on the urban transport infrastructure, thus reducing traffic congestion. However, one notable disadvantage associated with metro transport lies in its heavy reliance on access and egress. In contrast, public bicycle (docked and dockless) is regarded as a promising supplementary mode to metro. There is very limited research focusing on individual decision over transfer between public bicycle and metro. This study makes contribution to growing literature on the integration of public bicycle and metro by conducting investigation into transfer choice preferences at a trip level. The decision process is researched using Multinomial Logit model and Nested Logit model where the utility is affected by individual attributes (such as age and gender), trip attributes (such as trip distance), bicycle infrastructure variables and land use as well as built environment attributes. The proposed quantitative analysis is conducted by using citizen card data from which the record of transfer between metro and docked public bicycle can be derive between March to July 2017. Then the results of model estimation are discussed, the findings of which are valuable for the design of policies aimed at improving the integration of metro and public bicycle to enhance metro ridership. Besides, they are conducive to planning the bicycle availability and re-balancing operations at bicycle stations.

Key words: Metro transit, public bicycle, Multinomial Logit model, Nested Logit model, transfer, land use, built environment, bicycle infrastructure.

A VEHICLE ROUTE CHOICE METHOD BASED ON UNCERTAIN MULTI-ATTRIBUTE DECISION MAKING

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Abstract: A vehicle route choice method based on uncertain multiple attribute decision making is put forward in the paper, aiming at solving such a problem that travelers have to take the following path indexes into account when they select an optimal route: travel time, travel fee and the degree of congestion, etc. Owing to the indefinite characteristics of the values of some indexes, the utility function cannot precisely interpret such a problem by arithmetic expression. Through the weighting and normative approach of three kinds of index values: real number, interval number or fuzzy number in the decision matrix, positive and negative ideal points are set up. According to the rule that traveler’s selected route should be near to the positive ideal point and far away from the negative one, the optimal route is picked out according to the value of the comparative closeness. In the end, the rationality and validity of the algorithm are proved by an example.

Key words: uncertain multi-attribute decision making, route choice, decision matrix, ideal point, the optimal path
THRESHOLD DIVISION OF URBAN ROAD NETWORK TRAFFIC STATE BASED ON MACROSCOPIC FUNDAMENTAL DIAGRAM AND K-MEANS CLUSTERING

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Abstract: In order to identify the real-time traffic state of the regional road network effectively, this paper proposes a method to determine the thresholds of the selected index corresponding to different traffic states, which combines the Macroscopic Fundamental Diagram (MFD) of the road network with the K-means clustering. Firstly, in order to facilitate real-time control of regional traffic, the number of accumulated vehicles inside the road network is selected as the discriminant index, and the cluster K value is determined according to the data characteristics of MFD and related specifications. Then select the K-means algorithm to cluster the MFD scatter plots to get the range of indicators corresponding to each traffic state. The case study shows that the method can quickly identify the macroscopic traffic state of the road network according to the number of internal vehicles in the road network. Moreover, the difference between the threshold of the indicator obtained by clustering the MFD and the threshold obtained according to the speed of the road network is within 10 veh, which proves the effectiveness of the method. In addition, by comparing and analyzing the index thresholds identified under different control methods, the application value of this method in the evaluation of traffic measures is illustrated.

Key words: traffic engineering, urban road network, traffic state, clustering, Macroscopic Fundamental Diagram

EQUILIBRIUM ANALYSIS OF SUPPLY AND DEMAND OF SELF-DRIVING PARKING SPACES IN TOURIST SCENIC SPOTS BASED ON BERTH SHARING

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Abstract: In recent years, there are many parking spaces of various scenic spots at the peak period of tourism in short supply, which makes the parking problem of scenic spots more serious. For this problem, this paper introduces berth sharing strategy into berth regulation of scenic spots from the perspective of resource sharing. Considering the sharing of berths between the scenic spot and surrounding buildings, this paper establishes a supply-demand balance regulation model of parking spaces in the scenic spot during the peak period of tourism, so as to provide a safe and reliable parking environment for self-driving tourists at the peak period of the scenic spot. Finally, the paper takes the scenic spots of Dujiangyan as an example and uses the model to regulate and control the berths of Dujiangyan scenic spots during the golden week of the Spring Festival in 2019 to meet the parking demand of self-driving tourists in the scenic spot during the peak period of tourism.

Key words: tourist attractions, self-driving tour, demand forecasting, berth sharing
QUANTITATIVE DETERMINATION METHOD FOR TRAFFIC ANALYSIS ZONE GENERATION AND ATTRACTION POINTS

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Abstract: With the goal to improve the accuracy of traffic assignment without increasing the additional workload of data collection and data processing, a quantitative method to determine traffic analysis zone generation and attraction points is proposed based on clustering analysis and land use data, including Area of Interest, the number of households in residential community and building storey data. Taking the morning rush hour as traffic analysis time period, multi-source urban land use data were collected using web data crawling technology. To obtain traffic generation and attraction points with traffic activity intensity weights, clustering analysis was conducted on residential and non-residential land which could reflect the regularity of traffic demand distribution in traffic analysis zone. Then, automatic subdivision of traffic analysis zone was realized by distributing traffic demand to its generation and attraction points based on traffic activity intensity weights. The results from the practice show that there exists obvious regional aggregation and the clustering results of residential and non-residential land are generally inconsistent; by replacing the original 332 centroids of traffic analysis zone with 665 traffic generation points and 606 traffic attraction points determined by this method, the proportion of intra-zone motor trips, which are not assigned to the road network, decreases from 3.55% to zero, and the relative error of sampling sections’ forecasting results decrease by 15.99% and 9.36% in peak value and average value respectively. It is shown that traffic generation and attraction points quantitative method can improve the accuracy of traffic assignment while maintaining the existing traffic analysis zone division.

Key words: traffic engineering, quantitative method for generation and attraction points, clustering analysis, traffic analysis zone, multi-source land use data, traffic assignment, TranStar

COMMUNITY BUS ROUTE PLANNING BASED ON METRO SHORT-RANGE TRIPS ANALYSIS

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Abstract: As the last part of urban public transport, community bus serves for the last part of trips. Aimed to share the pressure of high-flow-density metro section and provide short-walk-distance server for remote districts that away from metro stations, this paper analyzed the time/space distribution of trips that travel short than 4 sections in the metro net based on metro AFC data (Nanjing) on weekdays/weekends/vacations. Result shows that the time/space distribution varies different among different type of days. Based on the analysis, this paper raised a Heuristic route plan method for community bus that aimed to replace the metros. Using metro data and minimize the sum of travel time cost and operating cost, method finally get the route/station/gap of community bus, and the real data of Nanjing is applied to the method. The research results of this paper will provide important method support for the construction of urban public transport.

Key words: community bus, metro data, heuristic algorithm
REVERSED TRAFFIC ASSIGNMENT FOR STAGGERED SHIFTS WITH USER EQUILIBRIUM

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Abstract: Staggered shifts are a common traffic demand management, aiming to relieve traffic congestion in peak hour. They move part of traffic demand to a later period, and lead to the original equilibrium state of the system disappearing. Staggered commuters will adjust their home departure time with consideration of renewed work start time and renewed perception or experience of road traffic volume, and some commuters with a relatively late work start time may encounter a more crowded network so they will choose an earlier home departure time, with the final consequence that the system reaches a new equilibrium state. To study the effect of a giving staggered shifts policy on system and commuting behavior, this paper firstly introduces reversed traffic assignment (RTA), then proofs the dual relationship between RTA and forward traffic assignment with user equilibrium, and finally proposes a RTA based model to obtain the transformation of time-varying system state and the commuters’ departure time with consideration of before and after staggered shifts implementation. A numerical test illustrates the model and shows the model can derive the above results with acceptable accuracy. In addition, this study can provide traffic administrations with method to evaluate a giving staggered shifts policy for better management.

Key words: Staggered Shifts, Reversed traffic assignment, User equilibrium

COMPREHENSIVE TRANSPORTATION CORRIDOR LAYOUT OF URBAN AGGLOMERATION BASED ON IMPROVED ANT COLONY ALGORITHM

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Abstract: The comprehensive transportation corridor layout of urban agglomeration affects the operation of various modes of transportation and the exertion of their comparative advantages and comprehensive benefits. In order to give full play to the role of agglomeration and diffusion of transportation corridor, reduce transport cost and meet the needs for close internal and external connection, the generation method of comprehensive transportation corridor in urban agglomeration was studied. After influence factors and nodes analysis, a transportation corridor layout algorithm based on ant colony search is designed and implemented with the importance degree of links as the basic heuristic condition. The probability of next node selection in searching is not only determined by the pheromone and the connection importance to adjacent nodes, but also the guidance of the terminal node. An example shows that the application of the method is effective, which is conducive to the construction of perfect and reasonable layout structure of comprehensive transportation corridor in urban agglomeration.

Key words: urban agglomeration, comprehensive transportation corridor, layout optimization, ant colony algorithm
COORDINATED PASSENGER FLOW CONTROL AND BUS CONNECTION SETTING DURING PEAK HOUR OF URBAN RAIL TRANSIT

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Abstract: In order to alleviate urban rail traffic congestion during peak hour and balance the percentage of stranded passengers in different stations, this paper proposed a multi-station passenger flow control model for the rail transit station. The model takes maximum interval transport capacity and shortest passenger delay time as objectives, and takes the passenger flow demand, train capacity, interval passage capacity and platform capacity as constraints, to solve optimal passenger flow control stations, control time and control intensity. In order to reduce passenger overflow caused by the passenger control in rail transit station, an evaluation method of the bus connecting is proposed from the perspective of connecting travel time and passenger demand. Taking passenger flow data in the morning rush hour of Nanjing metro line 1 as an object, the collaborative control of passenger flow in multiple stations and the analysis of bus connecting routes were conducted. The results show that passenger flow control can effectively improve utilization rates of passenger flow in each section, balance passenger retention in each station, and put forward a new idea of multi-mode public transport coordination for the improvement of passenger travel satisfaction.

Key words: urban rail transit, passenger flow coordinated control, multi-mode public transport, multi-objective linear planning urban rail transit

INTERACTION AND APPLICATION OF BIM TECHNOLOGY IN URBAN RAIL TRANSIT DESIGN PHASE

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Abstract: Building Information Modeling (BIM) is considered to be the core technology for the intelligent cities in China. At present, most construction projects only use BIM technology for installation projects in China, and few use BIM technology for urban rail transit projects. By using the most mainstream BIM software in China as the research tool, combining the BIM usage criteria in China, this research finds that the main reason why BIM technology can not be used in urban rail transit system maturely is that under the current technical conditions, it is almost impossible to complete the perfect interaction among the three-dimensional models. Lack of a more mature BIM management platform; and through comparative with the successful application of BIM cases in construction projects, technical improvements are provided to maximize the integration and sharing of all information in the design phase model, and the direction of optimization is put forward.

Key words: BIM technology, urban rail transit, interaction, application
FUNCTIONAL LAYOUT PLANNING OF SMALL TOWNS WITH LOGISTICS BASED ON IMPROVED SLP (SYSTEMATIC LAYOUT PLANNING) AND GENETIC ALGORITHM

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Abstract: The connotation of ‘industry connection, green sustainability, supply chain integration and occupation accommodation’ put forward higher requirements for planning and construction of logistics features small towns in the new era. Compare the example of logistics park or logistics agglomeration area which based on the single function with logistics, the small towns also increase the functions of urban transportation system and residential living (include leisure and entertainment areas). According to the relevant requirement of ‘pushing reduce logistics cost and improve efficiency’ which is issued by Ministry of Transportation and National Development and Reform Commission, as well as, the public pay more attention to green environment protection, the layout of logistics functional area can help to achieve the dual goals of logistics costs and green environmental protection.

Based on the existing academic researches, at the beginning, the article consider the transportation system, residential community, upstream industry cluster and other factors to have effect on the layout of logistics function. Using it as the analysis and construct comprehensive relationship network which combined the virtual function unit and physical function unit. Next, modify the artificial layout adjustment method in SLP as well as, make the minimum of logistics cost and environment pollution as the comprehensive goals. Lead into the solution of Genetic Algorithm to optimize and reasonable layout scheme. Last, application of those theories to a logistics small town to analyses the functional area layout and proof the scientific nature of this method is verified.

Key words: Logistics characteristics of small towns, functional area layout, improved SLP, genetic algorithm, virtual functional area

PROSPECT THEORY’S APPLICATION IN ROUTE CHOICE PROBLEM

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Abstract: Route choice is the basic and crucial link of passenger assignment procedure. Uncertainty such as travel time variability caused by at capacity operation or demand variation of metro networks during peak period are gaining attention in solving the route choice problem. Prospect Theory is suitable for uncertain situations by taking the decision maker’s psychological response and risk attitudes into consideration. The application of Prospect Theory in route choice problems under uncertainty are elaborated to manifest the status quo of the utilization of the theory and the future research direction

Key words: route choice, uncertainty, prospect theory
A NEW HYBRID EVALUATION METHOD IN RAILWAY HUB PLANNING

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Abstract: Reasonable evaluation method is very important to the scientific decision-making of railway hub planning (LI Bing, 2006). In this paper, the principle of the Scatter-degree model is introduced, and the existing problems in solving the model are pointed out. The necessity of incorporating the decision-maker's subjective consciousness into a single objective weighting method is discussed, and a new operator that characterizes subjective consciousness is added to the model. Aiming at the uncertainty of the Heiser matrix in the problem and the strong global optimization ability of the genetic algorithm, a hybrid evaluation Method of Genetic Algorithms (GA) and subjective-objective Scatter-degree Method is proposed. This method makes full use of subjective information and is not limited by the state matrix. Finally, the evaluation method is applied to the scheme evaluation of a new high-speed railway leading into the hub. The evaluation results are consistent with the actual selection scheme, which shows that the method is scientific and reliable, and can be popularized and applied in the evaluation of hub planning scheme.

Key words: GA, scatter-degree method, determining weight subjectively and objectively, railway hub planning

SELECTION OF INTRODUCTION SCHEMES FOR GUANZHONG INTERCITY RAILWAY NETWORK BASED ON COMPLEX NETWORK

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Abstract: Intercity Railway is the backbone passenger transport mode which serve the adjacent cities, when choosing the introducing scheme between intercity railway network and the urban traffic network, the differences in network structure and function of the comprehensive traffic network which consist of the intercity railway network and internal traffic network should be taken into consideration. According to the complex network theory, the 4 first-level indicators are determined as network structure, network robustness, network vulnerability and network transfer efficiency, and the corresponding second-level indicators are determined as well. The corresponding index values are calculated according to the SpaceL and SpaceP models of the alternative schemes. The comprehensive evaluation of the alternative schemes is completed by using the AHP. The comprehensive weight of scheme I is 0.6251, and that of scheme II is 0.3749. It is determined that scheme I is the best scheme. The result is the same as the actual planning conclusion, which proves the reliability of the evaluation.

Key words: complex network, comprehensive traffic network, Guanzhong intercity railroad, scheme comparison, AHP
SYNCHRONIZATION ANALYSIS OF COUPLED NETWORK SYSTEMS WITH MULTI-WEIGHTS LYAPUNOV FUNCTIONS IN TRAFFIC FLOW NETWORKS

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Abstract: A variety of scholars have developed the properties of traffic flow jams, while most of the researches are limited to the basic assumption of the operating independently for vehicles. In this paper, coupled with the interactive impacts from the surrounding vehicles, the multiple traffic flow model is presented with the aid of neural networks. Through the application of the graph theory and multi-weighted Lyapunov functions, the authors analyze the vehicle synchronized system, and verify the stability condition for the hybrid system. It is proved that the weighted Lyapunov functions are feasible to assess the stability evaluation of the hybrid systems. Also, the expansion of the previous methods is carried out. This work provides a stability guidance of the coupled network system which can be applied in the reality test of the unconstructed and constructed coupled traffic system.

