Water Transportation
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A Simulation Analysis of Ocean Container Freight Rates Using a System Dynamics Model

Luqi Ke
keluqi1993@gmail.com

Abstract: This research attempts to find the critical factors that affect ocean container freight rates and show the influences of each other as well as with container rates, using system dynamics modeling and simulation. The important influence factors in the container rate mechanism and their influences were discussed, determined, and quantified in the modules of the system dynamics model. As a case study, the simulation output is compared to real freight rate for the period of 2012 to 2016 which shows the supply-demand ratio has the greatest influence on the rate variations. Additionally, the US Dollar exchange rate adjusts freight rate and adds more fluctuation, which implies that stronger US Dollar will cause the freight rate to decrease. Moreover, bunker prices and empty container repositioning costs caused by trade imbalance also play significant roles in the freight rate price-fixing mechanisms applying in the liner market. In the scenario analysis, the assumption that the companies are rational and can successfully follow the market demand is released, and then the simulation output is much better. This approves that the unsuccessful supply displacement is the main problem of the volatile freight rate.

Keywords: Container liner shipping; freight rate; system dynamics; supply and demand
Profitability Challenged by Large Containerships: A Carrier’s Perspective

Wenming Shi (Australia)
Wenming.Shi@utas.edu.au

Kevin Li (Korea)
kxli@cau.ac.kr

Zhu Mo
上海海事大学 交通运输学院
mozhu@shmtu.edu.cn

Zhang Qiang
上海海事大学 交通运输学院
qiangzhang@shmtu.edu.cn

Ge Jia-wei
上海海事大学 交通运输学院
646435645@qq.com

Abstract: As of 2017, the container shipping market faced persistently low freight rates, owing to the mismatch between sluggish demand for container shipping services and overcapacity of containerships, especially of the arrival of more large containerships. Placing emphasis on the overcapacity problem, this paper aims to examine how an individual carrier’s capacity expansion decision about the use of large containerships affects other carriers, which in turn affects industry profitability. The perceived inconsistency between the firm and industry-level profitability of using large containerships can clearly explain the overcapacity problem in a systematic manner. More specifically, at the firm level, a case study of the East Asia-Europe route confirms attractiveness and popularity of large containerships, while the industry-level impact of using large containerships are discussed from the supply chain cost perspective. In addition, a possible solution is suggested from a carrier’s perspective to help the container shipping industry improve its unprofitable situation.

Keywords: Container shipping; Overcapacity problem; Large containerships; Profitability
Analysis of the Latent Risk of Ship Evacuation during a Tsunami using AIS Data

Gao Xin-jia
xjgao@shmtu.edu.cn

Abstract: This study aimed at the prevention of stagnation of the overall integrity and functions a port in the event of a huge natural disaster, by focusing on the safety evacuation of vessels responsible for the primary functions in the harbor. In the event of a tsunami or a huge typhoon, in particular, not only a port's facilities and ships may be damaged but the people living in coastal areas are also at risk of serious danger. In addition, if a large ship floating in the sea faces difficulties in maneuvering, it can be a potential source of serious damage. Disaster mitigation measures are aimed at mitigating such factors in future disasters and solving problems that require immediate attention. When considering these countermeasures, a detailed understanding of the evacuation status of ships is a necessity.

This study analyzed the movements of ships in a port area that received a tsunami warning by using data obtained from the Automatic Identification Systems (AIS) of the vessels in Tokyo Bay. The results show that most tanker ships in each port of Tokyo Bay started evacuating approximately 30 minutes after the tsunami warning and completed evacuation to outside the port within 60 minutes of the announcement. The results aid in the understanding of the actual status of ship evacuations. In addition, to examine the refuge waters outside the port for ships after evacuation, an analysis was conducted using a kernel density presumption analysis was conducted based on the distance between anchoring ships during evacuation. Danger areas where the distances between ships were too close were analyzed and identified.

Keywords: ship evacuation; Tsunami; AIS; ship behavior analysis; latent risk
Location Characteristics of Cruise Terminals in the Asian Region: Lessons in Hong Kong and Shanghai

Yui-yip Lau
Hong Kong Community College, The Hong Kong Polytechnic University
yylau@hkcc-polyu.edu.hk

Tsz Leung Yip
Department of Logistics and Maritime Studies, The Hong Kong Polytechnic University, Hong Kong, China
t.lyip@polyu.edu.hk

Abstract: Cruise is explained as any fare paying voyage for leisure on-board a vessel whose primary objective is the accommodation of guests and not freight normally to visit different destinations instead of operating fixed routings. Start from the late 1960s, the cruise industry has been appeared in the two key regions, namely European and North American. However, the cruise industry has undergone fundamental changes implies that a growing frequent cruisers supposed diverse cultures, attractive cruising destinations and exotic experiences in Southeast Asia for western travelers, and thus cruising in the Asian region has been happening at an enormous growing stage. Among the Asian regions, Hong Kong and Shanghai can be described as home port cruises in the 21st century. However, Hong Kong and Shanghai cruise terminals need to deal with neighboring competitors like Taiwan, Singapore, Japan, Vietnam, to name but a few, in a challengeable and dynamic environment. In order to examine Hong Kong and Shanghai’s potential evolution into an international cruise terminal hub, we suggest CRUISE framework to seize attainable prospect of the external environment and investigate locational characteristics of cruise terminals in Hong Kong and Shanghai respectively. The first mover advantage and sustainable competitive advantage will be performed. Academic and managerial implications of the research findings for cruise terminals are elaborated.

Keywords: cruise terminal; Hong Kong, Shanghai; location characteristics; CRUISE framework
Study on the Sub-period Forecast of the Chang Jiang River Trunk Freight Volume

Li Jun
School of Engineering, Sun Yat-sen University
stslijun@mail.sysu.edu.cn

Wan Li-cheng
School of Engineering, Sun Yat-sen University
wanlch3@mail2.sysu.edu.cn

Abstract: The accurate forecast of the freight volume on the Chang Jiang River trunk line is of great significance for the freight policies of the Chang Jiang River. However, the existing researches on the freight volume forecast are difficult to obtain the satisfactory results with only consideration of its non-natural influence factors. This study aims to develop a sub-period forecast model of the freight volume of the Chang Jiang River trunk line based on the support vector machines (SVM) in consideration of the both non-natural factors and natural factors affecting the freight volume. The low-water period and high-water period are calculated separately according to the actual periodic water condition in the Chang Jiang River. The results show that the accuracy of the sub-period forecast model is nearly doubled compared with the traditional forecast model, and the proposed method is practical for more accurate forecast of the Chang Jiang River trunk freight volume and can also be applied to other similar forecast scenarios.

Keywords: Chang Jiang River; Trunk line; Freight volume; Sub-period forecast; Support vector machine
Traffic Impact Analysis of Inspection Area Site Selection at Foreign Trade Container Terminal

Zhou Yong
Shanghai Maritime University
zhouyong@shmtu.edu.cn

Ge Ying-en
Shanghai Maritime University
yege@shmtu.edu.cn

Wang Wen-xuan
Dalian University of Technology
wangwenyuan@dlut.edu.cn

Abstract: For the security of ports and the container shipping industry, a key problem for a foreign trade container terminal is the planning and design of inspection area. Layout site of inspection area directly affects terminal truck traffic, so determination of inspection area site should pay attention to terminal truck and make convenient for container inspection and terminal traffic. This paper uses simulation to evaluate traffic impact of inspection area site selection at foreign trade container terminal. A real-world foreign trade container terminal is chosen to do a case study and traffic volume of terminal road network, segments and intersections are compared for two schemes of inspection area layout sites. The results show that inspection area should be laid out close to terminal gate if conditions permit from the point of terminal traffic, which can provide a reference for the planning and construction of foreign trade container terminal.

Keywords: Foreign trade container terminal; inspection area; site selection; traffic
Crucial Factors Influencing International Logistics Operations for Africa Landlocked Country

Yu-Kuo Chang
joseph.chang@opl.com.tw

Ching-Chiao Yang
yangcc@mail.nkmu.edu.tw

Abstract: This study aims to evaluate the crucial factors influencing international logistics operations for Africa landlocked developing country. Data were collected by questionnaire survey from the view of container shipping companies. Results of factor analysis reveal that transportation capability, external risks, information integration, logistics infrastructure, local agents’ logistics capability, and nation’s law and policy were crucial factors influencing the logistics operations for Africa landlocked countries. Specifically, local agents’ logistics capability was perceived by respondents as the most important factor. Moreover, results indicated that small size shipping companies had their highest factor mean value on external risks and local agents’ logistics capability, whereas container shipping companies who arranged the truck for inland transportation payed more attentions on external risks, logistics infrastructure, local agents’ logistics capability, and nation’s law and policy.

Keywords: Logistics operations; Landlocked country; Factor analysis; Africa
Application of Data Mining Technique on the Port State Control – A Study on the Tokyo MOU

Taih-Cheng LIRN
tedlirn@hotmail.com

Ming-Cheng Tsou
MCTSOU@WEBMAIL.NKMU.EDU.TW

Kuo-Chung Shang
gordon@mail.ntou.edu.tw

Abstract: To know whether foreign vessels meet the international conventions’ requirements, port state control officers have to inspect the suspicious non-Taiwanese flag and substandard vessels when these vessels visit international ports in Taiwan. A study employs the massive data mining technique to investigate important attributes of these suspicious vessels by using data stored in the Tokyo Memorandum of Understanding database is highly desired. Once these attributes are found, our international ports PSCOs can minimize their PSC inspection frequency and interferences with the non-suspicious vessels, and finally our ports’ overall performance can be improved greatly.

Two major issues are discussed in this early investigation project. Firstly, the inspected vessels’ deficiency and detention information recorded in the Tokyo MOU are collected and surveyed, there are five variables considered important for this research, which include age of vessels, duration of detention, whether the inspected ship is classified by IACS members, gross tonnage of vessels, and whether if the ships fly a flag of convenience. The binary logistic regression technique is finally employed to analyse the relationship between the duration of detention to age of vessels, if the ship is classified by a member of the IACS, and the gross tonnage of vessels. Furthermore, an analysis on the degree of importance of decisive attributes on the prolonged detention of the ship is carried out. Finally, operational models of the port state control in the other major foreign ports are reviewed and classified. Research findings from this early investigation can be employed as a cornerstone to support the future PSC research using the other massive data mining technique.

Keywords: Big data analysis; Tokyo MOU; IACS Members; Port State Control
Ship Pooling and Market Power in the Containership Charter Market

Qing Liu(Germany)
qing.liu.winter@gmail.com

Sebastian Ehlert(Germany)
Sebastian.Ehlert@wiso.uni-hamburg.de

Thomas Hartwig(Germany)
hartwig@doehle.de

Abstract: Consolidation activities among container liners have caused a high discrepancy of market share sizes and market power between liners and their counterparties in the market. In the containership charter market, a large number of small non-operating ship owners (NOO) are facing against a few very large liners and their alliances.

Owner pooling and containership charter market have been scarcely studied in literature. This study introduced ship pooling as a collaboration method among NOOs in the ship charter market to gain countervailing power against their powerful customer—the liners and their alliances. In addition to some common business benefits of the forming alliances to mitigate risk, stabilize revenue and improve flexibility, the market return potentials are also checked by analyzing an extensive containership fixture dataset.

In addition to critical characteristics of the vessels and charter contracts, the impact of the sizes of the negotiation parties are particularly checked. Evidences are found that larger charter owners (or the large pools) tend to obtain higher charter prices and higher market power for the study period 2009 to 2017.

Furthermore, containership idle rate is strongly negatively correlated with the average time-charter rates. Overcapacity issue after 2008 has been the fundamental reason of a depressed global shipping market. When oversupply is above 5%, the intensive competition from the suppliers’ side reduces the containership time-charter price close to the operating cost of the most efficient charter owners in the market and the market is no longer sustainable in the long run.

Keywords: containership charter market; charter price, market size; negotiation power; liner alliances
21世纪海上丝绸之路我国沿海港口类型化研究

陈磊
（大连海事大学）

摘要：对21世纪海上丝绸之路我国沿海主要港口采用主成分分析和聚类分析相结合的方法，进行类型化研究，发现我国沿海港口发展现状不尽相同，同时所处经济发展环境存在差异。为此，根据“一带一路”区域物流一体化发展要求，结合港口类型化研究结果，为每一类港口进行了准确的发展定位与功能设定，从而使港口之间形成明确分工，达到协调、持续发展的目的。最后，在港口类型化研究的基础上提出了提升我国沿海港口产业整体化水平、明确港口间的资源分配机制、实现港城一体化发展体系等促进21世纪海上丝绸之路我国海上运输体系一体化的建议。

关键词：类型化；主成分分析；聚类分析；港口；21世纪海上丝绸之路

The 21st Century Maritime Silk Road The Type of Coastal Ports in China

Chen Lei
(Dalian Maritime University)

Abstract:
Along with the 21st century maritime silk road, China’s main ports are analyzed with both principal component analysis and clustering analysis. The study finds current situations of the development of China’s coastal ports are diverse as well as there exist differences in economic environment of areas the ports located in. In accordance with requirement of regional logistics integration development of the Belt and Road, combined with the study on the port type, this article sets accuracy development positioning and function for each type of the ports and achieves the purpose of coordinated and sustainable development. At the end, based on the study, it puts forward suggestions on promoting the integration of China’s seaborne transport system along with the 21st century maritime silk road, such as to promote the integration of China’s coastal port industry, to clear and definite the resource distribution mechanism among the ports and to realize the integration development system of ports and cities.

Keywords: Classify; Principal component analysis; Clustering analysis; ports, Maritime silk-road in the 21st century

作者简介：陈磊，大连海事大学，电话：18042682036，邮箱：chenlei258000@163.com。
Abi-objective Programming Model for Uncertain Liner Shipping Service Considering Berth Allocation and Emissions

Wen Xin
Shanghai Maritime University
985651039@qq.com

Ge Ying-en
Shanghai Maritime University
yege@shmtu.edu.cn

Abstract: Uncertainty in liner shipping service is a challenging issue in planning liner shipping service because it may have a significant adverse effect on port operations and accordingly on ship scheduling, both economically and environmentally. Especially more than 90% of schedule unreliability is attributable to port-related uncertainties. This paper focuses on the liner ship fleet scheduling problem with consideration of berth allocation, sailing speed at each leg, arrival and berthing times at each port, which aims to obtain cost efficiency, service effectiveness and best environmental performance. This problem is formulated as a bi-objective programming model to achieve the trade-off between the total cost of shipping lines and terminal operators and the schedule reliability. To reduce the uncertainty in liner shipping service, the robust arrival and departure time windows and fuzzy handling times at ports are taken as supplementary measures to slow steaming. The fuzzy programming approach is used to solve the bi-objective formulation. A case study is provided to illustrate the results and the application of the model in uncertain scenarios.

Keywords: Liner shipping; Ship scheduling; Uncertainty; Robust optimization; Fuzzy programming; Carbon emissions; Berth allocation
Long-term Forecast for Seaborne Trade

Xiaoning Shi(Sweden)
World Maritime
xs@wmu.se

Abstract: Besides technological progress and political willingness discussed, demand for transport primarily responds to the economic environment. There has been a close statistical correlation between the growth of Gross Domestic Product (GDP) and growth in seaborne trade volume. In other words, economic activity and trade are still the main drivers of transport demand. Based on our statistical tests, growth in GDP per capita has a positive effect on the all freight transport volume, and seaborne trade especially.

In this paper, when forecasting the projected transport volume by 2040 as an output, the economic environment are used as an input and GDP as its proxy accordingly. Based on this, the long-term forecast of seaborne trade by 2040 is conducted. It should also be addressed that emerging economies, transaction economies and advanced economies are enjoying different speeds of macroeconomic development.

Keywords: seaborne trade; long-term; forecast; multiple regression
雇佣救助法律适用的案例探讨及对策建议

彭赞
（交通运输部南海救助局湛江救助基地）

摘 要：雇佣救助是指救助方依据被救助方的请求实施救助，不论救助成功与否，都按照约定的费用收取报酬的行为。雇佣救助在当前救助实践中的应用越来越多，但是在法律上却缺少针对性强和具有可操作性的规定。本文结合“加百利”案的纠纷焦点和判决结果，对雇佣救助的基本概念和法律属性进行分析探讨，进而得出雇佣救助的法律适用，最后形成若干建议。

关键词：“加百利”案；海难救助；雇佣救助；雇佣救助合同；“无效果 无报酬”救助合同；法律适用

Case Study and Countermeasures Proposals of Legal Application at Employed Salvage

Peng Zan

Abstract:

Employed Salvage means that, regardless of whether the rescue is successful or not, the Rescue Party provide rescue services as the Rescued Party required and charge at the agreed price. There are more and more applications of employed salvage in practice. However, there is a lack of clear legal basis and operable regulations. This paper combines the dispute focus and judgment results of the Gabriel case, analyzes and discusses the basic concepts and legal attributes of employed salvage, and then concludes that the legal application at employed salvage, and finally forms some suggestions.