Key words: synchronization analysis, coupled systems, weighted Lyapunov functions, traffic flow networks

ANALYSIS OF COMPETITIVE PUBLIC TRANSPORT ADJUSTMENT STRATEGY BASED ON MULTI-ALTERNATIVE DECISION FIELD THEORY

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Abstract: Aiming at the problem of excessive competition between urban rail transit and the parallel conventional bus, this paper, from the perspective of travelers, establishes a decision-making behavior analysis model of competitive public transport modes based on multi-alternative decision filed theory (MDFT). Selecting the competitive transit modes between the two campuses of Southwest Jiaotong University as experimental scenario, this paper analyzes the decision-making process of travelers and the selected probability of each scheme by means of computer simulation. The results illustrate that MDFT theory and model can reasonably reflect the decision-making process of the traveler and effectively calculate the selected probability of each scheme, which confirms the validity of the model. Then, the model is applied to analyze the real decision-making case that travelers make a choice from rail transit and the parallel conventional bus. According to the analysis of simulation results, some adjustment strategies are proposed for competitive rail transit and conventional buses. Eventually, the adjustment strategies can be verified to coordinate the rail transit and the conventional bus properly, and improve the efficiency of the public transportation system.

Key words: urban traffic, adjustment strategies, MDFT, competitive public transport modes
APPLICATION OF HIERARCHICAL CLUSTERING BASED ON PRINCIPAL COMPONENT ANALYSIS TO RAILWAY STATION CLASSIFICATION

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Abstract: Railway station classification is an effective way to simplify train timetable planning under the condition of railway network. In this paper, a classification method framework of railway station is proposed, which combines principal component analysis with hierarchical clustering. Firstly, considering that there are many attribute indicators and some indicators may be correlated, a new set of indicators is obtained by using principal component analysis to aggregate and reduce the dimension of attribute indicators of railway station. Secondly, a hierarchical clustering method is used to cluster the reduced data set of new station attributes, and the result of station classification is obtained. Finally, taking Beijing-Shanghai high-speed railway as an example, this method is compared with the direct clustering method. The results show that the hierarchical clustering based on principal component analysis is better than the direct clustering method.

Key words: railway station classification, principal component analysis, hierarchical clustering, Beijing-Shanghai high-speed railway

THE SCALE OF THE URBAN FUNCTIONS DEVELOPMENT OF THE INTEGRATED PASSENGER TRANSPORT HUB

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Abstract: The urban functional scale of railway integrated passenger transport hub (Hereinafter referred to as the urban functional scale) , related to the capability of diversified operations of the hub and the coordinated development with city, is an important issue in the current development. This paper establishes the urban function scale calculation model by calculating the attraction intensity of each business to passengers, considering the existing commercial scale model and introducing the factor of the residual capacity of traffic and volume rate of city. the nonlinear scheme model is calculated by LINGO, obtaining a reasonable range of functional development scale and providing reference for the urban functions development.

Key words: integrated passenger transport hub, Urban Functions, scale, residual capacity of traffic, LINGO
OPTIMIZATION OF MUNICIPAL TRANSPORTATION STRUCTURE BASED ON COLLABORATIVE SERVICE—TAKE SERVING THE PASSENGER FLOW OF TRUNK RAIL LINE AS AN EXAMPLE

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Abstract: The collaboration of transportation modes is the inevitable direction for the development of transportation system under the current comprehensive transportation system. Guiding the collaborative development of municipal transportation system is a necessary way to solve municipal transportation problems. The efficient assignment of line passenger flow in railway hub requires the collaboration service of various modes of the municipal transportation system. Each mode has different service characteristics in the process of serving passenger flow and occupies a corresponding proportion. The analysis shows that the arrival passengers’ choices of the municipal transportation mode are mainly influenced by the travel cost, travel time, transfer time and coverage rate. This paper analyzes the relationship between municipal transportation structure and collaborative service based on collaborative service of municipal transportation system. Aiming at minimizing the deviation of the ideal and actual utilization rate of effective supply in a single mode, the objective function of overall utilization rate of municipal transportation system is constructed, and the municipal transportation collaborative service model is established. According to the variables solved by the model, the generation mechanism of optimization strategy of municipal transportation structure based on optimizing transportation service characteristic index is analyzed, and the municipal transportation structure optimization strategy aiming at collaborative service is proposed.

Key word: collaborative services, municipal transportation, structure optimization, sharing rate
Traffic Control and Information Technology
THEORETICAL CONCEPT AND METHOD SYSTEM OF TRAFFIC CONGESTION CONTROL OF URBAN ROAD NETWORK WITH INTELLIGENT TRANSPORTATION SYSTEMS

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Abstract: As the intelligent transportation system constructions at home are increasingly perfect, the originally open network system of urban road traffic is gradually changed into a virtual closed controlled network, in which the traffic processes and states can be detected, measured and controlled. But the traditional open system idea based theories about the balance between supply and demand of urban traffic system, as well as the corresponding congestion control theories and methods, are difficult to match effectively with current field applications. How to identify urban traffic network equilibrium principle under the condition of intelligent transportation systems and set up the corresponding theory and method of congestion control becomes the crucial issues for modern urban traffic management and smart city construction. This paper summarizes the development states of intelligent traffic management and control system in Chinese cities, put forwards the theoretical concept for traffic congestion control of urban road network with Intelligent Transportation Systems, which establishes a virtual closed spatio-temporal system by the “data perimeter or boundary” expressed as the discrete detection points of traffic flow-in-and-out data in the range of controlled urban road network, implements pinning control mixed with active control in combination with Macroscopic Fundamental Diagram (MFD) theory and the perimeter and boundary flow control methods, based on the regional traffic controllability. And the technical route and method system to realize this theoretical concept is further designed.

Key words: traffic engineering, urban road network, congestion control, system analysis, traffic control

INTELLIGENT NETWORK BOUNDARY DIVISION BASED ON K-MEANS AND DBSCAN CLUSTERING FEATURES

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Abstract: The modeling and control of converged networks has received extensive attention in recent years. The division of road network boundary is one of the most important steps in urban traffic control. The traditional division method is mainly based on administrative region and several division principles. Based on the idea of cluster analysis and the spatial topology characteristics of road segments in the road network, we analyzed the effects and the applicability of K-means algorithm and DBSCAN algorithm on road network boundary division. Converging road network traffic density and traffic flow and compare the preliminary segmentation, to obtain the final road network segmentation results. We select two road network division indicators to evaluate the effect of two division methods on road network boundary division. The results show that the classification coefficients of the two types of algorithms are 0.0042, 0.0056. The K-means algorithm is used to determine the boundary of the road network based to the density. The variance indicators before and after the adjustment are 0.7476 and 0.7442 respectively, so the overall variance is reduced. Therefore, the road network segmentation after the boundary adjustment is better. Compared with the DBSCAN partitioning method, the K-means algorithm refine and obtain better road network segmentation results.

Keywords: road network division, K-means, DBSCAN, spatial topology, boundary adjustment
APPLICATION AND PROSPECT OF NEW TECHNOLOGY IN INLAND WATERWAY REGULATION

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Abstract: With the development of economy and society, the demand for inland river transportation is increasing. A large number of waterways is restricted by natural conditions and other factors. It is becoming more and more difficult to build a high-grade waterway. How to make full use of the limited waterway resources and improve comprehensive service capacity has become an important subject of inland waterway transportation. Based on the current situation and business scope of waterway regulation, this paper summarizes the requirements of waterway regulation. It also designs an intelligent waterway management system according to analyzing the applications of intelligent sensor, Internet of Things, big data, cloud computing, artificial intelligence, wireless communication in waterway management. This intelligent system can provide navigation security services including waterway maintenance, hydro meteorological, route planning, dynamic monitoring, automatic collision avoidance supporting, rescue service and traffic flow management. It will bring a new form of modern shipping with more efficient production, more scientific management, more flexible and transparent service, and stronger guarantee. In the future, the application of waterway should gradually adapt to the development of economy and society. Finally, it will achieve the goal of the overall perception of shipping elements, the comprehensive sharing of shipping information, the comprehensive intelligence of shipping production, the comprehensive wisdom of shipping management and the high quality of shipping service.

Keyword: Waterway regulation, intelligent waterway management system, a new form of modern shipping

ESTIMATING TRAVEL TIME OF A ROAD BOTTLENECK USING BUS PROBE DATA: TOYOTA CITY, JAPAN

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Abstract: This paper utilizes low-frequency bus probe data to estimate the travel time of a road bottleneck. The probe data collected from one bus route in six months in Toyota City, Japan are used for empirical analysis. To investigate the impact of commuting behavior of Toyota Motor Corporation (TMC) which has more than 25,800 workers in Toyota, the Gaussian mixture distribution is applied to fit four groups of bus travel time referring to the combination of working, non-working days of TMC and peak, off-peak periods on weekdays. The major findings indicate that: 1) Gaussian mixture distributions applied for peak and off-peak periods in non-working days of TMC have a bimodal feature; 2) the Gaussian mixture distribution outperforms the Gaussian distribution for the 4 categorized groups, which is indicated by a higher value of the decimal logarithm of likelihood with respect to sample data.

Keywords: travel time, road bottleneck, bus location system, Gaussian mixture distribution
FREEWAY TRAFFIC CONTROL IN THE PRESENCE OF CAPACITY DROP

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Abstract: Capacity drop at congested freeway bottlenecks is well known with a lot of field observations. This paper addresses coordinated ramp metering and mainstream traffic flow control (MTFC) on freeways with capacity drop. The two control measures were first checked with respect to active bottlenecks with capacity drop. It was illustrated that the significance and usefulness of the control measures are very much justified by the presence of capacity drop in field. Coordinated ramp metering, MTFC, and their integration were formulated in an optimal control framework. It was demonstrated via macroscopic simulation studies that an appropriate usage of the control measures can effectively prevent the activation of potential bottlenecks on freeways and hence avoid capacity drop there.

Key words: coordinated ramp metering, mainstream traffic flow control, variable speed limits, bottlenecks, capacity drop, macroscopic traffic flow modeling

QUANTITATIVE COMPARISON BETWEEN LEADING GREEN AND CONVENTIONAL SETTING OF PEDESTRIAN CROSSING SIGNAL CONTROL AT INTERSECTIONS

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Abstract: The key to ensure the orderly operation of urban traffic is to realize the precise and reasonable signal control of cross-street pedestrians. In this paper, the effects of leading green and conventional setting signal control mode on pedestrian crossing efficiency are analyzed using the time-space diagram, in view of the actual pedestrian crossing demand under different traffic organization modes at signalized intersections. According to the pedestrian's arrival and departure time at the crosswalk and central safety island, the delay models of pedestrian crossing under different traffic organization and signal control conditions are derived, and the capacity constraint relations of pedestrian twice-cross safety island are developed. The results of example analysis demonstrates that the pedestrian delay models proposed in this paper can accurately calculate the pedestrian crossing delay corresponding to different traffic organization and signal control conditions. Compared with the conventional signal control mode, the average delay optimization effect of the leading green setting is more obvious for pedestrian once crossing, partial twice crossing and complete twice crossing. Moreover, it is more advantageous to improve the service level of pedestrian's waiting area by adopting partial twice crossing traffic organization mode, under the condition of restricted capacity of twice-cross safety island, whereas it is relatively difficult to ensure the waiting comfort of central safety island by adopting complete twice crossing traffic organization mode.

Key words: pedestrian crossing, leading green setting, time-space diagram, delay model, traffic organization
DIFFICULTIES AND SOLUTIONS FOR THE TRAFFIC ARRANGEMENT AND MANAGEMENT DURING INTERNATIONAL SPORTS EVENTS

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Abstract: Many cities in China have successfully held lots of large-scale international events. The scale of the international competitions was large, as a result these cities had to meet the great challenges of municipal traffic transportation. Although in the past years, these cities have made great progress and improvement in their own infrastructure construction, there are still existing difficulties in the municipal traffic arrangement and management during the international sports events. There are solutions to remove the problems such as promoting traffic management, controlling through the application of high technology and raising the quality of service etc. It is necessary to strengthen the construction of traffic infrastructure, to constantly improve personnel’s quality, to constantly improve the investment in science and technology, to improve the quality of service, ensure a smooth and successful the international sports event, and create a good image of the city.

Key words: sports events, traffic, difficulties and solutions

SIGNAL BLOCK LAYOUT SYSTEM FOR HIGH-SPEED RAILWAY

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Abstract: Signal block layout is very important for the operation efficiency and safety of high-speed railway. In this paper, signal block layout system for high-speed railway was designed based on the principle of train traction calculation and train operation control. In order to introduce the system more completely, some key issues are discussed such as automatic train traction calculation, train headway calculation and automatic signal block layout. This system could provide a reasonable layout plan for railway signal block design, and be benefit for line capacity and train operation optimization.

Key words: high-speed railway, signal block layout, train traction calculation, system design
PRICING ANALYSIS OF PARKING CONGESTION BASED ON THE PARKING CITY MODEL

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Abstract: On-street parking facility is widely established as a means to alleviate urban parking problems. Meanwhile, the urban traffic congestion problem is more common. If the on-street parking users pay for the traffic congestion costs caused by parking, this will reduce social costs while meeting parking needs of on-street parking user. This also has a certain effect on alleviating urban traffic congestion. This paper calculated the total congestion cost caused by on-street parking which is generated by each traveler in the Parking City Model, and pricing the on-street parking charges based on congestion costs. The research shows the calculation method about how to calculate the optimal on-street parking price when aiming at get the minimum travel cost of urban residents, and finally present a model result.

Key words: congestion pricing, Parking City Model, on-street parking pricing

TIME HEADWAY DISTRIBUTION IN URBAN EXPRESSWAY MERGING SECTION CONSIDERING VELOCITY DIVISION

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Abstract: Time headway is an important parameter in traffic flow theory and plays an essential role in many fields of traffic engineering. Based on the traffic flow data of the inner lane, the kerb lane and the acceleration lane in the merging section of the second ring urban expressway in Chengdu, this paper proposes to divide the time headway into several ranges by using the interval velocity of vehicles. The log-normal model, the exponentially modified Gaussian model, the non-central F-distribution model, and the Generalized extreme value model are used to fit the time headway of three lanes in each velocity range, and K-S test is used to determine the goodness-of-fit for each model. Finally, the division scheme of the velocity range is discussed, and it is found that reasonable adjustment for the velocity range division can improve the fitting effect of the model for the time headway.

Key words: time headway, merging section, K-S test, urban expressway
HALO EFFECTS OF AUTOMATED SPEED ENFORCEMENT: A LITERATURE REVIEW

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Abstract: With the increasing evidences of halo effects regarding Automated Speed Enforcement (ASE), an empirical review is conducted to analyze the findings of previous literatures. 24 studies are filtered to evaluate the three types of halo effects. The current paper finds that the typical existence of distance halo is associated with fixed cameras, while spillover effect and time halo are related to mobile cameras. There are limited literatures to investigate relative contributors, although factors such as ASE type, visibility, warnings, roads and vehicles are proved to be related to characteristics of various halo effects. Moreover, this review reveals the essence of halo effects, which represented three dimensions of enforcement impact (two spatial dimensions and one temporal dimension). This paper also provides a potential repeated enforcement assumption to explain the time halo. Limitations of the existing studies have been discussed.

Key words: halo effect, automated speed enforcement, speed, distance halo, kangaroo jump, time halo, spillover effect

MODEL PREDICTIVE CONTROL FOR PUBLIC TRANSPORT TRANSFER SYNCHRONIZATION

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Abstract: This work proposes a model predictive control (MPC)-based optimization framework for public transport (PT) transfer synchronization. The MPC scheme is based on a transfer-based distributed control architecture using vehicle-to-vehicle communication. A library of operational tactics serves as the basis of a sequential decision-making process in improving PT transfer synchronization. The optimal operational tactics are determined at each decision epoch within a receding horizon control framework. It is anticipated that the MPC scheme can help significantly improve the actual occurrence of synchronized transfers in PT networks.

Key words: public transport, transfer synchronization, model predictive control
A REVIEW OF THE SPEEDING INTERVENTION EFFECTIVENESS AND ACCEPTANCE OF INTELLIGENT SPEED ADAPTATION

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Abstract: This study introduced the anti-speeding effectiveness of ISA as well as acceptance from 2010 to 2019, which followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. Based on the selection criteria, four key items were searched from six databases and 26 studies were selected. It is reported that researches in the past ten years has been tending to study the effect of ISA on speeding intervention in special users. Factors impacting effectiveness were also be discussed and all three types of ISA are related to road speed limit. In respect with acceptance, the acceptance of ISA is still unknown, nevertheless, the literatures from recent ten years in terms of acceptance factors are more comprehensive. Future researches need to explored the defect of ISA using as well as the shortage of ISA research, including the actual acceptance of ISA.

Key words: Intelligent speed adaptation, ISA, acceptance, anti-speeding effect, factors
Transportation and Socio-Economic Development
“WISDOM+SHARING” : AN ANALYSIS OF THE INNOVATIVE PATH OF SICHUAN-TIBET RAILWAY READING PROMOTION SERVICE

WANG Yang and SHI Jinli

Abstract: As a popular means of transportation, railways have a large consumer base. China's high-speed railway is an important part of the “The Belt And Road initiative”. The second “heaven road” under construction—the Sichuan-Tibet Railway will contribute to national unity, cultural exchange and border consolidation in the new era and help Sichuan Province and the people of the Tibet Autonomous Region get rid of poverty, embarking on the "fast track." The article will explore the Sichuan-Tibet Railway reading promotion service to help further develop the "high-speed rail reading" culture and establish a flowing cultural courier station, strengthening cultural exchange among nations.

Key words: wisdom sharing, Sichuan-Tibet Railway, reading promotion, innovative path

A CLUSTERING METHOD FOR ANALYZING TRANSPORTATION AGGLOMERATIONS

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Abstract: With the emergence of urban agglomerations and the rapid development of population and economy, the transportation efficiency of urban agglomerations must be improved. Transportation integration of urban agglomerations is an efficient mode that can not only play the role of government macro-control, but also effectively integrate and allocate transportation resources. Taking the comprehensive transportation of Beijing-Tianjin-Hebei as the research object, aiming at relieving the dense traffic in the center city and maximizing the transportation efficiency, the traffic integration model of Beijing-Tianjin-Hebei is constructed based on clustering to realize the accessibility of passenger travel.

Key words: urban agglomeration, integrated transport system, cluster, traffic integration
ANALYSIS OF INFLUENCING FACTORS OF INTERCITY PASSENGER RESIDENCE TIME BASED ON SURVIVAL ANALYSIS THEORY

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Abstract: The residence time of intercity passengers is an important factor affecting the frequency of intercity railway departures, and it also reflects the service level of stations to a certain extent. However, due to the unique statistical properties and complexity of the residence time, the censored and non-negative in the data processing process frequently appear, which causes scholars to encounter bottlenecks when studying the problem in depth. Based on this, this paper considers the advantages of biomathematics in dealing with such data. It is proposed to introduce a parametric survival analysis model in biology to study the factors affecting passenger residence time and establish a passenger residence time evaluation system to determine the weight of each impact factor. At the same time, with the help of SPSS, the method of survival analysis Cox semi-parametric model is used to test the model parameters. The test results show that the model fits well. In the course of the research, this paper considers a number of characteristic variables related to passengers. The results show that the degree of influence of the transfer tool, the purpose of the trip and the source of the cost on the passenger's residence time increases one by one. Moreover, the income level, age and education level of passengers also have a certain degree of influence on the residence time of passengers. At the end of the paper, the significance of the research results on station management decision-making is analyzed separately.

Key words: passenger's residence time, subsistence analysis, cox semiparametric model, Zheng Jiao intercity railway

INVESTMENT AND FINANCING OF ORDINARY TRUNK HIGHWAY CONSTRUCTION IN SICHUAN PROVINCE

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Abstract: Firstly, the paper clarifies the current situation and problems of investment and financing of trunk highway construction in Sichuan Province. The deep-seated causes of investment and financing problems are analyzed. On this basis, This paper puts forward a series of countermeasures and suggestions, such as optimizing the construction objectives of trunk highways in ordinary provinces, promoting the matching of financial and administrative rights, innovating investment and financing modes, establishing provincial transportation development funds, actively guiding social funds to enter, and improving management system. Establish a systematic, scientific, standardized and effective investment and financing system and mechanism. To provide reliable financial guarantee for the completion of the construction objectives of trunk highways.

Keywords: Sichuan Province, ordinary trunk highway, investment and financing

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PROPOSALS ON THE DEVELOPMENT OF URBAN AND RURAL TRANSPORTATION INTEGRATION IN SICHUAN PROVINCE UNDER THE BACKGROUND OF THE RURAL REVITALIZATION STRATEGY

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Abstract: Based on the rural revitalization strategy, the requirements of the "four-merit rural roads" and the actual situation in Sichuan province, this paper proposes the basic principles, goals and key tasks of urban and rural transportation integration. It also constructs the index system to measure the level of urban and rural transportation integration and puts forward some suggestions. This research is helpful to upgrade the basic public service level of urban and rural transportation, eliminate the differences and achieve balanced development gradually between urban and rural areas.

Key words: rural revitalization strategy, urban and rural transportation, integration

KEY POINTS AND COUNTERMEASURES OF COMPREHENSIVE TRANSPORTATION PLANNING IN THE NEW PERIOD

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Abstract: Transportation planning is an important part of economic and social development planning, but also a key link in the spatial planning system. Traffic planning has been carried out for many years in China. Planning has effectively guided all levels of traffic construction, especially in the process of building transportation infrastructure network. With the initial stage of independent development of transportation from various modes, it has entered a new stage characterized by coordination, convergence and service. The compilation of comprehensive transportation planning has gradually increased to implement General Secretary Xi Jinping's directive spirit on comprehensive transportation planning, which is better under the background of building a strong transportation country. It is necessary to analyze the situation and requirements of the new era and put forward countermeasures and suggestions and implementation paths according to the problems and shortcomings of the current planning work.

Key words: comprehensive transportation, transportation planning, key countermeasures
BENEFITS ANALYSIS OF URBAN-RURAL JOINT DISTRIBUTION

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Abstract: Joint distribution is the main development trend of urban and rural logistics distribution. In view of the lack of quantitative calculation and evaluation of the benefits of joint distribution between urban and rural areas, this paper defines the benefits as changes in the distribution indicators caused by the changes of distribution routes before and after joint distribution, and takes vehicle mileage, vehicle loading rate, distribution time and distribution cost as the benefit indicators to construct the benefit calculation model. Finally, a case study is illustrated to calculate and evaluate the benefits of joint distribution by using the calculation model.

Key words: urban-rural joint distribution, distribution benefits, benefits calculation model

RAILWAY FREIGHT DYNAMIC PRICING METHOD BASED ON SYSTEM DYNAMICS

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Abstract: In order to make railway freight transport enterprises better adapt to freight rate reform and improve their competitiveness in the transportation market, it is necessary to establish a dynamic pricing method reasonably. This paper first analyzes the internal and external factors affecting the freight rate of railway freight and the advantages, disadvantages and applicability of the existing pricing theory methods. Then, because of the complex nonlinear feedback characteristics of the railway freight pricing system, system dynamics method is used to analyze and quantify the internal and external factors affecting the freight rate of railway freight and establish the system dynamics model between freight rate and those related factors. Finally, the simulation is carried out by using VENSIM PLE software, and the changes of the railway freight rate with the related factors is calculated by the example. It verifies the validity of the model and its controllability and flexibility.

Key words: railway freight, freight rate, influencing factors, system dynamics model
ANALYSIS AND REVELATION OF DEVELOPMENT OF JAPAN RAILWAY TOURISM

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Abstract: This paper takes the development of Japanese economy and railway as the axis and combs the development history of Japanese railway tourism. On the basis of analyzing its various development stages, this paper summarizes and analyzes the classification and characteristics of Japanese railway tourism products, and discusses the reasons for the success of Japanese railway tourism from the perspectives of traffic connection, comprehensive development, passenger service and international vision. This paper takes the development mode as the starting point, discusses the development experience of railway tourism in Japan, and proposes the enlightenment of the development of China's railway tourism. This paper provides a way and reference for accelerating the development of China's railway tourism and implementing the integration of railway and tourism.

Key words: Japan, railway tourism, development mode, revelation
Transportation Security, Environmental Protection and Sustainable Development
SECURITY ANALYSIS ABOUT SWITCHING EQUIPMENT BASED ON BAYESIAN NETWORKS

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Abstract: With the development of rail transport, the role of Urban Rail Transit is more important in promoting economic development and social progress. Therefore, from the point of view of safety system engineering, it is a very valuable research that we use qualitative and quantitative research methods to evaluate the various factors affecting the Urban Rail Transit safety, to establish appropriate safety measures. By the study of switching Equipment, we will build a Bayesian networks model on switching Equipment in GeNle, and through parameter learning of the Bayesian networks we can do quantitative safety analysis on switching Equipment. Via the safety analysis model of switching Equipment based on Bayesian networks we can not only appropriate security risk quantification calculations point switch, but so analysis and diagnose the main factors which lead to different consequences and posterior probabilities. 

Key words: switching Equipment, Bayesian networks, Safety analysis

ACCIDENT SCENARIO ANALYSIS OF PASSENGER CAR TO POWERED TWO-WHEELER ACCIDENT BASED ON CHINA IN-DEPTH ACCIDENT STUDY

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Abstract: Different from north American and European countries, the national statistical data of China shows that the users of powered two-wheeler (PTW) has accounted 37% of total traffic death and 46.6% injuries in 2017, indicating the PTW user is the most harmed group among various road users in China. Comparison with the occupant and pedestrian protection technology, research on PTW protection methodology was ignored in developing countries. The casualty caused by PTW will leading the board in next few years. The objective of this research was to illustrate the typical pre-crash scenario of passenger car to PTW accidents in China and for the better understanding on the impact configuration and environment overview. 2319 target cases were selected out of 5219 cases from 2011 to 2019 in China In-Depth Accident Study database. Descriptive statistic about the environmental influences, vehicle information, individual characteristics and injury severity was used to interpret the crash events in detail. Based on European Cyclist Accident Testing Scenarios (CATS), the extended version was adapted to classify the 2319 cases into 19 kind of scenarios. Result shows the crossing scenario (PTW from left and right side of passenger car) is the most frequent and harmful scenario which accounted 35.8% for the seriously injured and death accident and 29.1% regardless the injury severity. 25.8% of the accidents are longitudinal scenario (including L1-L6, On1, On2). The proportion of passenger car turning left ((including T3-T5, T9)) is a bit higher than turning right (including T1-T2, T10, T14) with percentage of 24.4% and 18.1% respectively. Comparing with the similar research result in European Union, the crossing scenario is the most frequent type in both two regions. The EU scenario densely distributed on crossing and longitudinal (64%-78% for the seriously injured and killed) while the scenario in China is more like average distributed. After categorizing the accident scenario, PC-CRASH was used to reconstruct the accidents. The reconstruction result shows that 81.3% of PTW initial speed is under 30km/h and 88.6% of passenger car initial speed is under 60km/h. This research could be the guidance for vehicle autonomous emergency braking test scenario as well as PTW user’s protection protocol assessment.

Key words: accident investigation, pre-crash scenario, powered two-wheelers, reconstruction;
QUALITATIVE ANALYSIS OF SAFETY CULTURE CONSTRUCTION SYSTEM IN TRANSPORTATION ENTERPRISES

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**Key words:** transportation, safety, culture, system

**Abstract:** Safety culture is of great significance to the safety management of enterprises, and it is also an important part of the construction of enterprise culture. In transportation enterprises, safety includes three aspects: human life, property and environment. We can define a safety culture of transportation enterprise as a continuum of safety commitments, values, standards of conduct and beliefs shared by the group of employees of a transportation enterprise. Accordingly, the safety culture construction of transportation enterprises can be defined as the process of continuous progress and development of safety culture of transportation enterprises through comprehensive organization and management. This is a behavioral system aimed at improving the safety concept of employees in transport enterprises. The system includes target elements, material elements, personnel elements, environmental factors and management elements. Therefore, the particularity and interaction of the elements that make up the system can be qualitatively analyzed by using the method of system analysis. It can be seen that the construction of safety culture in transportation enterprises has a long way to go.

LOCATION MODEL OF FREEWAY NETWORK EMERGENCY MANAGEMENT STATION UNDER THE COOPERATIVE MANAGEMENT MODE OF FREEWAY ADMINISTRATION AND TRAFFIC POLICE

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**Abstract:** The cooperative management mode of freeway administration and traffic police is a relatively advanced freeway network management mode. In order to ensure the long-term and stable operation of the cooperative management mode of freeway administration and traffic police, this paper studies the location problem of the emergency management station under this mode. In this paper, the demand point is analyzed, and the model of Location Set Covering problem which considers the time limit factor and cost to meet the maximum distance limit is constructed. The shortest path algorithm and the software Lingo are used to solve the model. Finally, the model is applied to HeBei expressway network as an example to verify the feasibility of the location model of expressway network emergency management station under the cooperative management mode of freeway administration and traffic police. The results show that the location model of the emergency management station can provide a reference for the promotion of the cooperative management mode of freeway administration and traffic police in Hebei Province.

**Key words:** the emergency management station, the cooperative of freeway administration and traffic police, the model of Location Set Covering problem
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ANALYSIS OF FACTORS AFFECTING TRAFFIC ACCIDENT SEVERITY BASED ON HETEROSKEDASTICITY ORDINAL LOGIT

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Abstract: In order to identify causational information for accidents, propose preventive countermeasures and reduce the number of accident casualties, statistical models and econometric models are prevalently employed to analyze the historical accident data. However, due to certain factors including the complexity of accident data and the limitations of models, many problems remain to be explored in accident analysis. Based on previous research findings, this study conducted a crash severity analysis by the following steps: the classification of road accident severity, identification of miscellaneous factors (e.g., driver, vehicle, roads, environment, and management), introduction of covariance theory to analyze the interaction effects among factors. Methodologically, this study used the Heteroskedasticity Ordinal Logit (HORL) model to investigate road traffic accident data, which also utilized T test, information criterion test, likelihood ratio test, chi-square test, and pseudo chi-square test to test parameter estimation and model fit. The accident data were sampled from 5023 crash records in the HSIS (Highway Safety Information System) database housed in North Carolina, which verified the statistical methodology employed herein. The research found road accident data has heteroskedasticity, and orthogonalization processing and independent distribution processing can avoid heteroskedasticity. The fixed-variance Logit model has better applicability to this. HORL is specific to the treatment of accident data with variable variance, which can effectively capture factor heterogeneity and tap into more potential latent variables.