Keywords: The Gabriel Case; Salvage At Sea; Employed Salvage; Employed Salvage Contract; “No Cure No Pay” Salvage Contract; Application of Law.  

作者简介：彭赞，交通运输部南海救助局湛江救助基地，电话：15989004828，邮箱：19170794@qq.com。
Empirical Analysis of Boundary Effects of Emission Control Areas

Chen Qiong  
Shanghai Maritime University  
john704653@163.com

Ge Ying-en  
Shanghai Maritime University  
yege@shmtu.edu.cn

Wang Zhi-huan  
Shanghai Maritime University  
zhwang@shmtu.edu.cn

Abstract: This paper carries out an empirical analysis of ship trajectories going through or along the edge of emission control area (ECA). It is found that some ships sailed around the boundary of an emission control area to avoid low speed or use of quality or more expensive oils while traveling within ECAs has to experience. Unfortunately, this phenomenon actually leads to an increase in pollutant emissions and forms a contaminated area near ECAs although it is further away from the coastal area where people may reside at a high density. Without question, this adversely affects climate change. We term this the boundary effects of ECAs. Our investigation also shows that this phenomenon is related to the location of ports and ECAs. According to the study of ECA on the west coast of North America using the AIS data recorded in March 2015, we found that almost all of the ships that experienced this phenomenon were cargo ships plus a few of tankers, excluding container ships. We also analyze the trajectories of global voyages of a particular vessel in 2012 and 2015. This research shows the impacts of the establishment of ECAs on ship navigation and provides a theoretical and empirical basis for us to think about how to further reduce and transfer pollutant emissions from ships and their adverse effects.

Keywords: ECA; AIS(Automatic Identification System); Ship track; Boundary Effect
基于 AIS 数据的开放水域船舶碰撞风险评估模型

张伟斌1, 冯馨予

(1. 南京理工大学 电子工程与光电技术学院)

摘要：在繁忙的开放水域，船舶间的碰撞风险是影响海上安全的主要因素之一。现有的研究多从单艘或两艘船的角度分析海上船舶的碰撞风险，建立一个微观层面的风险模型。然而，区域风险模型的缺失可能会阻碍水运安全管理的改善。考虑到船舶航行的时空特性，本研究提出了一种新的基于船舶自动识别系统（AIS）的区域风险网络模型。结合海上交通流量状况在区域背景下构建各船舶间的碰撞风险的框架，并引入改善后的 VCRO（船舶碰撞风险算子），得到一个宏观层面的风险模型。与先前的研究相比，本研究将碰撞风险分为碰撞风险发生的可能性与碰撞可能带来的后果，通过建立风险矩阵，更好地建模了船舶在相遇过程中的碰撞风险。通过分析和验证，表明该模型在船舶航行的区域风险评估方面更具可靠性和准确性。

关键词：海运安全；船舶自动识别系统；船舶碰撞风险算子；区域风险网络；碰撞风险

Towards the Model of Vessel Collision Risk Assessment for Open Waters Based on AIS Data

Zhang Weibin, Geng Xinyu

Abstract:

In some busy open waters, the risk of ship-ship collision is one of the major factors to affect the maritime safety. Some current studies mostly analyze the vessel collision risk at sea from a single vessel or two vessels and establish a micro-level risk model. However, modeling of regional risk for maritime transport is still lacking, which may hamper the efforts of safety management improvement. Considering the spatial and temporal property of ship trajectory, a new regional risk network model based on Automatic Identification System (AIS) is proposed in this study. And this study combined with the traffic flow and a modified vessel collision risk operator (VCRO) in maritime to establish the framework of vessel collision risk in a regional background, which is a macro-level risk model. Compared to previous studies, this study divided the risk of collision into the possibility of collision risk and the bad consequence of collision. By establishing a risk matrix, we can better model the collision risk during the process of encountering. Through the analysis and verification, the model is more reliable and accurate in the regional risk assessment of ship navigation.

Keywords: maritime safety; Automatic Identification System; vessel collision risk operator; regional risk network; collision risk

作者简介：张伟斌，南京理工大学电子工程与光电技术学院，电话：13236532288，邮箱：wbin.zhang@outlook.com。
UAV Applications and Intension to Use in the Maritime Shipping

Chung-Shan Yang
r58951022@yahoo.com.tw

Abstract: The purpose of this study is to empirically evaluate the impact of UAV applications and acceptable cost on intension to use UAV in the maritime shipping context. Factor analysis was employed to identify the key UAV applications (i.e. pollution forensics, supervision and service, search and rescue, humanitarian and emergency delivery, and safety and security), UAV acceptable cost, and intension to use UAV. Using survey data collected from 201 respondents working for maritime port corporation, shipping company, agency, and stevedoring company, and then hierarchical regression analysis used to test the research hypotheses and examine the UAV applications and acceptable cost dimensions on intension to use UAV. The results suggest that pollution forensics, supervision and service, search and rescue, humanitarian and emergency delivery, and safety and security dimensions positively affect intension to use UAV. The study findings also reveal negative associations between seniority, turnover, and intension to use UAV. Theoretical contributions and managerial implications are drawn to maritime port bureau, corporation, and operators for policy and operating practices design and remaining competitive and efficient.

Keywords: Maritime UAV applications; Pollution forensics; Supervision and service; Search and rescue; Humanitarian and emergency delivery; and Safety and security
Safety Marketing, Safety Awareness, and Safety Behavior in Ferry Services: A Passenger’s Perspective

Chin-Shan Lu
chin-shan.lu@polyu.edu.hk

Abstract: This study examines passengers’ perceptions of safety marketing, safety awareness, and safety behavior in ferry services based on the service route between Hong Kong and Macau. Based on a questionnaire survey, 316 respondents who have travelling experience to Macau by ferry were collected. A structural equation modelling was conducted to examine the relationships between safety marketing, safety awareness, and safety behavior. Research findings indicated that passengers’ perceptions of ferry safety marketing had a positive influence on passengers’ safety awareness; while safety awareness is positively related to safety behavior. This research provides useful information and managerial implications for ferry operators to concern the influence of safety marketing and passengers’ safety awareness on safety behavior in ferry safety.

Keywords: Ferry; Safety Marketing; Safety Awareness; Safety Behavior
Prediction of Wave Characteristics by Numerical Wave Model

Long Yanghua
hlyang@dlmu.edu.cn

TheinSaw Nu Sanda
snsdts@gmail.com

Abstract: According to the instant development of maritime transport all over the world, Myanmar, as a developing country, also needs to upgrade existing ports and to construct new deep-sea ports for larger vessels. There are some potential areas for deep-sea port project along Myanmar coastline. One of the most important challenges for coastal engineering is to understand the basic knowledge of local wind generated waves. These are vital factors not only for vessel navigation in the entrance channel but also for coastal structures. Due to the absence of long-term in-situ data and high cost of wave measurements, especially for the area of interest, coastal engineers have to estimate wave characteristics using a variety of methods, which involve empirical and numerical solutions.

The main purpose of this paper is to predict the wave characteristics for coastal regions of Myanmar by using a third-generation numerical wave model SWAN (Simulating WAves Nearshore). In this paper, the generation of waves by a constant wind filed blowing over a fetch limited area is presented firstly and the results are compared with empirical formulae for validation. The simulated significant wave heights and wave periods are well agreed with the results from empirical equations. And then, numerical simulation is carried out with actual wind field for the duration of average maximum wind speed in the Bay of Bengal monsoon season. The calculated wave parameters are compared with the ECMWF (ERA-Interim) reanalysis data sets. Finally, the wave characteristics for future port development sites are predicted.