Keywords: safety control, traffic accident severity, Heteroskedasticity Ordinal Logit model

AIRPORT OPERATION SITUATION RISK ASSESSMENT: COMBINATION METHOD BASED ON FAHP AND FINE KINNEY

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Abstract: This paper introduces a combination method for airport operation situation risk assessment. In order to quantify the key influencing factors of airport operation situation and improve the airport operation efficiency and service capacity, we attempt to develop a model of situation value for airport operation situation. Ten indexes are selected as the key influencing factors of airport operation situation from three aspects: flight guarantee, airport core resource utilization efficiency and take-off and landing efficiency. Airport operation situation is layered. We propose a method named FAHP to determine the weight of each level and a combination method based on FAHP and Fine Kinney to assess the risk of the ten indexes. Taking Xinzhuang Airport as an example, independent t-test and Levene-test are carried out on the evaluation results. The results suggest that the combination of FAHP and Fine Kinney has certain generalization. The research results can be applied to risk assessment of airport operation.
situation and provide decision-making basis for civil aviation departments.

**Key words**: operation situation assessment, hierarchical quantization, risk assessment
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ANALYSIS OF HEALTH SECURITY FOR RAILWAY WORKERS IN PLAINS WORKING IN HIGHLAND ENVIRONMENT
--TAKE THE CONSTRUCTION OF THE NEW SICHUAN-TIBET RAILWAY AS AN EXAMPLE

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Abstract: The implementation of the western development strategy and the construction of Sichuan-Tibet and Qinghai-Tibet railways have led to a large increase in the number of workers engaged in railway, highway, bridge and other projects. Most of these people entered the plateau rapidly and started construction work in a relatively short time. 3000m (Medically, plateau above 3000 meters is called medical plateau, and various unfavorable natural factors such as low pressure and hypoxia at plateau can cause various maladjusted symptoms. The mild ones have headache, dizziness, gastrointestinal discomfort, fatigue and weakness, and difficulty in sleeping. When these symptoms develop to a certain extent, we define them as acute mountain sickness. (AMS) Even worse, high altitude pulmonary edema (HAPE) and high altitude cerebral edema (HACE) can occur.

Key words: plateau, plateau reaction, inflammatory, adaptation

RISK ANALYSIS OF LOADING AND UNLOADING OPERATIONS OF RAILWAY HAZARDOUS CHEMICALS

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Abstract: The loading and unloading operations of railway hazardous chemicals are the frequent accidents-prone link in the railway freight process. It is necessary to carry out risk identification and countermeasure research. Therefore, taking light oil unloading operations as an example, the HAZOP risk identification method is used to identify the potential risk factors during unloading operation in this paper. The risk level of the identified factor is assessed by the popular Dow F&E index method. Finally, some technical countermeasures were proposed to reduce the risk of dangerous goods unloading operations.

Key words: light oil unloading operations, HAZOP risk identification, Dow F&E index method
RISK ANALYSIS OF LNG TANKER FOR RAILWAY TRANSPORTATION

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Abstract: The risk analysis of railway dangerous goods transportation is an important part of railway transportation safety management. At present, the risk analysis methods for railway dangerous goods transportation are mainly qualitative and quantitative methods. Based on the theory of computational fluid dynamics, this paper applies FLUENT to analyze the diffusion law of LNG gas tanker after leakage. A three-dimensional numerical simulation on the consequences of jet fire accident caused by leakage has been studied in detail. The analysis results are compared with the simulation results of DOW F&E index method. Its accuracy of simulation is examined.

Key words: liquefied natural gas, risk analysis, computational fluid dynamics

OPTIMIZATION OF LOADING SCHEME ON RAILWAY DANGEROUS GOODS

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Abstract: Railway dangerous goods storage yard has many characteristics, such as large storage types, large storage capacity. The optimization of railway dangerous goods loading scheme can be regarded as an optimization problem related to the operation route. According to the characteristics of dangerous goods storage, this paper establishes a mathematical model of dangerous goods loading scheme, and uses genetic algorithm to solve it. The optimal goods allocation, loading scheme and the minimum operating time are obtained.

Key words: Railway storage, Dangerous goods, Optimization of loading scheme, Genetic algorithm, Model solution
THE INFLUENCE OF ELECTROCHEMICAL CORROSION ON THE TRANSPORTATION SAFETY OF BENZENE RAILWAY TANKER AND ACCIDENTS SIMULATION

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Abstract: In this paper, the influence of chemical corrosion on the transportation safety of railway tanker which loading benzene (coking benzene, petroleum benzene) and the accidents simulation were studied. The surface morphology and chemical composition of corrosion scale were characterized by SEM and EDS. The corrosion rate of the railway tanker was calculated by weight loss experiment. Corrosion behavior was preliminarily described by electrochemical experiment of potential polarization curve. Finally, the damage of leakage fire accident due to chemical corrosion was simulated by the pool fire model. The results show that the corrosion source are sulfur components such as thiol and thioether in the transport medium, and the mainly components of corrosion scale are Fe$_2$S$_3$ and Fe(OH)$_3$. The corrosion rate in the experimental range was in the range of 0.164–0.274 mm/a and which increased with the increase of total sulfur. In case of leakage fire accident caused by corrosion perforation or stress corrosion crack, the burning radius of the pool fire is 197.18 m, the flame height is 270.21 m, and the minimum safe range for equipment and personnel without damage and loss is 32.62 m.

Keywords: corrosion, benzene railway tanker, accidents simulation, transportation safety

TEST AND ANALYSIS FOR ENVIRONMENTAL NOISE OF AN INTEGRATED TRANSPORT HUB

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Abstract: The comfort of workers and passengers is directly affected by the level of environmental noise in integrated transport hub, which is also critical to the sustainable development of railway station areas. Sound pressure level (SPL) of different structural layers were measured in an integrated transport hub, and then analyzed in time domain and frequency domain. The impact of different types of trains and subway’s entering and leaving the station on the environmental noise of the platform layer and waiting hall were studied. Research conclusions are as follows: (1) The equivalent SPL on the platform is 65.4 dBA-70.2 dBA. And the equivalent SPL in the waiting hall is 72.8 dBA in the rush hour, which is 4.6 dBA higher than that in the flat peak time. The measured noise level is higher than the comfort limits in the range of 40-200 Hz. (2) The maximum and response time of SPL on the platform caused by different types of trains’ entering and leaving the station is various. However, the dominant noise frequencies are 400-2500 Hz. (3) During the trains’ braking to enter the station, the low-frequency noise responses of the platform and the waiting hall remain unchanged basically, and the noise response in a higher frequency range rapidly increases, which was caused by the collision between the wheel and rail, braking, etc. The equivalent A sound level for the platform layer is 73.8 dBA, and the waiting hall is 75.3 dBA. (4) As the distance between the key point of the platform and the track centerline increases, the noise response exhibits logarithmic attenuation.

Key word: vibration and wave, integrated transport hub, field test, characteristic analysis
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YANGTZE RIVER WATERWAY TRANSPORTATION SAFETY EARLY WARNING MANAGEMENT SYSTEM BASED ON GENERALIZED RISK-ENTROPY

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Abstract: This study put forward a generalized risk-entropy model in order to describe the complexity of Yangtze River waterway transport safety system, with the application of dynamic theory of energy transmission in nonlinear systems and analysis methods for complex systems. The generalized risk-entropy model can characterize the overall risk evolution mechanism of the emergence promoted by risk network communication, superposition coupling and level transition in waterway transport safety system. The method of artificial neural network is used to identify the model of generalized risk-entropy model, a BP neural network model is constructed for Yangtze River waterway transport risk assessment based on generalized risk-entropy. After that, waterway transport safety early warning management system framework, function structure and logic structure etc. are designed, and an early warning management system is developed for application demonstration in Wuhan waterway section. It hopes to provide a new idea and method for the risk prediction, evaluation and early warning management of waterway transportation system.

Key words: waterway transportation, generalized risk-entropy, risk assessment model, early warning management, safety system

REVISION OF METHODS FOR THE SECURITY MANAGEMENT OF RAILWAY BUSINESS LINE CONSTRUCTION FROM THE GOVERNMENT'S PERSPECTIVE

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Abstract: As an important regulation of train operation safety supervision, the content of Methods for the Safety Management of Railway Business Line Construction has a direct impact on the personal safety of railway workers. With the separation of government and enterprises, it is necessary for the National Railway Administration to formulate management methods from the perspective of government. With the large-scale construction and operation of high-speed railway, part of the content of this method is inconsistent with the actual situation of transportation and production. Therefore, it is necessary to revise this method considering the current situation. This paper interprets the revision background of this method, proposes the revision principle, basis and framework, and puts forward corresponding suggestions for the problems in the original Methods for the Security Management of Railway Business Line Construction, which provides ideas and basis for improving the revision of the method and further realizing government supervision.

Key word: business line, construction safety, government, rule and regulation, revision
Abstract: Geological hazard is one of the main facts which will influence the safety of traffic in mountainous areas. In order to investigate the temporal-spatial distribution of geo-hazards along highways, in this paper a geo-hazard information model is put forward to construct the Database of geological hazard based on GIS technology. The database includes three-dimensional spatial database of geo-hazards and attribute database, which are connected by "UnifiedCode". Finally, taking the Ya'an-Kangding Expressway as an example, the structure and content of database is given. The results show that the database can meet the requirements of standardized management of geo-hazards and provide direct data support for the study of regional geo-hazards distribution and hazards zoning.

Key words: Geological hazard information model, Geographic Information System (GIS), Spatial database, Attribute database
Urban Rail Transit Network Operations Technology
PASSENGER FLOW ASSIGNMENT OF URBAN RAIL TRANSIT UNDER NETWORKING CONDITIONS

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Abstract: Under the background of network operation of urban rail transit, the mode of "seamless transfer" has brought new challenges to the operation and management of urban rail transit while bringing convenience to passengers. Establishing a reasonable model to truly reflect the passenger flow assignment of the rail transit network, which is of great significance for solving the problem of balanced operation and ticket income distribution of existing network and predicting the impact on the current passenger flow with new metro lines accessing. The crowding effect of passenger travel, transfer times and other influence factors are fully considered in this paper based on the characteristics of urban rail transit system. The definition method of feasible path is proposed, and the equilibrium assignment model of passenger flow based on feasible paths is established, which is solved by Frank-Wolfe algorithm. This model embodies the choice psychology of minimizing passenger travel impedance, and reflects the actual situation of route diversification. The effectiveness of the model and algorithm is verified by an example of the partial rail transit network in Beijing.

Key words: urban rail transit, traffic assignment, feasible path, travel impedance

ROUTE CHOICE PROBABILITY MODEL BASED ON URBAN RAIL TRANSIT PASSENGER CLASSIFICATION

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Abstract: The “seamless transfer” operation mode of the subway makes it possible for passengers to have multiple route choice for the same OD pair. In order to better reflect the distribution of passenger flow in the metro network, it is particularly important to study the passenger route choice behavior. The passenger route choice model from the two principles of utility maximization and regret minimization is proposed in this study. Comparing the route choice probability calculated by the two types of models with the actual route choice probability. A hybrid route choice probability model based on two principles is developed and applied in the actual passenger flow assignment.

Key words: route choice, utility maximization, regrettable minimization, passenger classification
CONSTRUCTION RULES OF URBAN RAIL TRANSIT NETWORK BASED ON COMPLEX NETWORK EIGENVALUE

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Abstract: With the rapid development of economy, the problem of urban traffic congestion becomes more and more serious. Urban rail transit, with its fast speed, large carrying capacity, environmental protection and energy saving, starts to play an increasingly important role in the urban transportation system. However, due to the large scale of urban rail transit construction, high investment, reconstruction difficulties and other deficiencies, it is particularly important to explore the rules of urban rail transit network construction. Based on the complex network theory, this paper studies the rules of urban rail transit network construction in Shanghai. Firstly, the degree and degree distribution, shortest path, clustering coefficient, median and other characteristic values of Shanghai urban rail transit network are calculated by using Pajek software. Then, the graph analysis of the data was carried out, which objectively showed the changes of characteristic values of each network in the development process of Shanghai urban rail transit, and drew the conclusion that Shanghai urban rail transit line network was a scale-free network. Finally, based on the research results of this paper, this paper puts forward three Suggestions for the cities that are planning or planning the urban rail transit network, and provides auxiliary decision-making for the planning of the front-line network.

Key words: urban rail transit network, complex network eigenvalue, Pajek, construction rule

VULNERABLE STATIONS IDENTIFICATION OF URBAN RAIL TRANSIT NETWORK: A CASE STUDY OF THE SHENZHEN METRO

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Abstract: Rail transit in major cities in China has developed rapidly and become an essential part of urban transport. However, safety is a significant issue that cannot be ignored. Combined the network structure and passenger flow distribution, the vulnerability of urban rail transit network are analyzed and the hub stations in the network by their vulnerability are identified. The characteristics of urban rail transit network structure are analyzed by complex network theory. From the perspective of operation, an urban rail transit network model is established considering the load factor. The damage to the station varies according to different emergencies. Attack strategies are classified into random attacks and deliberate attacks which include static and dynamic ones. The consequences of an attack are divided into two cases: full failure and semi-failure. The overall network efficiency loss is used to evaluate the vulnerability of urban rail transit network on the node attacked. Ultimately, the Shenzhen Metro is taken as an example to analyze and evaluate the vulnerability and identify the vulnerable stations, which provide scientific reference and basis for the safety management of urban rail transit networks.

Key words: urban rail transit network, complex network theory vulnerability, attack
APPLICABILITY ANALYSIS OF URBAN RAIL TRANSIT TRAIN RESOURCE SHARING UNDER NETWORK OPERATION

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Abstract: Operational resources sharing and management is a critical issue in network operations. A rolling stock utilization model for minimizing operating cost for enterprise is proposed based on a discrete space-time network of urban rail transit. The constraints of operational safety, resource limitation and continuous operation time are taken into account. A developed genetic algorithm (GA) is addressed for solving the complicated problem. The application of the train resource sharing is analyzed from the perspectives of headway and cross-line costs according to a case study on a virtual rail network. The result indicates that when expanding the difference in headway between different lines, the train resource sharing is conducive to improve the balance of train operation and reduce operation costs.

Key words: urban rail transit, network operations, resource sharing, rolling stock scheduling, applicability analysis

ANALYSIS OF TRANSFER ROUTE CHOICE ON LOOP LINE WITH AUTOMATIC FARE COLLECTION DATA

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Abstract: The loop line plays an important role in meeting the transfer demand and enhancing the accessibility of urban rail transit network. After operation of loop line, the actual effect on transfer flow and passengers’ route choice are crucial for metro management. Some factors may greatly affect route choice on loop line, which are helpful to estimate an individual’s decision-making and improve transfer service quality. The massive data in automated fare collection (AFC) systems opens up a new opportunity to understand the transfer effect on loop line. In this paper, an analysis framework is firstly developed to define typical transfer sub-network formed by secant lines and loop line. Then, a qualitative analysis is conducted to explore the potential impact of spatio-temporal information by passenger route choice in sub-networks. To analyze transfer route choice, a spatio-temporal route match model by mining AFC data is proposed. The case of a typical loop line in Chengdu Metro is applied to demonstrate the capability of the proposed model. Results shows that passengers’ transfer route choice behaviors on loop line could be estimated, which is useful to analyze spatio-temporal distribution of transfer flow and evaluate the transfer service quality of loop line.

Key words: urban rail transit, loop line, transfer route choice, spatio-temporal, automatic fare collection (AFC) data
PASSENGER TRAJECTORY REDUCTION IN URBAN RAIL TRANSIT STATION BASED ON PROBING DATA

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Abstract: With the increasing requirements for the analysis of passenger flow and the increasing coverage of Wi-Fi signals in rail transit stations, the high precision advantage through Wi-Fi probing data becomes increasingly prominent in obtaining passenger trajectory. The research on trajectory mining is mature in outdoor environment. However, for indoor environment there are massive noise in Wi-Fi probing data, which significantly interferes the preciseness of the trajectory reduction and brings great difficulty to existing trajectory reduction methods. To this issue, the paper proposes a novel passenger trajectory reduction framework for urban rail transit system, which is composed of trip trajectory division, trajectory noise data cleaning and semantic trajectory extraction. In addition, the system considers the spatial topology characteristics of the rail transit station. Realistic trajectory Wi-Fi data from Hanzhong Road station of Shanghai metro is utilized to support the experiments. The results demonstrate that the proposed method can mine the space-time trajectory from the original noise trajectory data efficiently and accurately, and successfully provide support for passenger flow analysis and station streamline optimization.

Key words: rail transit station, trajectory data cleaning, space-time trajectory reduction, Wi-Fi probing data
High-speed Railway Operation Organization and Operation Safety
OPTIMIZATION OF HIGH-SPEED RAILWAY NETWORK BASED ON ACCESSIBILITY OF STATIONS

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Abstract: High-Speed Railway (HSR) is an important carrier of China railway passenger transportation. It is of great significance to improve the performance of HSR network. This paper studies the optimization of HSR network with the goal of optimal global accessibility. Based on the degree of stations, clustering coefficient of stations and other indicators, the topology characteristics of China's HSR network in 2030 are analyzed. The LeaderRank algorithm is used to identify the important stations of HSR network from the perspective of topology. Then the optimization model is established and solved with the goal of optimal accessibility of global network. The results show that Changsha is the most important station in China's HSR network in 2030. Considering the investment restrictions of railway construction, constructing HSR links between Tongliao and Yixian, Datong and Yulin, Wuhai and Wuwei, Mianzhu and Mianyang & Huanghua and Zibo can maximize the global accessibility of China's HSR network in 2030. The optimization model can improve the performance of HSR network effectively, it also has certain reference significance to construction of HSR network.

Key words: high-speed railway network, accessibility of stations, degree of stations, clustering coefficient of station, LeaderRank algorithm, optimization model

AN IMPROVED METHOD OF CALCULATION PASSING CAPACITY OF HIGH-SPEED RAILWAY

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Abstract: In order to make full use of the passing capacity and ensure the service quality of high-speed railway operation, it is especially important to calculate the passing capacity of high-speed railway reasonably. The direct calculation method is simple, but it aims at the ordinary railway and is not directly applicable to the high-speed railway. In this paper, the parameters of the original direct calculation method were studied and corrected based on the characteristics of high-speed railway operation of China. Firstly, in order to describe the horizontal structure of the train operation diagram, the train types were divided according to the grade of train speed. Secondly, the influence of the train stopping scheme and the overtaking scheme on the longitudinal structure of the train operation diagram were quantitatively analyzed, and obtained the calculation method and relevant parameters of the average time of the train group occupied in the train operation diagram. Thirdly, the effective time for calculating the passing capacity of high-speed railway was determined based on the skylight time and the reasonable time range of arrival and departure of high-speed trains. Finally, the formula for direct calculation of the passing capacity of high-speed railways was obtained. The case study shows that the improved direct calculation method can well adapt to the calculation of the passing capacity of high-speed railway in China; based on the dynamic change of train operating diagram structure under different train operating schemes, the parameters of the improved direct calculation method are adjusted synchronously, so it can reflect the line passing capacity under different train operating schemes accurately.

Key words: passing capacity, high-speed railway, direct calculation method, Train diagram
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PASSENGER FLOW ORGANIZATION OF XIPU STATION UNDER THE BUS-TYPE OPERATIONS OF CHENG-GUAN URBAN RAILWAY

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Abstract

The effective connection of different modes of transport is the goal of urban traffic system optimization, and integration is the concept of passenger transport hub design and management. This paper takes Xipu Station, which is a one-platform interchange stations, as the object of research, and analyzes transfer problem caused by bus-type operations of Cheng-Guan urban railway. Based on the idea of integration of passenger transport hubs, considering the characteristics of passenger flow of urban railway and subway, the layout of station and platform facilities, this paper proposes optimization measures for the operation mode of subway line 2, and verifies the proposed layout scheme of transfer facilities through Anylogic simulation. The research and related results of this paper can provide reference for the traffic organization of urban passenger transport hub and the integrated construction of different modes of transport.

Key words: urban railway, subway, passenger transport integration, Anylogic simulation

THE GAME PRICING OPTIMIZATION OF HIGH SPEED TRAIN AND AVIATION IN THE TRANSPORT MARKET

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Abstract: As high-speed railway and air transportation have the characteristics of fast running speed, good comfort and high safety factor. So the two have a competitive relationship within a certain distance. They are replaceable within a certain range and there is a certain passenger flow competition. By analyzing the market-oriented situation, the relationship between the government, the high-speed railway passenger transport enterprise and the civil passenger transport enterprise in the transport market, the Stackelberg game relationship, established the goal of maximizing social welfare as the upper-level goal, high-speed railway passenger transport enterprise. The two-way planning pricing model for the interests of civil aviation passenger transport enterprises is the lower target. In order to solve the established bi-level programming pricing model, the simulated annealing genetic algorithm was designed to solve the model. Finally, through the actual case, the optimized pricing model of the design is simulated. The calculated results show that the established model and algorithm are reasonable.

Keywords: transportation economics, game pricing model, Bi-level programming, high-speed railway, aviation
BENEFIT ANALYSIS OF WUHAN-GUANGZHOU HIGH-SPEED RAILWAY TRAIN OPERATION PLAN

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Abstract: The train operation plan is the guiding basis for the orderly conduct of transportation organization work. The railway department can achieve certain benefits by completing the transportation organization task. The quality of the train operation plan has a direct impact on the quality of train transportation services, which is reflected in the quality of the completion of various tasks in the actual transportation organization process. The train operation plan mainly includes the train operation level, the operation section, the number of trains, the train formation, the stop plan and so on. This paper takes the Wuhan-Guangzhou high-speed railway train operation plan as an example, and mainly analyzing the following aspects: the impact of different units of the train on transportation revenue, the influence of train load on the efficiency of train operation in different sections and during different time periods, the influence of marshalling on the benefit of train operation plan, the efficiency analysis of EMU operation. Some improvement suggestions are also put forward in this paper. Through the analysis of the above aspects, it can be seen that the transport organization of Wuhan-Guangzhou High-speed Railway is under great pressure during the peak period, and some improvement measures can be adopted to improve the transport capacity and increase the operation efficiency.

Key words: high-speed railway, operation plan, benefit analysis

EVALUATION OF TRANSFER SYSTEM OF HIGH-SPEED RAILWAY STATION BASED ON THE INTEGRATION OF STATION CITY

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Abstract: After entering the high-speed rail era, based on the urban compact theory and transit-oriented development theory, the requirements of the integration of the station city are proposed for the new generation of high-speed railway station transfer hub. By analyzing the impact of the integration level of the station city on the transfer system, a set of scientific system index evaluation is proposed, and the combination of analytic hierarchy process and Dempster-Shafer envidence theory is used to scientifically and systematically evaluate the transfer system level of the high-speed railway station. Finally, an example analysis of Chongqing Shapingba Station is carried out. The result shows that the transfer system of the Shapingba high-speed railway station in the plan is evaluated as good. The Dempster-Shafer evidence theory can reflect the same opinions of the expert and disagreement, and reduce degree of uncertainty, moreover better quantify and deal with uncertain factors.

Key words: station city integration, transfer system, comprehensive evaluation index system, DS evidence theory
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PREDICTION OF HIGH-SPEED RAILWAY PASSENGER TRAFFIC VOLUME BASED ON INTEGRATED METHOD

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Abstract: This paper constructs a passenger traffic volume prediction framework integrating Holt-Winters exponential smoothing model and ARIMA (Autoregressive Integrated Moving Average model). Taking the passenger traffic volume historical data of Beijing-Shanghai high-speed railway from July 2011 to June 2017 as an example, we validate the proposed model framework. The results show that the prediction deviation of integrated method is only 0.029, which is lower than that of the two single prediction models. Therefore, the integrated prediction model constructed in this paper is effective.

Key words: high-speed railway, passenger traffic volume prediction, Holt-Winters exponential smoothing, ARIMA, integrated method

BACK PROPAGATION NEURAL NETWORK (BPNN) IN PASSENGER DEMAND FORECAST FOR MOSCOW-KAZAN HSR

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Abstract: Forecasting passenger demand accurately is a vital issue for management and operation of high-speed railway. This paper propose to use Back Propagation Neural Network (BPNN) in order to predict future passenger demand on Moscow-Kazan HSR by considering socio-economic factors, such as: Gross Regional Product (GRP), population, real income and passenger demand for the last 20 years in 7 studied regions. This approach includes 3 stages: 1) Data collection of the influenced factors; 2) Travel modes division (comparison analysis of all travel modes including future HSR in order to define possible percentage of passengers); 3) BPNN method application.

The paper presents a forecast of passenger demand until 2027. From the travel modes division was found close relationship between air and HSR modes. The paper contributes to the empirical literature on HSR passenger demand forecast. Results indicate that BPNN method is a reliable method, which is able to predict the demand of future HSR.

Key words: HSR, Moscow-Kazan route, travel mode, demand forecast, population, GRP, real income, back propagation neural network (BPNN)
HIGH-SPEED RAIL EXPRESS SERVICE QUALITY BASED ON FUZZY COMPREHENSIVE EVALUATION

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Abstract: The service quality of high-speed rail express is the foundation and core of sustainable development for rail express company. This paper intends to evaluate service quality of high-speed rail express scientifically, reasonably and accurately, analyzing the service process of high-speed rail express from the perspective of both company and customers, and selecting effective indexes that affect they assess service quality. Through literature review, process analysis and questionnaires with customer and staff, preliminary index system is established. Then the fuzzy comprehensive evaluation method is applied to build an evaluation model, and the evaluation weight of each level index is calculated. By the calculation of membership degree matrix, the overall score of the high-speed rail express branch is determined. The result of this study shows that information tracking, traffic environment construction around branch and the level of the “door to door” service process should be strengthened in the future.

Key words: high-speed rail express, service quality, index system, fuzzy comprehensive evaluation
Modern Logistics and Supply Chain Management
MULTI-OBJECTIVE LOCATION OF FRESH FOOD E-COMMERCE DISTRIBUTION NETWORK BASED ON IMPROVED NSGA-II ALGORITHM

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Abstract: To optimize the distribution network location of fresh food e-commerce, based on the traditional location model, customer satisfaction and the loss function of fresh goods were defined, the multi-objective location model of the fresh food e-commerce distribution network was established to get the moderate balance between customer satisfaction and the cost of the distribution. Combined with multi-population optimization algorithms, an improved Non-dominated Sorting Genetic Algorithm-II (NSGA-II) was proposed. Multiple populations are introduced to search at the same time, and an elite population is formed to co-evolution, improving the population diversity and the search performance of global search and local search. The simulation results show that the improved NSGA-II algorithm can effectively obtain the Pareto optimal solution of the model and provide a comprehensive decision for the distribution network location of the fresh food e-commerce enterprises.

Keywords: fresh food e-commerce, site selection problems, multi-objective optimization, non-dominated sorting genetic algorithm-II

DECENTRALIZED APPLICATION OF PALLET POOL SYSTEM BASED ON BLOCKCHAIN

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Abstract: The sharing and implementation of standardized pallets is the foundation for the development of efficient supply chain and intelligent transportation. At present, pallet pool information systems have been rapidly promoted and applied worldwide. However, the pallet pool information system, which serves as the basis for pallet sharing and in charge of the core pallet business, encounters critical problems such as difficulty in pallet exchange via different information platforms. Such issues will prevent the development of pallet pooling. In view of the above problems, here, firstly, the solution is put forward to fulfill pallet exchange among different platforms and owners by using blockchain technology. Then, a more efficient pallet pooling logistics business system is proposed. Finally, the technical characteristics and key business combinations of such system and blockchain are analyzed and studied.

Key words: pallet pool, blockchain, pallet asset digitalizing
RIMER BASED WORKFLOW NETWORK MODEL AND ITS INFERENCE ALGORITHM

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Abstract: The transfer of activity information plays an important role in running process of workflow management system. It not only affects the self-adaptation efficiency of workflow, but also can bring about resource consumption problem, which caused by the judgement of transfer of complex activity information. Aiming at this, based on belief rule-base inference methodology using the evidential reasoning approach (RIMER), it is proposed that a novel workflow network model to reduce complexity of the transfer process. After an activity node rule with belief degrees is defined, the activity node rule base is built by using activity history tables in workflow log data. Moreover, calculating the similarity between input activities and rules of activity node and judging the status of activity nodes are carried out to obtain activation rule set. The evidential reasoning (ER) approach is adopted for rule inference on the basis of calculating the activation degree of rule in activation rule set. Subsequently, comprehensive rules are constructed so as to achieve the transfer of activity information. And workflow network model is also successfully developed. Besides, this model can be further applied to improve the benefit and value of business process management.

Key words: workflow network model, activity node rule, inference algorithm, RIMER

INNOVATIVE STRATEGY OF LOGISTICS PLANNING AND MANAGEMENT FOR CHENGDU 2021 UNIVERSIADE

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Abstract: The successful holding of large-scale sports events requires the coordination and unification of a large and complex system, and the logistics system is an important part of it. By taking the successful holding of the Chengdu Universiade in 2021 for an example, it requires the detailed, comprehensive and systematic planning of the event logistics management. By the means of literature review and expert interview, starting with the necessity of establishing logistics planning and management of Chengdu 2021 Universiade, using the success of logistics experience of large events at home and abroad for reference, according to the characteristics of concentration, complexity, stage and short-term of large-scale sports events in Chengdu, adhering to the Ideas of Green and Humanistic Competition, and setting out from safe and efficient service, the paper defines the connotation of logistics planning and management of Chengdu 2021 Universiade, analyzes the outsourcing logistics service, intelligent logistics platform, green recovery, safety emergency and organization and management mode at different stages and puts forward the innovative strategy of logistics planning and management for the Universiade, which lays the foundation for the smooth execution of the logistics of Chengdu 2021 Universiade and conducive to the efficient, intelligent, safe and ecological running of Chengdu 2021 Universiade.

Key words: Chengdu Universiade, logistics planning, management
BEHAvIORAL GAME ANALYSIS OF STAKEHOLDERS IN CLOSED-LOOP SUPPLY CHAIN OF ELECTRICAL AND ELECTRONIC PRODUCTS UNDER THE EXTENDED PRODUCER RESPONSIBILITY SYSTEM

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Abstract: Based on the extended producer responsibility system, in view of the forward logistics and reverse logistics stages in the closed-loop supply chain of electrical and electronic products, this paper uses game theory to construct dynamic and static game models of government, producer and consumer respectively, and to analyze the game relationship and equilibrium solution of each participant. The results show that the good operation of the closed-loop supply chain of electrical and electronic products requires the balanced interests of all players. The positive and negative incentives of the government to producers and the subsidies to consumers will affect the enthusiasm of producers and consumers to participate in the closed-loop supply chain of electrical and electronic products. Accordingly, effective suggestions are proposed to promote the implementation and development of closed-loop supply chain for electrical and electronic products.

Keywords: electrical and electronic products, extended producer responsibility system, closed-loop supply chain, dynamic game, static game

JOINT PROMOTION BASED ON RETAILER-LED SUPPLY CHAIN

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Abstract: In this paper, a demand function model based on price and promotion efforts is constructed for the situation where the retailer is dominant in the supply chain, and the problem of joint promotion when the manufacturer invests in promotion efforts is investigated. This paper analyzes the influence of the cost-sharing ratio coefficient of promotional efforts on the decision-making behavior and profits of the manufacturer and retailer. Through theoretical and simulation analysis, we find that if the manufacturer invests in the promotion efforts, the retailer’s share of the promotion efforts cost will lead to the decrease of the manufacturer’s profit relative to the manufacturer’s sole responsibility for the promotion efforts cost, while for the retailer, the retailer’s profit will increase if the retailer’s share of the promotion efforts cost is small, and vice versa, the retailer’s profit will decrease.