Keywords: SWAN Wave Model; Wind-generated Wave; Numerical Simulation; Wave Characteristics; Monsoon Season.
山区河流港口码头钢构件防腐涂层抗冲蚀性能比较分析

曾丽琴
(重庆交通大学)

摘要：山区河流由于存在覆盖层浅及深水施工等问题，码头下部结构更多采用钢管混凝土嵌岩桩型式，桩基及纵横撑均大量使用钢结构，钢构件防腐涂层受含沙水流冲蚀磨损，出现大范围脱落。针对山区河流大流速、含沙量大的环境特点，本文通过对钢构件防腐涂层模拟在含沙水流环境中的冲蚀试验，对比研究三种防腐涂层在不同冲蚀条件下的抗冲蚀性能，获得不同冲蚀条件下防腐涂层的磨损规律。通过对比分析三种防腐涂层的基本性能，优选出适合山区河流冲蚀环境的高性能防腐涂层。结果表明：防腐涂层的冲蚀磨损失重量随着冲蚀速度的增加而增加，涂层冲蚀率与冲蚀流速呈现指数相关，与冲蚀时间呈线性相关，与冲蚀含沙量呈指数相关；不同冲蚀条件下，模具硅橡胶涂层质量累计冲蚀率和壁厚累计冲蚀率都小于山区河流港口码头现有的钢构件环氧沥青漆涂层，其抗冲性能良好，为今后研发适合山区河流冲蚀环境的高性能长寿命防腐涂层材料提供了依据。

关键词：含沙水流；防腐涂层；冲蚀试验，模具硅橡胶涂层

Comparative Study on Erosion Resistance of Steel Coatings in Mountain River Docks

Zeng Liqin
(Chongqing Jiaotong University)

Abstract:
Due to the shallow covering and deep water construction in mountainous rivers, the substructure of wharf usually uses reinforced concrete rock-socket pile. Pile foundation and crossbar extensively use steel member. Because of sediment laden flow erosion, steel member anti-corrosion coating occur a large extent of shedding. For the large flow of mountain river, sandy environment characteristics, in this paper, we simulate steel member anti-corrosion coating in erosion test in sandy flow environment and study erosion resistance of three anticorrosion coating in different erosion conditions. We get anticorrosion coating in different erosion conditions wear rule. By comparing the three basic properties of anticorrosion coating, we select suitable for mountain river erosion environment of high performance anticorrosion coating. The results show that the loss weight of erosion wear of anticorrosion coating increases with the increase of erosion velocity. The coating erosion rate is exponential with the erosion flow rate. The coating erosion rate and erosion time was linearly correlated. The coating erosion rate is exponential with erosion sediment concentration. Under different erosion conditions, silicone rubber coating quality cumulative erosion rate and wall thickness cumulative erosion rate less than steel components.
epoxy bituminous anti-corrosion paint coating erosion in mountainous rivers port terminals. The impact resistance is good. It provides a basis for the future research and development of high performance long-life anti-corrosive coating materials suitable for mountain river erosion environment.

**Keywords:** sediment laden flow; anti-corrosion coating; erosion test; die silicon rubber coating

作者简介：曾丽琴，重庆交通大学，电话：15922720313，邮箱：815492334@qq.com。
Adaptation Strategies for Port Infrastructure and Facilities at Kaohsiung Port under Climate Change

Ge Ying-en
Shanghai Maritime University
yege@shmtu.edu.cn

Abstract: The growing impact of climate change on port infrastructure currently threatens to result in a rising frequency of such serious natural disasters and accidents as rising sea level, increasing extreme weather, increasing intensity of tropical storms and typhoons, rising wave height surmounting breakwater design levels, heavy rain exceeding quay well drainage capacity, and rising ocean temperatures, causing the deterioration of harbor water quality.

The paper’s methodology consists of a vulnerability assessment and use of a risk management matrix employing a fuzzy system. The former consisted of questionnaire survey of experts at shipping companies and port management offices in the port of Kaohsiung which sought to perform vulnerability analysis of port infrastructure and facilities under the impact of severe typhoons; the latter sought to identify adaptation strategies for port infrastructure and facilities at the port of Kaohsiung under the impact of climate change based on the risk management matrix approach.

The chief findings of this paper consisted of the following:

1. Ten vulnerability assessment criteria for the impact of climate change on port infrastructure and facilities were determined.
2. The top moderate risk areas potentially impacted by typhoons included ground roads and access roads in the port area, and drainage facilities in flooding-prone areas.
3. Adaptation strategies for the moderate risk areas impacted by serious typhoon, the former is to regular inspect and maintenance on road pressure and drainage power; the latter is to make pavement rising and drainage capacities improvement in the flooding-prone areas.

Keywords: Seaport; port infrastructure; vulnerability analysis; adaptation strategy
Spatio-temporal Evolution of Ecosystem Service Values in Port Areas

Diao Zhen
大连理工大学 海岸和近海工程国家重点实验室
dudiaozhen@163.com

Abstract: The continuous development of maritime industry has brought a marked increase in the construction land of port areas. China possesses a large number of ports, whose ecological problems have received more and more attention. Frequent human activities had caused dramatic changes of land use pattern in port areas in the past decades, which brought a significant impact on local environment. Together with the RS, GIS technologies, we relied on land use pattern analysis and ecosystem service value evaluation methods to analyse the ecosystem service value changes of study area. The authors found that from 1995 to 2015, the area of ecological lands reduced significantly in the study area. The area of woodland reduced the amount of 104.13 hectares, while the area of grassland and waterbody reduced the amount of 109.8 and 140.76 hectares, respectively. The total ecosystem service value of the study area was 3.84×10^7 Yuan in 1995 and 2.25×10^7 Yuan in 2015, with a reduction of 1.59×10^7 Yuan from 1995 to 2015. Besides, the value from water reservation had the greatest decrease, followed by the waste disposal and climate regulation. This study aims to provide references for the ecological environment protection in port areas.

Keywords: port area; land use change; ecosystem service value; spatio-temporal evolution
基于 STAMP 模型的“东方之星”号客轮翻沉事件致因分析

隋忠义，周春辉，文元桥，韩栋，周玲
（武汉理工大学 航运学院）

摘 要：随着社会技术系统愈发复杂，船舶的安全管理俨然变成一个复杂的系统工程，船舶的航行安全需要船员、航运公司、监管部门的相互协同，共同作用，所以对其进行深入的分析以改进和提高系统性能还是很有必要的。本文引入 STAMP 模型 (Systems-Theoretic Accident Modeling and Process)，对“东方之星”号客轮翻沉事件进行分析，分别从船员、船公司、海事管理部门三个层面进行分析，建立系统分层安全控制结构，识别其安全约束，找出各个层面的失效和不恰当的控制行为和各自之间的不安全交互，并对非线性高度复杂的客船安全管理提出建议。目前，国内外将 STAMP 模型应用于水上交通行业的研究并不多见。因此，以“东方之星”号客轮翻沉事件为例，引入 STAMP 模型对其进行致因分析，具有较大的意义。

关键词：STAMP；东方之星；系统理论；水上交通；致因分析

A STAMP-based Analysis of the Eastern Star Ferry Accident

Sui Zhongyi, Zhou Chunhui, Wen Yuanqiao, Han Dong, Zhou Ling

Abstract:

With the increasingly complex social technology system, safety management of passenger ships has become complicated system engineering, the navigation safety of ships requires the cooperation of the crew, shipping companies and regulatory authorities, and therefore it is still very necessary to carries on the deep analysis to improve the performance of the system. In this paper, Systems-Theoretic Accident Modeling and Process (STAMP) are used to analyze the Eastern Star ferry accident from crew level, ship company level and maritime management level. Establish the system security control structure, identify its security constraints, and find out the failure and inappropriate control actions at all levels and the unsafe interaction between them. Propose some improvement measures for the passenger ships safety management of highly complex and nonlinear. At present, there are few researches on the application of STAMP model to the water transportation industry in the world. Therefore, it is of great significance to introduce the STAMP model to analyze the causes of the Eastern Star ferry accident.