Keywords: Retailer-led, Joint promotion, Supply chain
IMPLEMENTATION PATH OF GREEN SUPPLY CHAIN IN MANUFACTURING ENTERPRISES UNDER INNOVATION DEVELOPMENT STRATEGY

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Abstract: Faced with the increasingly environmental problems and downward pressure of the economy, China put forward innovation-driven development strategy and green development strategy at the 18th and 19th CPC National Congresses respectively. However, most of the manufacturing enterprises in China have lower technology level and great environmental impact. They need to improve their environmental management capabilities with all the members of the supply chain in order to gain new competitive advantages. Green operation of the supply chain is an important tool to achieve this goal. Starting from the actual situation of our country, this paper uses game theory, and empirical analysis method to discuss the path and strategic requirements of promoting the implementation of green supply chain in manufacturing enterprises from the perspective of member coordination. It provides suggestions for the implementation of green operation strategy in manufacturing enterprises and the formulation of relevant environmental management regulations in government departments.

Key words: innovation and development, manufacturing enterprises, green supply chain, game theory, implementation path

A LOGISTICS NETWORK ASSIGNMENT METHOD WITH DUAL-EQUILIBRIUM

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Abstract: This paper established a three-tier logistics network consisting of carriers, logistics providers and shippers. The logistics products flow in the network. There is competition in the same tier and cooperation between the distinct tiers. We use Nash equilibrium to analyze the optimal decision behaviors of the carriers and the logistics providers, and we use user equilibrium to analyze the choice behaviors of the shippers. The variational inequality problem describes their optimality/equilibrium conditions. The equilibrium assignment model of the logistics network is established when the tiers are in the equilibrium state. Finally, a numerical example is given. The example indicates that the model and the algorithm are effective.

Key words: Logistics network, Equilibrium assignment model, Nash equilibrium, User equilibrium, Modified projection algorithm
FREIGHT TRANSPORT MODE BASED ON PUBLIC TRANSPORT: TAKING PARCEL DELIVERY BY SUBWAY AS AN EXAMPLE

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Abstract: Freight transport based on public transport is an indication of integration of passenger and freight transportation. Relative problem and practical applications of freight transport based on public transit were studied and four operating modes of freight transport by rail were summarized in this paper. Additionally, parcel transport capacity of a single subway line in different modes and parcels demand in main urban areas were estimated. For freight transport through subway network, the appropriate operating modes of freight transport under three different demand scenarios were analyzed as well, and corresponding environmental benefits under these three modes were evaluated separately. The result shows that using the subway to transport goods can efficiently reduce carbon emissions by 20-50%. Furthermore, when the demand is low and dispersed, the trolley and roller container can be used to load the goods. When the demand is relatively high or when dispersed demand can be merged, the single freight train or mixed train with passengers and freight in different carriages need to be used.

Key words: integration, public transport, freight transport, parcel delivery, operating mode, carbon emission

THE IMPACT OF SEPARATION OF INVENTORY AND OWNERSHIP BASED ON THE DROP-SHIPPING

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Abstract: Recently, the rapid development of E-commerce has raised a new channel operation model, namely drop-shipping. However, since the inventory level is determined by the supplier, the retailer does not bear any inventory risks under the drop-shipping model, which would lead to the retailer not being active in sales and the loss of the supplier due to the overage inventory. Therefore, this paper proposes a new model where the inventory and its ownership can be separated. The retailer, as inventory decision-maker, bears inventory risks and the supplier retains the function of delivery as drop-shipping. In order to prove the validity of the new model, this paper studies the new model with the traditional drop-shipping model as benchmark and obtains the optimal decision. Furthermore, we also find that it is beneficial to apply the new model in supply chain of commodity with low salvage through numerical analysis.

Keywords: drop-shipping, inventory management, supply chain management, ownership
THE IDENTIFICATION OF RISK FACTORS FOR LOGISTICS LOSS OF FRESH AGRICULTURAL PRODUCTS BASED ON GROUNDED THEORY

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Abstract: The logistics loss of fresh agricultural products in the circulation process is a risk caused by uncertain factors. In this paper, it is the factors and production mechanism of logistics loss of fresh agricultural products that are studied by using the method of grounded theory. It continuously implements open coding, axial coding and selective coding to construct the recognition model of risk factors for loss of fresh agricultural products. It summarizes four main categories including the ability of logistics performance, management, elements security, and loss transfer control. It also explains the mechanism of its generation and the logical relationship between them. The research works to extend the method of loss risk identification.

Key words: grounded theory, fresh agricultural products, loss, risks

HOME DELIVERY DISTANCE AND FREE SHIPPING POLICY FOR FRESH FOOD CONSIDERING THE LOSS

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Abstract: The home delivery of fresh food in B2C e-commerce environment is studied. Considering the loss of fresh food in the distribution process, the paper modifies the initial model of home delivery distance, which is based on function value. And the optimal home delivery distance for fresh food in B2C e-commerce is presented. In view of the fixed charging mode of home delivery service, the consumer expectations function is built. And based on the maximization of the utility of the consumer surplus function, the free shipping threshold of home delivery for fresh food is solved. Finally, a calculating example is carried out. The results show that there is a nonlinear negative correlation between the loss degree and home delivery distance for fresh food. The internet retailers provide a fixed fee for the home delivery service based on service distance. A reasonable free shipping threshold can effectively stimulate consumers to buy more goods, thus improve the internet retailers’ profit.

Key words: home delivery, fresh food, service distance, free shipping threshold
ORDERING POLICIES OF POST-RIpenING FRUIT SUPPLY CHAIN UNDER PHYSICAL LOSS

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Abstract: The physical loss of the post-ripening fruit occurs mainly in the retail stage. This paper studies the ordering policies of the post-ripening fruit supply chain under the physical loss. And the retailer's ordering policies in both decentralized and centralized systems are discussed. The natural loss rate of the post-ripening fruit is considered as a decision variable in the supply chain. The results show that when the natural loss rate is low and medium, the retailer should choose the decentralized ordering policy in order to reduce the procurement costs or the deterioration losses. When the natural fruit loss rate is high, close to the maximum shelf life, the retailer should adopt the centralized ordering policy and try to reduce the loss of degradation with the highest delivery frequency and minimum order quantity.

Key words: physical loss, post-ripening fruit, ordering policy

AN INPUT-OUTPUT BASED ANALYSIS OF COST REDUCTION AND EFFICIENCY IMPROVEMENT OF STRATEGIES IN TRANSPORTATION LOGISTICS INDUSTRY

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Abstract: It analyzes the changes in transportation logistics industry to intermediate input in various industries and household consumption ratio based on the input-output table from 2002 to 2015 in China. For the research of paper, it shows that the transportation and logistics industry has achieved significant achievements in cutting cost and increasing efficiency in recent period. For example, the input ratio is continuously falling for the transportation logistics industry to intermediate input in agriculture and manufacturing industries. However, the ratio is significantly rising in service sectors. The proportion of transportation logistics industry occupies the relatively higher for rural private households’ consumption than it for urban household. Meanwhile, the research discovers the value-added ratio of the transportation logistics industry has the down term between 2002 and 2015. Therefore, in the light of the findings, it proposes corresponding measures for cost reduction and efficiency improvement in the transportation and logistics industry.

Key words: transportation logistics industry, input-output, cost reduction and efficiency improvement
Road and Railway Engineering
EFFECT OF RECYCLED AGGREGATE ON THE PROPERTIES OF ROAD BASE MATERIALS

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Abstract: The utilization of recycled aggregates in civil engineering is an effective way to deal with construction waste and conserve natural resource. This paper presents a study on the effect of recycled aggregate obtained from waste concrete on the properties of road base materials. The gradations of both natural aggregate and recycled aggregate were designed according to the upper limit, median value and lower limit of standard gradation, respectively. The natural aggregate was replaced by recycled aggregate with the replacement of 25%, 50%, 75% and 100% by volume, respectively. The maximum dry density, optimal moisture content, unconfined compressive strength, and drying shrinkage were investigated for road base materials. It was shown that aggregate prepared with upper limit gradation exhibited the best optimal moisture content, while the road base material prepared with median gradation aggregate showed the best 7-day unconfined compressive strength. The optimal moisture content and the maximum dry density of road base material would be both increased with increasing the replacement level of recycled aggregate. Recycled aggregate can improve the 7-day unconfined compressive strength of the road base material within a certain replacement percent.

Key words: recycled aggregate, waste concrete, road base materials

SOIL ARCHING EFFECT IN HIGH-SPEED RAILWAY GRPS EMBANKMENT SUBJECTED TO LONG-TERM TRAFFIC LOADING

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Abstract: Geosynthetic reinforced pile-supported (GRPS) embankment, which is widely used in the construction of high-speed railway on soft soil, is one of the infrastructures considering soil arching effect as a key factor in the research. However, the existing design of GRPS embankment is mainly based on static achievements, as its behavior under long-term traffic loading is not yet fully understood and difficult to be predicted. In this study, an implicit-explicit transition calculation strategy was implemented to predict the permanent deformation under high-cycle loading through the data transfer and conversion between implicit and explicit numerical stages. Base on the method, a series of numerical simulations were conducted with the finite element (FE) models to study the soil arching effect in the GRPS embankment subjected to long-term traffic loading. A field test section of high-speed railway was selected as a case for discussion and validation. Results indicate that both the degree and affected area of the stress concentration over piles in the embankment are reduced under traffic loading. Considering the effect of different loading amplitudes, the variation of stress concentration ratio of the soil arching effect can be mainly classified into three groups: stable, gradual weakened and destroyed.

Key words: high-speed railway, pile-supported embankment, soil arching effect, traffic loading, high-cycle loading
FEEDER BUS TRANSIT DESIGN FOR TRUNK RAIL SYSTEM: CASE STUDY OF PURPLE LINE CORRIDOR IN MARYLAND

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Abstract: This study developed an approximate analytical model to design feeder bus transit (e.g. shuttle bus, minivan) services along a trunk line (e.g. metro rail and light rail) whose stations and line alignment are pre-determined. Specifically, an optimization model is developed to identify the density and frequency of feeder bus services that minimizes the total cost of the trunk-feeder system (sum of operating cost and user cost) subject to vehicle capacity constraints. The model is applied using the data from Purple Line Light Rail (LRT) system in Maryland, U.S.A. The results demonstrate that the developed model provides a useful tool to generate the optimal number of feeder bus lines and the best frequency of feeder service along the Purple Line corridor.

Key words: trunk-feeder model, feeder bus design, discrete optimization

BEHAVIOR OF CONCRETE WITH RECYCLED CLAY BRICK AS COARSE AGGREGATE

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Abstract: This paper presents the main results of the research to explore the effect of recycled clay brick on performances of the concrete. Two water to cement ratio (W/C) of concrete in the test was designed to be 0.35 and 0.47. The replacement percentages of recycled clay brick were controlled to be 0, 25%, 50%, 75% and 100%, by volume. Some conclusions have been found based on the results of experiment. Both the compressive strength and the flexural strength decreased with the increasing of recycled clay brick content. The permeability performance and the frost resistance became worse when the replacement percentage of recycled clay brick increased.

Keywords: concrete, recycled clay brick, freeze-thaw cycles, permeability, mechanical properties
ENERGY ABSORPTION LEVEL TEST OF TUNNEL LINING SECTION CROSSING ACTIVE FAULT

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Abstract: In recent years, researches showed that the tunnels may be seriously damaged when crossing fault zone. Therefore, the anti-shock designation of lining structure in fault zone is particularly prominent. Through the drop-weight test, this paper researched the damping level of the plain concrete lining, reinforced concrete lining and rubber lining in circular direction. The test data show that the anti-seismic of reinforced concrete is better than plain concrete. The seismic load absorption ability of rubber lining is much greater than concrete lining. Through numerical simulation, we found the energy absorption rate of rubber lining is 42.5% and rubber lining may meet the anti-seismic requirements of tunnel when crossing fault zone.

Key words: drop-weight test, active fault, damping structure, energy absorption level, strain energy

REINFORCEMENT AND MONITORING MEASURES FOR OVERLAPPED SHIELDS CROSSING UNDERNEATH RAILWAY STATIONS

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Abstract: Shield tunneling method is widely used in urban metro construction at present. How to control the disturbance of shield construction on overlying soil and adjacent exist railways is an important issue in the development and utilization process of underground space. Based on the project, Shenzhen Metro Line 7 crossing underneath Shenzhen North Railway Station, this paper puts forward a set of reinforcement measures system for overlapped shield crossing underneath railway station. This paper concludes that full-bin mode tunneling, decreasing slag volume, accelerating the shield tunneling speed and early synchronous grouting are effective methods for controlling stratum deformation, which are verified by field monitoring. The research conclusion can provide some reference for the similar engineering in the future.

Key words: shield tunnel, railway station, shield cross underneath, ground settlement, field monitoring
MECHANICAL BEHAVIOR AND ANALYSIS OF PILE-PLANK COMPOSITE STRUCTURE

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Abstract: The pile-plank composite structure combined with the characteristics of expressway load has been applied in the reconstruction and expansion projects of expressways. Taking a six-span pile-plank composite structure as the research object, a finite element software ANSYS is used to establish the simulation model to better study the mechanical behavior of the pile-plank composite structure. Through lots of analytical calculations, parameters such as crack width, deflection and bearing capacity of the structure at different limit states meet the requirements of the specifications. According to the advantages and the mechanical behavior of the pile-plank composite structures, this new type of the composite structure could be widely promoted to the reconstruction and expansion projects of expressways.

Key words: reconstruction and expansion, bearing capacity, pile-plank composite structure, expressways

IMAGE FILTERING ALGORITHMS FOR TUNNEL LINING SURFACE CRACKS BASED ON ADAPTIVE MEDIAN-GAUSSIAN

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Abstract: An adaptive median-Gaussian filtering algorithm is proposed to solve the problem of poor noise filtering effect and easy to destroy the details of crack edge in the process of the crack detection of the tunnel lining by traditional filtering algorithm. Firstly, the Gaussian noise and salt and pepper noise in the image are detected by comparing the gray value of the window target pixel with the weighted average gray value of the window, and then the difference between the gray value of the point pixel and the weighted average gray value of the window is used to detect the noise twice by setting a suitable threshold. Finally, the detected Gaussian and salt and pepper noise are filtered by Gaussian filtering and adaptive median filtering, respectively. The experimental results show that compared with the traditional filtering algorithm, the mean square error (MSE) of the proposed algorithm is the smallest, and the peak signal-to-noise ratio (PSNR) is the largest, and it has better performance in filtering noise and protecting the details of crack edge.

Key words: noise, image processing, adaptive median filtering, Gaussian filtering
Transportation Big Data Application Technology
THE UPGRADE OF PASSENGER SERVICE MANAGEMENT FOR HIGH-SPEED RAILWAY STATION IN THE ERA OF BIG-DATA

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Abstract: Big-data technology has been successfully applied in different fields. However, big-data technology has not been widely applied in the daily operation of high-speed railway stations which are shining cards for metropolis. Firstly, the paper describes the characteristics of Big-data Era and its influences on the passenger service management of high-speed railway station. Then, it explores the innovation modes for passenger transport service management by using big-data technology. Additionally, threes measures have been put forward with the aim of upgrading the passenger service management: strengthening the construction of big-data, innovating Marketing Model and raising the Level of Passenger Transport Organization. In the end, Shanghai Hongqiao Railway Station is taken as a case study.