Keywords: STAMP; Eastern Star; system theory; water traffic; causal analysis

作者简介：隋忠义，武汉理工大学航运学院，电话：18696118075，邮箱：122643563@qq.com。
船舶起重机吊钩形状优化

陈海泉，龙培基，吴俊杰
（大连海事大学 轮机工程学院）

摘 要：由于起重机吊钩在海上作业时受到频繁的冲击载荷作用，使得吊钩容易发生疲劳断裂。为了进一步加强吊钩的结构强度，研究起重机的大开口吊钩的偏斜角度、吊钩的开口直径和吊钩壁最大厚度位置，这三个参数对起重机吊钩的影响。对起重机吊钩进行参数化建模，利用 ansys 进行数据仿真分析，对吊钩强度进行优化分析，为吊钩进一步的增强可靠性提供依据。

关键词：参数化建模；船舶起重机；吊钩；形状优化

Shape Optimization of Hook for Marine Crane

Chen Haiquan, Long Peiji, Wu Junjie

Abstract:

The hooks are prone to fatigue fracture due to the frequent impact loads on the hooks at sea. In order to further strengthen the structural strength of the hooks, the influence of the three parameters on the hooks is studied, such as the deflection angle of the hooks with large openings, the opening diameter of the hooks and the position of the maximum thickness of the hook walls. The main points are as follows: parameterized modeling of crane hooks, data simulation and analysis with ANSYS, and optimization analysis of hooks’ strength, which provides basis for further enhancing reliability of hooks.

keywords: Parametric modeling; Ship crane; hook; Shape optimization

作者简介：陈海泉，大连海事大学轮机工程学院，电话：18580122017，邮箱：18580122017@163.com。
Robust Liner Shipping Routes and Schedules Planning under Uncertain Weather and Ocean Conditions

Li Mingyu
School of Naval Architecture, Ocean and Civil Engineering Shanghai Jiao Tong University
limingyu@sjtu.edu.cn

Abstract: Since sailing in the Northern Sea Route (NSR) through the Arctic Ocean comes into reality, commercial developments including opening new liner shipping services along this route have been put on the agenda. However, uncertainty in weather and ocean conditions in this region, especially during temperature-varying seasons, may lead to failure to on time arrivals, resulting unignorable or even unaffordable monetary losses. As a result, such uncertainty will inevitably affect the customers’ willingness of using NSR, even if on average its shipping time is much shorter than that of the traditional Asia-Europe shipping lines. In this context, the present paper describes a single-ship liner routing and scheduling problem considering time-sensitive demand and late-arrival penalty. For two types of uncertainty sets, bounded and budget-bounded uncertainty sets, their corresponding robust counterparts are proposed. The deterministic model and bounded robust model can be seen as special cases of the budget-bounded robust model when the uncertainty budget is set to null or full respectively. A case study of planning liner shipping routes and schedules along NSR is performed to validate the efficacy of the proposed models and explore the effect of uncertainty bounds and budgets. The computational results from the case study reveal that robust model functions the best under the worst condition; the sequence in the route to be visited of a port decides the weight of its uncertainty budget on the whole shipping line, and setting the uncertainty budget in a decelerating way will enhance the robustness of the solutions.

keywords: liner routing and scheduling; uncertain weather and ocean conditions; uncertainty bound; uncertainty budget; robust optimization; mixed integer linear programming
唐山京唐港区航道等候区设置的探讨

苏华伟，章文俊
（大连海事大学）

摘 要：唐山京唐港区货物吞吐量增长飞速，现有航道拥挤程度严重，大型船舶乘潮进港需要占用整个航道，导致中小型船舶无法进出港。文章根据港口 VTS 连续记录的船舶进出港数据，利用统计软件分析船舶进港驶入主航道的位置及方向，出港船舶下主航道的位置及方向。从实际应用的角度出发，结合所分析数据的特点，根据航道周围海域的环境提出设置船舶航道等候区，对于船舶进出港的效率有明显的提升。以不扩建现有航道和经济消耗为代价，这种方法提高航道效率是可行的。

关键词：京唐港；统计分析；航道等候区；通航效率

Study on the Zone of Channel Waiting in Jingtang Port of Tangshan

Su Huawei, Zhang Wenjun
(Dalian Maritime University)

Abstract:

The cargo throughput of jing tang area of Tangshan port has been increasing rapidly, and the existing shipping lanes are so crowded that large ships need to take up the whole navigation channel in the port of tidal entry, resulting in the inability of small and medium-sized ships to enter the port. According to the data of the ship's inbound and outbound data recorded by VTS, Statistical software is used to analyze the position and direction of the ship entering into the main channel, and the position and direction of the main channel of the vessel under the port of departure. From the perspective of practical application, combining with the characteristics of the analyzed data, according to the passage of the waters around environment set shipping channel waiting area, for the ship, or efficiency significantly. It is feasible to improve the efficiency of the channel by not expanding the existing waterway and economic consumption.

keywords: Jing tang area; Statistical analysis; Zone of channel waiting; navigation efficiency

作者简介：苏华伟，大连海事大学，电话：18342211790，邮箱：suhuawe1629@163.com。
新时代我国国际航运中心的发展内涵和思路

张晓晴 孙瀚冰 毕珊珊 刘长俭

（交通运输部规划研究院）

摘 要：党的十九大提出了习近平新时代中国特色社会主义思想，为交通和水运行业发展指明了前进方向。为明确新时代我国国际航运中心的发展思路，本文在梳理了国际航运中心发展规律和内涵的基础上，明确了我国国际航运中心的历史使命和发展特点，从提升枢纽地位、促进贸易投资便利化、打造航运服务功能体系、发展邮轮游艇经济、促进智能化发展、实现安全绿色发展等方面，提出了我国国际航运中心的主要发展方向。

关键词：国际航运中心；航运服务；交通强国

Research on the Connotation and Development of Chinese International Shipping Center in a New Era

Zhang Xiaoqing, Sun Hanbing, Bi Shanshan, Liu Changjian

Abstract:

The 19th National Congress of the Communist Party of China put forward the thought on socialism with Chinese characteristics for a new era, pointed out the way forward for the development of the transport and maritime industries. Based on the analysis of the rules and connotation of the development of international shipping center, this paper clarifies the historic mission and development characteristics of Chinese international shipping center, presents the main direction of development of Chinese international shipping center.

keywords: international shipping center; shipping service; building China’s strength in transportation

作者简介：张晓晴，交通运输部规划研究院，电话：13910830462，邮箱：zhangxq@tpri.org.cn
深水铺排船滑板支撑结构受力模型分析研究

冯海暴
(天津大学)

摘 要：传统的深水铺排船采用吊浮式滑板受力结构，水深和其它作业工况的变化对滑板的受力有显著的影响。论文在对国内外铺排船滑板结构形式调研的基础上，针对国家重点工程的现场施工条件，通过试验、解析计算和数值模拟对深水铺排受力进行了分析和应用验证。这项成果对深水铺排施工提供了受力分析和计算的方法，对类似设备中排体的设计和施工技术的改进有一定的借鉴作用。

关键词：深水铺排船；滑板固定支撑；受力模型；移动悬链线

Study on Mechanical Model of Support Structure on Geotextiles-Laying Vessel

Feng Haibao
(Tianjin University)

Abstract:

Floating slide plate is applied to traditional deep-water ship laying, and variation of water depth and other working conditions has significant influence on the stress of the slide plate. Through the investigation and research on the structure of slide plates mounted on ships in China and foreign countries, this paper analyzes the stress of deep-water laying by means of experiment, analytical calculation and numerical simulation. The research result provides a method calculating structural stress for deep-water laying construction, and also provides a reference for the design and construction technology of similar equipment.

Keywords: deep-water ship laying; fixed stay of slide plate; stress model; moving catenary

作者简介：冯海暴，天津大学，电话：18853257218，邮箱：351515258@qq.com。
长周期波对船舶及构筑物作用调研与分析

冯海暴
（天津大学）

摘要：长周期波对海上船舶的稳定性具有较大的影响，尤其是工程施工船舶，在长周期波的作用下其横摇、纵摇、垂荡等六个自由度数值较大。本文结合智利圣文森特码头工程打桩船桩基施工，研究了长周期波作用下打桩船存在的问题，并结合工程施工和研究经验，总结了一套桩顶移动打桩的高精度沉桩技术方法，该技术方法可有效利用已打设桩基，搭建桩顶移动式平台，实现循环使用装备采用标准件模块化设计制作，集装箱装箱运输的方式，可快速拆装和运输、调配。并可实现桩头截取的多功能施工，通过现场测试与应用，该装备和方法沉桩的质量、精度和效率均达到了设计要求，经济性和先进性具有明显的优势。

关键词：长周期波；高桩码头；桩基施工；移动打桩平台

Long Period Wave Sea Area on Pile Foundation Construction and Preventive Measures

Feng Haibao
(Tianjin University)

Abstract:

Long period waves have a great influence on the stability of ships at sea, especially for engineering ships, the six degrees of freedom of roll, roll and sway are larger under the action of long periodic wave. This combination of piling ship pile foundation construction in Chile Vincent dock project, on the existence of long period wave action under the piling ship problems, and combined with engineering construction and research experience, summed up a set of high precision pile top mobile piling piling technology method, this technique can be used effectively has driving pile, the pile top mobile building platform, to achieve recycling equipment using standard modular design, container transportation, fast dismounting and transportation, disposal. Through the field test and application, the quality and the precision and the efficiency of the pile and the pile can meet the design requirements, and the economy and the advanced characteristics have obvious advantages.