Key words: the Era of Big-data, High-speed Railway Station, upgrade of passenger service management

A METHOD FOR EXTRACTING PASSENGER FLOW TIME SERIES FEATURE OF URBAN RAIL TRANSIT

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Abstract: Urban rail transit passenger flow time series data has unique space-time feature. Using big data mining technology to master the feature is of great significance for ensuring station safety and improving service level. The main purpose of this paper is to propose a method for extracting passenger flow time series feature which collected by AFC, video surveillance, mobile phone signaling, WiFi probe technology, etc. Firstly, the agglomerate hierarchical clustering algorithm based on the average distance is used to classify the existing historical data. Moreover, an improved box plot analysis method is proposed to extract the characteristic curves of various types of data as feature representations. In addition, considering the efficiency of data update, a long-term and short-term combination update strategy is proposed. In the end, the method is practiced on the passenger flow data of Hanzhong Road Station of Shanghai Metro.

Key Words: passenger flow time series, feature extraction
APPLICATION OF BIG DATA TECHNOLOGY IN LARGE-SCALE EVENT MANAGEMENT AND TRAFFIC SUPERVISION

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Abstract: Due to the density of passenger-flow and complexity of personnel structure in large-scale event, without an effective system to keep the site in good order, some unexpected accidents, such as trample accident will happen. It is not enough to rely on the on-site staff to keep the site order, therefore, it is necessary to effectively apply the big data technology in corresponding event-management and traffic supervision. The maximum advantage of big data technology lies in that, based on big data technology, the event management and traffic system can be more efficient, and an accurate prediction can be made to meet the demand of the whole event, so as measures can be taken to help the on-site staff to particularly focus on the traffic distribution and management. This paper is mainly analyzing the value of big data technology applied in large-scale events, and takes Chengdu sports center as an example to explicitly illustrate how big data technology is applied in the management and traffic supervision for large-scale events.

Key words: big data technology, large events, on-site management, traffic supervision, application

APPLICATION SCHEMA AND PLATFORM ARCHITECTURE DESIGN FOR BIG DATA APPLICATION ON RAILWAY TECHNICAL REGULATIONS

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Abstract: In recent years, CHINA RAILWAY has carried out researches of big data application in asset management, maintenance management, operation management, customer service and other fields, and it have providing support for railway transportation in some areas such as maintenance management. Technical regulations are the most direct basis for railway operation. The quality of technical regulations, the coordination among regulations, and the level of management and service of technical regulations directly affect transport safety. This paper analyzes the current situation of the management and application of railway technical regulations, and then puts forward suggestions for the development of big data about railway technical regulations according to the standards and the patent industry. Based on the requirements of technology regulations and life cycle big data application, we have designed the application schema and platform architecture for big data in technical regulations, which provides a theoretical support for the research and development of big data in technical regulations.

Key words: Railway Technical regulations, Big Data, Life Cycle, Application Schema, System Architecture
Abstract: To explore the status of operation and travel demand characteristic, we extract the taxi operation and travel demand information based on data mining model. On this basis, the passenger flow volume in each period, travel time distribution, travel distance distribution are discussed. Simultaneously, the spatial distributive characteristic of travel demand is obtained by displaying the location information on Arcgis software. In addition, we verified the characteristic through data analysis. Some significant conclusions are drawn through the taxi operation in Chengdu: (1) The travel demand of taxi in Chengdu is stable, and the travel demand on weekends decreased slightly compared with the travel demand on weekdays. (2) The travel demand is concentrated on the district within the third ring road. (3) A significant difference between Chengdu taxi passenger flow and conventional bus flow is that taxi passenger flow does not show obvious peak characteristics in the morning and evening. The proposed approach can obtain taxi operation and travel demand situations, which can provide aid decision making for analysis and evaluation, operation dispatch and assignment of vehicles.

Key Words: urban traffic, data mining, taxi operation, travel demand
Transportation Organization Optimization Theory and Method
THE REASONABLE TIME DOMAIN OF THE SUNSET-DEPARTURE AND SUNRISE-ARRIVAL TRAINS ON HIGH-SPEED RAILWAY RUNNING IN THE FORM OF PERIODIC MAINTENANCE WINDOW

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Abstract: As a kind of developing High-Speed railway transport product, the Sunset-departure and Sunrise-arrival Trains on High-speed Railway (Abb. SDSAT-HSR) has attracted much attention due to its unique transport characteristics and good market reputation. It is an important content of compiling the train operation plan which determined the reasonable running time domain of the SDSAT-HSR. Based on the existing method of determining the reasonable departure and arrival range time and the definition of the SDSAT-HSR in High-Speed railway, this paper applies the Congruence theory. Considering the factors of passenger service quality, opening periodic maintenance window and passenger travel habits, this paper gives a method to determine the reasonable time range of departure and arrival in the mode of Periodic Maintenance Window through the analysis of the examples. In view of the fact that all the SDSAT-HSR running across lines at present, this paper analyses the reasonable time range of the SDSAT-HSR at the crossing points, which is divided into two kinds of cases: the non-parking station and the parking station. It has a certain reference value for the drawing of train diagram.

Key words: sunset-departure and sunrise-arrival trains, congruence theorem, time domain, periodic, wait maintenance window

RAILWAY BASED ON TIME-SEGMENTED PASSENGER FLOW DEMAND

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Abstract: As an important part of the railway operation program, high-speed railway stop schedule plan focuses on meeting the spatial distribution of passenger transport demand in traditional research, and less consideration is given to the time fluctuation of passenger demand, which leads to the mismatch between capacity and demand in different periods, and affects passengers' satisfaction with the timeliness of high-speed railway. We propose an optimization method for high-speed railway stop schedule plan based on time-segmented passenger demand, to improve the matching degree between the train plan capacity and passenger demand.

Firstly, simulate the process of passengers choosing the most satisfying train in different periods, and build Stop Schedule Plan Optimization Model which aims to minimize total dissatisfaction with arrival time of all passengers. Secondly, genetic algorithm (GA) is used in the solution of the model. Take the reciprocal of the objective function of the model as the fitness and keep the best individual to the next generation by elitist strategy.

Finally, apply the model to Nanchang-Fuzhou High-speed Railway Line. As the maximum of stop choice change increases, the total dissatisfaction of passengers with arrival time would decline gradually. The dissatisfaction of passengers with the optimal scheme was reduced by 2.51 minutes per capita. The research results show that this methodology could enhance the matching between train diagram and passenger demand in different periods, and improve passengers' satisfaction effectively.

Key words: high-speed railway, stop schedule plan optimization, time-segmented passenger demand, dissatisfaction with arrival time
THE TRANSPORTATION ORGANIZATION MODE OF OFF-LINE TRAIN IN WUHAN-GUANGZHOU HIGH-SPEED RAILWAY

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Abstract: It has a great effect to capacity that a large amount of off-line trains running in Wuhan-Guangzhou High-speed Railway (WGHR). The paper compares and analyzes the off-line train and in-line train’s proportion, speed, stop and overtaking schedule plans. Taking Changsha South Station as an example, the paper analyzes the impact of off-line trains on station capacity. Due to the crossings, informing by the restriction turnout in the throat area, it takes a long time in throat area and tracks when receiving and departing off-line trains and then affects the station through capacity. The fixed time of off-line train makes the train intervals longer, and then impacts the section carrying capacity. Taking Changsha South-Hengyang East section as an example, it is found that when the proportion of off-line trains is about 65%, the capacity utilization rate is the lowest, only about 70%. Because the economic benefits of the off-line train is better and satisfies the company, and to is paper puts forward the suggestion that the transportation organization mode of off-line train should be single mode in peak hours and mixture mode in off-peak hours and the timetable of the off-line train remaining some problem can be optimized.

Key words: Transportation organization mode, Off-line train, Through capacity, Wuhan-Guangzhou High-Speed Railway

SHIP DISPATCHING SCHEME OF MARINE OIL SPILL EMERGENCY MATERIAL BASED ON GENETIC ALGORITHM

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Abstract: Transportation mainly includes railway, highway, shipping and aviation. As a kind of transportation mode, shipping plays an important role in participating in the transportation of maritime materials. When the marine oil spill accident occurs, it’s necessary to timely meet the demand for emergency materials at the accident point during the rescue of the marine oil spill. The reasonable arrangement of ship dispatching scheme can not only improve the efficiency of material transportation, but also reduce the damage caused by unreasonable dispatching scheme and economic losses, protect the marine environment. Combined with the characteristics of marine oil spill accidents, this paper proposes an algorithm for solving the specific dispatching schemes of each ships under the condition of emergency materials dispatching with multi-material and multi-ship features. The algorithm establishes a model with the minimum ship delivery time as the target. By introducing an example and using the genetic algorithm to solve and obtain the specific scheme for where each type of oil spill emergency material should be shipped to each ship in the system. The results show that the dispatching scheme can match demand conditions where the shore-based supply points meet the accident points and are not more than the current stock. All ships can complete the dispatch of all emergency supplies within 22.0245 hours. It provides a decision basis for the dispatch of emergency materials in marine oil spill accident.

Key words: marine oil spill accident, ship dispatching scheme, genetic algorithm
FUNCTIONAL DESIGN AND OPERATION PROCESS ANALYSIS OF CARGO OPERATION YARD AND STATION FOR FREIGHT EMU

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Abstract: With the network operation of high-speed railway, the rapid development of e-commerce logistics and the high requirements for the timeliness and freight quality, as well as meeting the increasing freight demand for high-speed railway, China has begun to study and developed freight multiple unit for operation on high-speed railways. It has laid a solid foundation for China's high-speed railways freight. Therefore, which kind of freight yard and station and how to operate will be urgently needed solve. Firstly, the cargo operation characteristics and the product characteristics of freight EMU are analyzed to analyze and summarize the cargo types and characteristics of freight EMU. Secondly, the functional positioning on operation yard and station of the freight EMU and the contents and types of cargo operations required to be handled in the yard and station are analyzed with the product characteristics of freight EMU and cargo operation characteristics. The function and flow line of the yard and station, as well as cargo operation process are designed with the graphic and qualitative analysis methods. The operation process for different types are analyzed and designed.

Key words: freight EMU Freight, yard and station, Functional positioning, operation process analysis, Graphics method

THE INFLUENCE OF MAINTENANCE WINDOW CONFIGURATION ON THE CARRYING CAPACITY OF SHUOHUANG RAILWAY

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Abstract: Shuohuang Railway is a typical heavy-haul railway with coal transportation in China. In this paper, the influence of Maintenance Window setting on the carrying capacity of Shuohuang Railway is studied. Firstly, the factors affecting the traffic volume of Shuohuang Railway are analyzed in terms of the overall situation. Then the main factors influencing the traffic volume under different Maintenance Window schemes of Shuohuang Railway are selected, and then the calculation method of the carrying capacity of double-line parallel operation diagram and non-parallel operation diagram is deduced under the condition of the configuration of Maintenance Window in Shuohuang Railway. Based on this, the influence of Maintenance Window setting on traffic volume is quantitatively described. The research proves that under the conditions of the existing train running, all kinds of trains in Shuohuang Railway can stop evenly in front of the Maintenance Window, and the number of arrival-departure tracks will not affect the traffic volume under the condition of Maintenance Window setting. considering the slow running after comprehensive maintenance or not, the theoretical calculation capacity exceeds the actual traffic volume, which provides a theoretical basis for the further optimization of transportation organization and the improvement of transportation capacity of Shuohuang Railway.

Key words: heavy-duty railway, maintenance window setting, passing capacity, minimum train interval
CAPACITY OF PASSENGER PASSAGEWAY IN LARGE-SCALE RAILWAY PASSENGER STATION

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Abstract: The passenger passageway of large-scale railway passenger stations mainly includes passenger corridors and passenger staircases. The capacity of these two parts has significant influence on passenger passageway design and passenger transport organization. In this paper, based on the video information of passenger flow in the passenger passageway of Beijing railway station and Beijing west railway station, the data of walk speed and average occupied space was collected. Meanwhile referring to the relevant foreign researches, this paper analyses and constructs the model of relationship among passenger flow, speed and density in passenger passageway, and fits it with Origin software. The curve fitted can well reflect the relationship among these three parameters. Finally, the service level standard and design capability reference value of the passenger passageway are determined by the ratio of passenger traffic volume to the maximum capacity of the passenger corridor and the passenger staircase.

Key words: Passenger passageway, Level of service, Design capability

A MIXED INTEGER NONLINEAR OPTIMIZATION MODEL TO COORDINATED PASSENGER INFLOW CONTROL WITH TRAIN SKIP-STOPPING ON AN OVER-SATURATED METRO LINE

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Abstract: In order to reduce accident risks when the density of passengers waiting at platforms exceeds its critical value and better match between the passenger demand and the traffic capacity, an effective method to coordinated passenger inflow control with train skip-stopping on an over-saturated metro line is proposed in this paper. Through considering the passenger demand characteristics and train operation conditions, a mixed integer nonlinear programming model with 0-1 decision variables is presented to minimize the total travel time including the passengers in-train time and waiting time at the stations. The sequential iterative convex programming (ICP) approaches are designed to search for high-quality solutions. Finally, taking Guangzhou Metro Line 8 as a number example, the rationality of the model and effectiveness of the algorithm are verified.

Key words: train operation scheme, skip-stopping mode, passenger inflow control, mixed integer nonlinear programming
CALCULATION OF AFFECTED PASSENGER FLOW FOR RAIL TRANSIT OPERATION DISRUPTION BASED ON TIMETABLE

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Abstract: Quantitative calculation of the affected passenger flow scale under the operation disruption of urban rail transit is of great significance for the formulation of emergency strategies. The different impact of operation disruption on passengers may lead to various affected passenger flow. Based on the timetable, the duration of disruption and the shortest path time, this paper considers the affected departure time range of origin stations in affected OD (origin-destination) station pairs to calculate the OD matrix of the affected passenger flow with historical data. Various affected passenger flow and the total amount of affected passenger flow can be calculated by the OD matrix of affected passenger flow. The analysis and calculation for the local network of Nanjing Metro proves the feasibility of the proposed method, which can quantify the scale of affected passengers and is helpful to the emergency management.

Key words: rail transit, operation disruption, timetable, affected passenger flow

MULTI-OBJECTIVE MTLBO ALGORITHM FOR MULTIMODAL TRANSPORTATION SCHEME SELECTION

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Abstract: It is the key issue to propose an optimized scheme for multimodal transportation operation. Here, firstly, the model of multimodal transportation plan is constructed. Then, the multi-objective Teaching and Learning Optimization (MTLBO) algorithm is established to solve above model, which provides decision support for optimizing the multimodal transportation scheme. Furthermore, the feasibility and validity of the whole scheme design method are illustrated by an example. The Pareto solution set of the multi-objective multimodal transportation model is obtained by the scheme. Finally, the optimal solution for customers is put forward.

Key words: multimodal transportation, MTLBO algorithm, pareto solution
DESIGN AND IMPLEMENTATION OF THE KEY ISSUES PROMPT SYSTEM FOR RAILWAY PASSENGER TRANSPORT PRODUCTION

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Abstract: In order to accurately grasp the key issues of transportation in Railway passenger station, assess risks in advance, and to ensure the continuous safety, stability and order of transportation production, a prompt system for the key issues of transportation production in Railway passenger station has been developed. The system adopts Spring Boot's integrated architecture and uses single point database architecture to complete the design and implementation of the transportation and production reminder system. The implementation of this system solves the problems of easy omission, time and energy consumption, and low efficiency in the past when someone find the key items of the day, and improves the work efficiency of station staff and brings indirect economic benefits to the station.

Key words: railway passenger station, key issues, risk, Spring Boot's integrated architecture

ANALYSIS OF THE LIMITING FACTORS OF CARRYING CAPACITY AT CHANGSHA SOUTH RAILWAY STATION

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Abstract: This paper introduces the train dispatch scheme and carrying capacity of Changsha South Railway Station. Through the analysis of several aspects such as the train headway, the station and yard layout and the utilization of tracks, the limiting factors of the carrying capacity at Changsha South Railway Station are found out. Based on the actual situation of the Station, relevant suggestions are given for these limiting factors.