Keywords: Long-period wave; high-pile wharf; pile foundation construction; mobile piling platform

作者简介：冯海暴，天津大学，电话：18853257218，邮箱：351515258@qq.com。
Locating LNG Refueling Station Within Inland River Network

Yu hang
gelist@163.com

Abstract: Air pollution effects from inland river shipping have aroused the attention of shipping industry. As an economical and environment friendly clean fuel, LNG has already been applied to fuel inland shipping along Yangtze river and some European inland river network. We study the refuel station locating problem within inland river network in this research. We try to model the newly built refuel station locating problem considering the heterogeneity of inland river. We aim to better fulfill the increasing LNG refueling demand from inland waterway shipping and focus on ships need refueling during the sailing. Results show that the cargo flow distribution and refueling station choice depend on the emission requirement and the fuel price. It is also proven from our study that LNG will become more competitive than other fuels as the emission requirement get stricter.

Keywords: LNG fueled shipping, inland waterway, green shipping, location choice
沿海港区新建码头通航风险评价的方法研究

王晨阳，孔宪卫，王建军
（交通运输部天津水运工程科学研究所）

摘 要：通过将模糊数学与层次分析法相结合的方法建立沿海港区新建码头通航安全风险评价模型，建模过程中综合考虑专家调查意见、实测水文气象资料、船舶仿真模拟试验等各类成果，使得模型计算结果能够比较真实、可靠地反映事实情况。评价结果表明，该方法可充分掌握沿海港区新建码头水域通航安全状况，并且能够直观的表示各影响因素对风险贡献的大小。

关键词：通航安全；模糊综合评价法；权重；隶属度；风险评价

Study on Method of Navigation Risk Evaluation of New Wharf in Coastal Port Area

Wang Chenyang, Kong Xianwei, Wang Jianjun

Abstract:

Considering the results of expert questionnaire survey, hydrometeorology data analysis and Simulation tests of ship, a new navigation risk assessment model was established by combining fuzzy synthetic method and Analytic Hierarchy Process method to reveal the reality of new wharf in coastal port area reliably. The results indicated that this method can fully grasp safety condition of the new coastal port wharf waters navigation, and intuitively estimate contribution of each influence factor to the risk assessment.

Keywords: navigation safety; fuzzy synthetic evaluation method; weight; membership; risk evaluation

作者简介：王晨阳，交通运输部天津水运工程科学研究所，电话：15222090561，邮箱：chenyang3623@163.com
Abstract: Over the years many shipping lines have established terminal operation companies, with some set up as independent firms. However, port authorities and local governments have not always welcomed external investment and control with open arms. The economic implications and each stakeholder’s best strategies remain unclear. This study develops an analytical model in order to study the effects of vertical integration, with a focus on shipping lines’ investment in ports’ capacity. Modelling results suggest that vertical integration between terminal operator and a shipping line leads to higher port capacity, port charge, market output and consumer surplus. It also reduces delay costs. All these results suggest that vertical integration can be an important source of synergy for the maritime industry. However, vertical integration increases the participating carrier’s output at the expenses of non-integrating rival shipping firms. The overall social welfare change is uncertain and influenced by capital costs. Therefore, port authorities and government regulators should carefully review the market competition status as well as port expansion plans.

Keywords: port and shipping lines; capacity investment; vertical integration
Green Project Scheduling for Port Construction with Comprehensive Efficiency Consideration

Wang Wei
Hohai University
13813826667@hhu.edu.cn

Huang Li
Hohai University
lily8214@hhu.edu.cn

Gu Jian
Hohai University
kiangj@163.com

Jiang Liupeng
Hohai University
jsjlp@hhu.edu.cn

Abstract: Port is an important driving force for world economic growth, but there exist high energy consumptions and pollution emissions in its daily operations. In order to achieve the low-carbon and sustainable development, the port industry puts forward the development direction of green port. This paper presents a green project scheduling model of port construction with the objective of maximizing the comprehensive economic and environmental efficiency. Various realistic constraints are considered, including investment scale, energy saving, emission reduction, and project priority. The comprehensive efficiency involves cost reduction, energy saving, emission reduction and other efficiency goals. The problem is formulated as a multi-objective integer program and solved by CPLEX. We take a famous large-scale coastal port in China as a case company and solve its green project scheduling problem. The results show that the port can save 6526.64 tons standard coal, reduce 39390.22 tons CO2 and obtain 49.2238 million yuan each year after the construction period. The payback on investing these green projects is less than 5.89 years. From the economic and environmental perspective, the comprehensive efficiency is significant.

Keywords: Green port; Comprehensive efficiency; Project scheduling
基于组合赋权 TOPSIS 方法对港口应急物流方案的评价

张荀，刘晓佳，汪强
（集美大学航海学院）

摘 要：为了能够在多个应急物流方案中选取最优方案，建立以变异系数法和熵权法组合赋权的 TOPSIS 模型。采用时间、经济成本、运作效率、运作合理性等方面建立港口应急物流方案评价指标体系，同时采用组合赋权来确定评价指标权重，反映数据本身的信息。通过案例分析，验证了方法的有效性并选出了最优方案。

关键词：TOPSIS；应急物流方案；变异系数法；熵权法；权重

Evaluation of Port Emergency Logistics Scheme Based on Combined Weighted TOPSIS Method

Zhang Xun, Liu Xiaojia, Wang Qiang

Abstract:
In order to select the optimal scheme in many emergency logistics schemes, the TOPSIS model with the combination of variation coefficient method and entropy weight method is established, which adopts time, economic cost and operation efficiency. The evaluation index system of port emergency logistics scheme is established in terms of operation rationality, and the weight of evaluation index is determined by combination weight, which reflects the information of the data itself. The effectiveness of the method is verified and the optimal scheme is selected.

Keywords: topsis; emergency logistics scheme; coefficient of variation method; entropy method; weight

作者简介：王晨阳，集美大学航海学院，电话：18050106803，邮箱：blessed_xun@163.com。
船舶领域的分类和定义

彭延领  
（上海港引航站）

摘 要：本文从上海港船舶引航实际出发，对船舶领域进行了分类和定义，方便学者有针对性地研究、驾引人员恰当地应用，并用量化的值举例上海港船舶避让领域，有一定的参考价值。

关键词：船舶领域；动界；航行领域；避让领域；碰域

Classification and Definitions of Ship Domains

Peng Yanling

Abstract:
Based on the Ship Pilotage in Shanghai port, this paper classifies and defines the ship domains, which is convenient for scholars to do research and is useful for navigator maneuvering a vessel. and quantitative value about avoidance collision domain in Shanghai port has been given. It has some reference value.

Keywords: ship domains; arena; navigation domain; avoidance collision domain; collision domain

作者简介：彭延领，上海港引航站，电话：15921130006，邮箱：1809408872@qq.com。
Optimization Research on Control System of Controllable Pitch Based on Auto-disturbance Rejection

Li Guanglei
ericli1066@dlmu.edu.cn

Abstract: In the control system of ship's controllable pitch, it is often difficult to achieve the best control effect to use the classical PID control. As for the characteristics of process model of this control system, designed a controller based on auto disturbance rejection. The simulation results show that: measurement of external disturbances, It has good performance especially in the speed of response and high control precision. So this work has a certain reference value for the design and further research of the pitch control system.

Keywords: Active disturbance rejection control; Controller; Controllable pitch propeller
Economic Cost of Port Disaster: Tianjin Port Explosion and Property Value

Cong Liang  
Hong Kong Polytechnic University 
liang.cong@hotmail.com

Tsz Leung Yip 
Hong Kong Polytechnic University 
t.lyip@polyu.edu.hk

Abstract: This paper intends to investigate the effect of economic cost and environmental risk after port disaster on property value. By using the difference-in-differences method and the sample from the property agent, we found that the value of the property near explosion site would drop by 20% after the Tianjin port explosion. A port disaster may generate a long-time effect on the public and property market, we suggest that port government should learn from this tragedy by reviewing and updating the policy for port safety and hazardous materials storage.

Keywords: Port disaster; Economic cost; Tianjin port explosion; Environmental risk
Analysis on the Features of Chinese Dry Ports

Dong Yang
dong.yang@polyu.edu.hk

Abstract: In recent years, many regions including China have witnessed fast growth of dry ports. Unlike in the other regions of the world, the major dry ports in China are not profitable, but the reasons behind have not been discussed before. After a brief review on the development pattern of Chinese dry ports, certain dry port functions like customs clearance and rail connection, dry port ownership structure, and inter-competition among dry ports are identified as the unique factors which distinguish Chinese dry ports from others and affect their performance. We investigate the relationship between these factors and the efficiency of Chinese dry ports with a two-stage approach based on a panel data collected from eight dry ports affiliated to the port of Ningbo, China, covering the 2011-2016 period. In the first stage, Data Envelopment Analysis (DEA) is used to measure these dry ports’ technical efficiency. In the second stage, Tobit regression analysis is applied to explore the relationship between efficiency and the above mentioned factors. Several insightful findings are observed, further leading to useful managerial insights.

Keywords: Dry port development; Efficiency evaluation; Data Envelopment Analysis (DEA); Tobit regression
澜沧江—湄公河国际航运发展规划研究

杨燕华，张明进，杨阳
(交通运输部天津水运工程科学研究所)

摘要：通过对中缅—老挝琅勃拉邦890km河段航运现状分析及国际航运需求预测的基础上，提出规划河段2015-2025年国际航运发展规划。对航道规划，到2025年建成通航500吨级船舶的航道；对港口规划，按客运港口和货运港口两种类型对沿岸港口进行了规划，需建12个客运泊位、33个500吨级货运泊位、1个300吨级货运泊位；对船型规划，根据澜沧江—湄公河水路进出口货物种类、人员往来发展趋势和目前新投入船舶营运情况，提出了规划船型；并在现有的四国国际航运协调联络机制—航联委基础上提出了支持保障体系发展规划。上述规划内容将分为两个阶段实施，第一阶段首先实施中缅243号界碑至老挝琅勃拉邦河段建设工程，第二阶段再实施思茅港南得坝至中缅243号界碑河段建设工程。

关键词：澜沧江—湄公河；规划；航道；港口；船舶

Research on International Shipping Development Planning of Lancang-Mekong River

Yang Yanhua, Zhang Mingjin, Yang Yang

Abstract:
Based on the analysis of the current shipping status of the 890 km river reach of China Simao - Laos Luang Prabang and the prediction of international shipping demands, the international shipping development planning for the planned river reach from 2015 to 2025 is proposed. For channel planning, the navigation channel of 500-ton ships shall be completed by 2025; for port planning, the related planning for both passenger and cargo ports is provided, with twelve passenger berths, thirty-three 500-ton cargo berths and one 300-ton cargo berth to be completed; the planning of ship types is based on the types of imported and exported goods through the Lancang-Mekong River waterway, the development trends of personnel exchange and the operation status of new ships; and on the basis of the existing four-nation international shipping coordination and liaison mechanism - China-Laos-Myanmar-Thailand Lancang-Mekong River Merchant Shipping Joint Committee, the support-safeguard system development planning is put forward. The above planning contents will be implemented in two phases. At the first stage, the construction of the segment from Sino-Burma No. 243 Boundary Marker to Laos Luang Prabang will be carried out; and at the second stage, the construction of the segment from the Simao Port Nandeba to Sino-Burmese No. 243 Boundary Marker will be implemented.

Keywords: Lancang-Mekong River; planning; channel; port; ship

作者简介：杨燕华，交通运输部天津水运工程科学研究所，电话：15822453054，邮箱：yyh200@163.com。
Key Success Factor Analysis on the Development of Japanese Yacht Leisure Industry

Dong Simeng (Japan)
dongsimeng1990@yahoo.co.jp

Abstract: In order to promote the development of yacht leisure industry in Japan, various factors that affect its development needs to be discussed. Based on related materials of Japan’s yacht leisure industry, taking personnel, experts and scholars of yacht leisure industry as objects, employing Modified Delphi Method (MDM) and Analytic Hierarchy Process (AHP), the thesis is devised to come up with key success factors in the development of yacht leisure industry in Japan and put forward some considerations related to the Japan’s future development of leisure industry. The empirical results show that according to the different positions, analysis results are slightly different, specifically summarized as the following points: (1) The results of overall weights ranking of port managers for the factors influencing the development of yacht leisure industry show that the ranking of overall weights by its importance are national conditions and policies, yacht-related industries, infrastructure construction, and natural conditions. In the ranking of influencing factors, top three weighting factors are ensuring and cultivating talents, building public docks and leisure environment. (2) The overall weights of ship managers for the factors influencing the development of yacht leisure industry shows that the ranking of overall weights by its importance are infrastructure construction, natural environment, national conditions and policies. In the ranking of influencing factors, top three weighting factors are sea surface environment, buoyant trestle construction and the dock overall facility construction. (3) The results of overall weight ranking of club managers on the factors affecting the development of yacht leisure industry shows that the rankings of important factors in ranking of overall weight values are national conditions and policies, infrastructure construction, yacht-related industries, and nature condition. In the ranking of influencing factors, top three weighting factors are recognition of recreational yachts; dock overall facility construction and ensuring and cultivating talents.

Keywords: Yacht Leisure; Key Success Factor; Shipping
Abstract: In order to give full play to the advantages of land and sea ro-ro drop and pull transportation, this paper considers inland collection and delivery operations and loading and unloading operations of ro-ro ship and puts forward the operation modes including wharf drop and pull mode, cabin drop and pull mode and mixed mode. An optimization model is established, and a simulated annealing algorithm is designed to solve the problem in multiple groups of analog data. Moreover, the influence of the number of tractors and tasks and the arrival time to the port of the tractor on the selection of the operation mode are analyzed. Result shows that different influence factors lead to the difference between the advantages and disadvantages of the operation mode and the scope of application. Transportation enterprises should choose the wharf drop and pull mode in the case of small number of tractors and more tasks, late arrival of tractors and the low traction fee. While the cabin drop and pull mode is chosen in the case of more tractors, small number of tasks, early arrival of tractors and the high traction fee. In other cases, the mixed mode is used. It provides a great theoretical and practical value to the operation mode optimization of land-sea ro-ro drop and pull transportation.

Keywords: Drop and Pull Transportation; Ro-ro transportation; Operation mode; Simulated annealing algorithm
A Theory of the Optimal Speed for a Vessel Fleet

Wei-Ming Wu
wwu@nkfust.edu.tw

Abstract: By measuring the daily total cost corresponding to different vessel speeds, this paper has constructed a model to study the optimal vessel speed under running a fleet of vessels. Due to the discontinuous total daily cost with respect to different vessel speeds, the minimum speed in a speed bracket will correspond to the lowest total daily cost and defined as the critical speed under a given number of vessels deployed. As a result, the optimal speed for running a fleet of vessels can be found by comparing the total daily cost with respect to different critical speeds. In addition, some implications of findings regarding to the variations of optimal speed are also provided in the paper. First, the finding implies that the service route with a longer sailing distance will be more possible to have a lower optimal speed. Second, the finding indicates that the optimal speed for large vessels will be larger than the one for small vessels, and thereby to suggest that it will be less possible for the carriers operating with large vessels to optimally reduce vessel speed. Finally, the increased fuel price may not necessarily enhance the cost savings associated with speed reduction. Furthermore, it will be fairly convenient for carriers and researchers to predict the variations of optimal speed if the critical fuel prices corresponding to different critical speeds are known.

Keywords: optimal vessel speed, speed reduction, ship size, fuel price, vessel fleet
Abstract: This paper aims to present an integrated methodology for the monitoring of marine machinery using machine learning algorithm. Under the background of marine big data, using data mining technology, numerical analysis and optimization technology is very necessary for model learning and performance monitoring of ship equipment under different life and complex sea conditions. The proposed methodology will train models using complete voyage data and then classify new data points using the improved Gaussian Mixture Model to classify the most frequent operating areas of the main engine. Finally, the principal component analysis method is used to evaluate the performance of main engine in different states. The above will provide a flexible but robust framework for the early detection of emerging machinery faults. This will lead to increase of the ship’s operability and income through operational enhancement, and provides a new way of thinking for the design of engine room monitoring system.

Keywords: Marine Big Data; Machine Learning; Performance Monitoring; Ship
Impact of the Belt and Road Initiative on Maritime Transport in the Indian Sub-Continent

Ruan Xiao
Ocean College, Zhejiang University
ruanx@zju.edu.cn

Yapa Mahinda Bandara (Sri Lanka)
University of Moratuwa
mahindab@uom.lk

Jun-Yeop Lee (Korea)
Inha University
jylee@inha.ac.kr

Paul Tae-Woo Lee (Korea)
Ocean College, Zhejiang University
paultaewoo.lee@zju.edu.cn

Prem Chhetri (Australia)
RMIT University
prem.chhetri@rmit.edu.cn

Abstract: Seaport sector plays a pivotal role in promoting international trade and economic development. The China’s Belt and Road Initiative (BRI) has triggered investment in seaport development in countries along the Maritime Silk Road (MSR), in association with infrastructure development in road sector and dry ports with the objective of establishing seaport centric logistics network system to realize economic gain from being a nodal in the logistics network. The main aim of this paper is to analyse the impact of the BRI on seaport development in the Indian Sub-Continent (ISC), assessing the extent to which current port development initiatives contribute to secure the present status of regional transhipment (T/S) hub and the future international trade potential of Sri Lanka under the BRI. In doing so, in the light of regional port infrastructure development efforts, mainly carried out in the ISC, the paper elaborates the expected impacts and implications of the BRI on maritime logistics and ports from the viewpoints of Sri Lanka. The paper used scenario analysis as research method to infer future development scenarios and identify possible challenges and directions for the maritime industry.