Key words: Changsha South Railway Station, carrying capacity, limiting factors
OPTIMIZATION OF TRAIN STOP PLAN ADJUSTMENT BASED ON PASSENGER FLOW MATCHING

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Abstract: The high-speed railway train stop plan is an important part of the operation plan. The operation plan should fully meet the passenger flow demand and be adjusted according to the actual passenger flow. Compared with the normal crowding, accidental crowding is difficult to pre-control in time and space, and has greater randomness. Therefore, it is not feasible to fully adjust the operation plan. In this case, this paper optimizes the train plan by adjusting the train stop plan. A 0-1 programming model is established, and the objective function consists of two parts, which minimizes the degree of deviation between the original and adjusted plan as well as maximizing the matching degree of the passenger flow. The adjustment method is proved by an example, and the results show that the method is feasible and can improve passenger satisfaction.

Key words: high-speed railway, accidental crowding, stop plan adjustment, passenger flow matching

EFFECTIVE SOLUTIONS TO SHORTEN TRAIN HEADWAY OF URBAN RAILWAY

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Abstract: Accompanied with rapid increasing passenger flows of urban railway nowadays, it puts forward urgent requirement to find solutions to shorten train headway so as to improve operation efficiency. This paper presents train headway scenario analysis, establishes model for train headway calculation, proposes solutions to shorten train headway via optimizing characteristics of rolling stock and signaling system configuration. Case simulation shows train headway can be effectively shortened by these solutions, which can be used for timetable optimizing and is of important reference for operation management.

Key words: urban railway, train headway, operation efficiency, timetable optimizing, operation management
DEMAND-DRIVEN OPTIMAL OPERATION OF STATIONS ON SINGLE-TRACK RAILWAY

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Abstract: The stations are important components of the railway line and basic carrier for the transportation organization and operation, thus may have an adverse impact on organization and operation revenues if the number of it is too much or too little. Therefore, in planning and designing, it is necessary to plan the operation of the stations along the line in near and far-term future. Which will lead to reduce line operation cost as much as possible while ensuring transportation demand. This paper analyzes the matching relationship between capacity and transportation demand of single-track railways, and studies the reasonable range of the restricted interval of the station under transportation demand. Based on this, the station operation plan is calculated. Combination of theoretical calculation and graphic method is used to verify the station operation planning scheme. A planned railway line as an example, the proposed method is applied to study the optimal operation of stations. Recommendations for operation plan of each station in the near future are obtained. Besides, theoretical calculation and graphic method are used for verification.

Key Words: single-track railway, operation of stations, railway capacity

OPTIMIZED LAYOUT OF NEW EMU OPERATION DEPOT BASED ON IMPROVED MDVRP MODEL

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Abstract: With the expanding scale of China's high-speed railway network, the increase of new lines and the increase of train density, the existing layout and maintenance capabilities of the EMU operation depot have been difficult to meet the operational needs of the high-speed railway network, so it is necessary to combine the network planning of high-speed railways to optimize the layout of new EMUs in advance. In this paper, the influence of new lines and exiting lines on the layout is analyzed and a multi maintenance spots optimization model for EMU operation and maintenance are built by applying Multi-depots Vehicle Routing Problem (MDVRP) with resource constraints. Then, Taking the high-speed railway network in a certain area as an example, this paper designs two layout schemes for the operation depot, and finally the recommended layout scheme of EMU for this region is given by calculating and comparing the use of EMU in the short and long term.

Key words: High speed railway, MDVAR, EMU operation depot, Layout optimization, Railway network structure
OPTIMIZATION OF TRAIN OPERATION SCHEME FOR INTERCITY RAILWAY NETWORK

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Abstract: The intercity railway train operation scheme is an important part of the passenger transportation organization work. A reasonable operation scheme can greatly improve the efficiency and service quality of railway enterprises. This paper first analyzes and determines the five major influencing factors of the train operation scheme. Considering the benefits of railway transportation enterprises and direct passenger transportation as objective functions, the road capacity and passenger flow demand are used as constraints, the optimization model of the train operation scheme is established. Then design intelligent optimization algorithm to determine the running section of the train, the number of the train and the train stop plan, etc. Finally, a partial simple road network is constructed, which verifies the feasibility and effectiveness of the model and algorithm of the train operation scheme.

Key words: intercity railway, train operation scheme, influencing factors, optimization model

SIMPLE METHOD FOR INBOUND TRAIN RECEIVING AND ALLOCATION IN BIDIRECTIONAL MARSHALLING STATION

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Abstract: Bidirectional marshalling stations are usually large and will inevitably produce angular railcar flow. How to deal with the receiving yard and allocation of this flow is an optimization problem. In this paper, a hybrid-direction train with angular railcar flow is defined, and we derive the critical proportion value of an angular railcar flow receiving yard according to the operation time standards of the marshalling station, including the disassembly and assembly time of the two operation systems. To prepare the outbound train for departure as soon as possible, the exchange yard connecting time constraint is considered as a priority. This is a simple mathematical model in which the minimum total cost is established by transforming the time constraint into the cost constraint to allocate the railcar flows in the two operation systems separately. The results of the case study show that the rational use of angular railcar flow can be realized by considering the connection time and the number of exchange railcars on the basis of the critical proportion of angular railcar flow and the departure of the outbound train with a full load. This can provide a basis for the establishment of a marshalling station outline shift plan.

Key words: bidirectional marshalling station, angular railcar flow, hybrid-direction train, critical value, railcar flow allocation
THE DYNAMIC FUZZY BRITTLENESS ANALYZING OF HIGH-SPEED RAILWAY TRAIN CONTROL USING COLORED PETRI NETS MODEL

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Abstract: A train control system, which guarantees the operation security of a train, is one of the most important parts of the railway operation system. In this paper, the dynamic fuzzy brittleness of the train control system is studied. Firstly, the traditional brittleness theory is introduced, so as the Petri nets theory. Then the fuzzy credibility information is appended and the dynamic fuzzy brittleness is analyzed by monitors. Finally, the high-speed railway train control processes are modeled, and the dynamic fuzzy brittleness is analyzed, which show that the higher the transition level is, the larger the brittleness degree is, and so as the destruction strength. The brittleness relevance results imply the correlation intensions between the subsystems or the sub-transitions, which can be used to guide the security guarantee strength adjustment.

Key words: railway transportation, dynamic fuzzy brittleness, dynamic evolution, safety control

OPTIMIZATION AND SIMULATION RESEARCH ON THE HIGH-SPEED RAIL TRAIN TRACKING INTERVAL

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Abstract: The tracking interval between HSR trains is the key factors affecting the capacity utilization of HSR. The paper proposes the calculation method of the tracking interval and analyzes some factors influencing the tracking interval. Based on this, some effective ways to reduce the tracking interval are proposed, including train speed control, CTC system optimization, train platform scheme optimization and line design transformation. Then a train tracking operation simulation model is established by means of the Anylogic software, in order to minimize the arrival tracking interval of trains under the condition of sectional route release. Besides, the simulation process is designed to get the minimum train arrival interval time under different arrival-departure track application plans. Thus the influence of arrival-departure track application plans on the minimum arrival tracking interval can be got. Finally Shanghai Hongqiao Station is taken as an example to demonstrate the efficiency of the proposed simulation train operation model. The simulation results show that the minimum train arrival interval varies with the arrival-departure track application plan and the best arrival-departure track application plan for trains at Hongqiao Station is get, and in this condition the train arrival interval can reduced by 30 seconds.

Key words: High speed rail, minimum train arrival tracking interval, multi-agent simulation, the arrival-departure track application plan
Transportation Equipment Performance Analysis and Reliability
THE CORRELATION BETWEEN PATH LOSS AND CUTTING SCENARIOS BASED ON GREY CORRELATION DEGREE

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Abstract: Accurate wireless channel modeling is the basis of reasonable estimation of railway wireless communication system. In order to further understand the relationship between scenario and path loss, based on the path loss exponent of cutting scenarios, the correlation between parameters of cutting scenarios and ideal cutting scenarios is analyzed by using grey correlation degree algorithm. The preliminary conclusion is that the path loss exponent is more reasonable when the cutting scenarios parameters are within a certain range. The research results have some guiding significance for the collaborative work of cutting structure construction and wireless network construction.

Key words: cutting scenario, path loss exponent, grey relational algorithm

DESIGN OF GPS POSITIONING PROTOTYPE SYSTEM FOR CONTAINER MANAGEMENT OF SINO-EUROPE BLOCK TRAINS

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Abstract: In order to manage the container operation of Sino-Europe block trains efficiently, here, firstly, the business requirement of the SINO-Europe block trains is analyzed. Then, a positioning information system is established so as to get the information of container transportation overseas accurately and timely. Furthermore, in view of the characteristics of SINO-Europe block trains, the specific business process is designed to meet the demand of customers. Finally, the database model of such information system with UML and IDEF1X diagram is concluded.

Key words: SINO-Europe block trains, Positioning information system, Database model
THE FRAMEWORK OF EMU WHEELSET LIFECYCLE RAMS QUALITY MANAGEMENT PLATFORM

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Abstract: With the rapid development of China’s EMU in recent years, it is particularly important that carry out informatization management for the key components’ lifecycle quality of EMU. Based on the current situation of RAMS quality management, this paper presents the wheelset lifecycle quality management requirement from the perspective of the EMU key components. Then the wheelset lifecycle RAMS quality management platform is discussed with respect to the basic frame of railway transportation quality and safety management, and the cooperation framework of wheelset lifecycle RAMS quality management referred to the framework of key components’ lifecycle RAMS quality management platform. With its help, the service life of wheelset can be prolonged and the economic benefit can be improved.

Key words: wheelset, lifecycle, RAMS quantity management, EMU

INFLUENCE OF CURVE GEOMETRIC PARAMETERS ON CURVING PERFORMANCE OF SUB-FRAME RADIAL BOGIE

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Abstract: Based on the theory of vehicle-track coupled dynamics, the dynamic model of the freight car mounted with the sub-frame bogies and the numerical model of curved track were established, utilizing the fast numerical integration method, the vehicle curving performance was simulated to study the influence of the curve geometric parameters such as curve radius, transition curve length and superelevation of outer rail on wheel-rail dynamic interactions. The simulation results indicate that: (1) Increasing curve radius can decrease the wheel-rail wear, but the effect will weaken while the curve radius is greater than 800m. (2) If the transition curve length is less than 30m, vibrations will appear at the transition-circle connecting point, but when the length is bigger than 50m, its further variation has very little effect on wheel-rail wear. (3) The superelevation of outer rail affects the distribution and difference of the inner and outer wheel-rail forces, too large deficient or excessive superelevation will worsen the wheel-rail wear either. However, an appropriate deficient superelevation of outer rail (e.g. <20mm) is helpful to reduce the wheel-rail wear, which is consistent with the engineering practice of settling a certain deficient superelevation value.

Key words: heavy-haul freight car, sub-frame radial bogie, curve geometric parameters, wheel-rail wear
A DESIGN OF INTELLIGENT FOREIGN OBJECT INTRUSION DETECTION SYSTEM IN SUBWAY STATION TRACK AREA

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Abstract: The rapid development of urban rail transit has brought convenience to people's lives. The installation of the Platform Screen Doors (PSD) of the subway station provides passengers with a safe and comfortable waiting environment. The space requirements of the subway running track area are very strict. However, there is a hidden danger that the subway station platform has a foreign object thrown into the track to affect the driving safety. Therefore, in response to this hidden danger, this paper proposes a design scheme for intelligent foreign object intrusion detection system in the subway station track area. We use sensors to collect and transmit data and combine the intelligent algorithm to process the scanned data in real time. If there is any foreign object detected, an audible and visual alarm will be sent to remind the staff to confirm. The system can effectively alleviate the pressure on the staff and improve the safety of the station.

Key words: foreign object detection, foreign body invasion, subway station, track area, intelligent detection

THE INFLUENCE PROPERTIES ON CRTS II BALLASTLESS TRACK UNDER UNEVEN SUBGRADE SETTLEMENT

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Abstract: In order to investigate the deformation and mechanical property of CRTSII slab ballastless track during uneven settlement after subgrade construction, taking a 60m long soil subgrade line on the Beijing-Shanghai high-speed railway as an example, a simulation model of the type II slab ballastless track considering the contact characteristics between the upper layers of the track was established. On this basis, through research the influence of different cosine settlement parameters and the parameters of the track structure layer on the orbit, analyze the deformation and static properties of various structural layers of track under specific settlement conditions. Studies have shown that: based on the 20m wavelength range, after the sedimentation amplitude reaches 10mm, the interlayer contact performance of the track getting deteriorated, and the gap between the baseplate and the subgrade occurs, the stress of the baseplate increases the most, and the maximum compressive stress occurs at a magnitude of 40 mm; based on the 20mm settlement amplitude, the base plate-subgrade gap disappears after the settlement wavelength is 30m. The longitudinal stress of each structural layer of the track increases first and then decreases with the increase of wavelength, and the maximum stress occurs simultaneously at 30m; the reduction of the thickness of the track slab and baseplate has a greater impact on the static structure of the track slab structure; the reduction of elastic modulus of concrete has great influence on the track deformation and static performance, but has little effect on interlayer contact performance.

Keywords: track engineering, ballastless track, subgrade, uneven settlement, finite element
Having been attracting extensive attention of worldwide experts and professionals, transportation plays a vital role in the development of the global economy. The transportation industry is developing extremely fast with the establishment and improvement of the ITS theory, large-scale constructions of high-speed railways and the development of urban public transport, as well as the formation of Integrated Transportation System, the application of theories on Transportation and Socio-Economic Development and the progress achieved in the domain of Modern Logistics. The themes above have also become important issues in today’s transportation research field.

As the pace of globalization has accelerated, the transportation industry and its related scientific research, technological innovations and management concepts, are inseparable from international exchanges and cooperation. Therefore, the Sixth International Conference on Transportation Engineering (ICTE 2019) provides a great platform for worldwide experts and scholars in the field of transportation, to share their findings and exchange their ideas.

The International Conference on Transportation Engineering (ICTE), which involves various forefront issues in the field of transportation engineering, has obtained significant success and very good responses. It has become a “high standard, high level and great influence” conference in the field of international traffic and transportation.

The School of Transportation and Logistics of Southwest Jiaotong University (SWJTU) has hosted the first five ICTEs in Chengdu in 2007, 2009, 2011, 2013 and 2015 respectively. More than 500 experts and scholars from all over the world attended these conferences and over 1900 conference papers have been indexed via the EI Compendex. Having promoted academic exchanges, theoretical innovation and scientific/technical development in the field of transportation engineering, the success of ICTEs has far-reaching socio-economical significance.

The Sixth International Conference on Transportation Engineering (ICTE 2019) is held in September 20-22, 2019. The motif of “ICTE 2019” is “The Belt and Road, Connection, Shared Mobility, Green and Intelligence”. It is a platform of communication and discussions for worldwide experts and scholars in the field of transportation engineering. Their 127 peer-reviewed papers involve topics as follows:

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8. Urban Rail Transit Network Operations Technology;
9. High-speed Railway Operation Organization and Operation Safety;
10. Modern Logistics and Supply Chain Management;
11. Road and Railway Engineering;
12. Green Transportation and Low-Carbon Transportation;
13. Transportation Big Data Application Technology;
14. Transportation Organization Optimization Theory and Method;
15. Heavy Rail Transportation Organization Technology;
16. Transportation Equipment Performance Analysis and Reliability;
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