Keywords: Belt and Road Initiative, Seaport development, Port financing, Multi-port economy, Scenario analysis, Intuitive logic method, Trend impact analysis.
深海远海搜救系统配置规划研究

杨立波
（交通运输部规划研究院）

摘 要：为支撑深海远海搜救系统总体规划编制，从履行职责公约、服务国家战略、应对突发事件、实现转型升级等方面，阐述了深海远海搜救系统布局研究进程与成果；从通信监控系统、搜救飞机及基地、搜救船舶及基地、扫测打捞装备等方面，评估我国深海远海搜救系统存在的问题和差距；从全方位覆盖、快速度反应、高效率处置等三个层面，制定并论证深海远海搜救救助系统目标体系和配置思路。

关键词：水上交通安全；搜救系统；配置规划；深海远海

Study on Deep-Sea and High-sea Search and Rescue System Layout Planning

Yang Libo

Abstract:

In order to support the overall planning of the deep-sea and high-sea search and rescue system, this paper elaborates the responding research process and results from the aspects of fulfilling the duty and convention, serving the national strategy, responding to emergencies and realizing the transformation and upgrading. The problems and gaps of China's deep-sea search and rescue system are assessed including the communication and monitoring systems, aircrafts and bases, vessels and bases, sweeping and salvage equipment. From four levels including full coverage, rapid response, efficient disposal, the target system and configuration ideas are developed and demonstrated about the deep-sea and high-sea search and rescue system.

Keywords: marine traffic safety; search and rescue systems; layout planning; high-sea and deep-sea

作者简介：杨立波，交通运输部规划研究院，电话：13693666912，邮箱：yanglb@tpri.org.cn
试析引航员单兵作战的风险及应对措施

竺志锋

摘 要：为强化港口水域引航员在船时的船舶操纵风险控制，对引航工作现状、岸基支持系统和被引船舶驾驶台支持系统的组成、引航团队管理的组织结构及其主要支持系统进行分析，对引航员单兵作战时驾引双方的相互监督和支持提出方向。通过将岸基支持系统中监控、特殊工作组的组建、调度系统的支持以及驾驶台团队等其他相关方面的监控方式引入到引航作业现场的方法，对风险进行评估、分析，提高引航作业的安全性，有利于进出港船舶的风险控制。

关键词：引航员；单兵作战；团队支持；风险控制

The Risk of Individual Maneuvering of Pilot and Countermeasures

Zhu Zhifeng

Abstract:
To strengthen risk control of the ships which are maneuvered by local pilot in port waters, the pilotage status, shore-based support system and the organization structure and management system of the pilot team are analyzed, the model of mutual supervision and support system direction guide are provided. The shore-based support system include monitoring, special working group organization, dispatching system as well as the bridge team and other related aspects of the monitoring will be used to improve the safety of the pilot maneuvering, which is beneficial to the risk control of the ships in and out of the port.

Keywords: pilot; individual maneuvering; team support; risk control

作者简介：竺志锋，电话: 13967801062，邮箱: nbzhuzhf@sina.com。
浅谈国内港口转型升级

杨文浩
(苏交科集团股份有限公司)

摘要：文章介绍了国内港口发展现状，分析了国内港口转型升级的驱动因素、面临的挑战和表现特征等，对港口未来发展方向提出了目标，对已建港口和新建港口的资源整合与规划设计提供了参考性意见。

关键词：国内港口；转型升级

Discussion of Upgrades of Domestic Ports

Yang Wenhao
(JSTI GROUP)

Abstract:
This paper introduces the development status of domestic ports, analyzes the driving factors, the challenges and performance characteristics of upgrades of domestic ports. This paper aims at the future development direction of the ports and provides reference for the resource integration and planning design of the established ports and the new ports.

Keywords: domestic ports; upgrades

作者简介：杨文浩, 苏交科集团股份有限公司, 电话: 13404130985, 邮箱: tomyang86@163.com。
新形式下引航员与船长的关系

竺志锋

摘 要：引航员与船长的矛盾时有发生，破坏了驾驶台和谐气氛，干扰了驾引人员对操控行面的判断，是港口生产的一个安全隐患。本文分析了矛盾产生的原因，阐述了当代引航员该如何把握新形式，精准定位，创建与船长更加融洽的合作关系。

关键词：引航员; 船长; 关系

Relationship between Pilot and Captain under New Circumstances

Zhu Zhifeng

Abstract:
The contradiction between pilot and captain has occurred from time to time, which has destroyed the harmonious atmosphere of the bridge, and disturbed the judgment of the navigator on the manoeuvring situation, which is a safety hazard of the port production. This paper analyzes the causes of the contradiction, and as a pilot of modern times, expounds how to grasp the new situation, precise positioning, and create a more harmonious cooperative relationship with the captain.

Keywords: Pilot; Captain; Relationship

作者简介: 竺志锋，电话: 13967801062，邮箱: nbzhuzhf@sina.com。
引航监控在引航安全中的运用

竺志锋

摘要：引航是一项高风险的行业，在多数情况下只有一名引航员上船引航，具有单独作业的特性。引航员有时难免会受到心理上、生理上、技术上等各方面因素的干扰而影响引航安全，因此有必要引入引航监控，对在外单独作业的引航员进行有效的监管，在个体引航员发生失误时，能够及时的给予提醒，减少引航事故的发生。

关键词：引航；安全；监控

The Application of Pilot Monitoring in the Safety of Pilotage

Zhu Zhifeng

Abstract:

The pilotage is a high-risk industry, in most cases only one pilot aboard vessel, has the characteristics of separate operation. Sometimes the pilot will be influenced by the Psychology and physiology, technology and other various factors affecting pilotage safety, it is necessary to introduce the outside monitoring pilot, reduce the occurrence of pilotage accident.

Keywords: Pilot; Safety; Monitoring

作者简介：竺志锋，电话：13967801062，邮箱：nbzhuzhf@sina.com。
考虑集装箱生命周期的空箱调运问题

曹乐麒 ¹，杨忠振 ²
（1. 大连海事大学；2. 宁波大学）

摘 要: 集装箱的维护费用和残值随服役时间增加而变化,航线设计和空重箱一体化运输时，基于集装箱生命周期，确定新造箱投入地点、由贸易顺差地区运往贸易逆差地区货物所用的集装箱的生命阶段以及在各处报废处理的空箱数量，有利于航运公司控制空箱调运费用。本文基于混合式航线网络，在给定备选航线和重箱运输需求的情况下，构建混合整数线性规划模型，以中国、日本、东南亚、欧洲和美国五个区域之间的集装箱运输为例，优化新造箱投入地点、空箱报废地点和航线次用处于什么生命周期阶段的集装箱来完成重箱运输。模型的计算结果表明：90%的新造箱要在中国投入使用，63%的空箱要在欧洲和美国退役，从中国运往美国的集装箱中73%属于老旧箱。

关键词: 海运运输; 集装箱生命周期; 航线设计; 空箱调运

Research on Empty Container Allocation Considering the Container Lifecycle

Cao Leqi ¹, Yang Zhongzhen ²

(1. Dalian Maritime University; 2. Ningbo University)

Abstract:
The maintenance cost and residual value of containers will change with the increase of service time, therefore in route designing and integrated laden/empty container transportation, based on the container lifecycle, determining the location of input new containers，the life stage of containers transported from trade-surplus areas to trade-deficit areas, and the number of scrapped worn containers in each place, is advantageous for liner companies to control the cost of empty container allocation. Based on hybrid shipping network and on the premise of given candidate routes and fixed laden container transportation demand, this paper establishes a mixed-integer linear programming model, with container transportation between China, Japan and South Korea, Southeast Asia, Europe and the United States as a case study, and optimizes the location of new containers input, the location of worn containers scrapped, and which lifecycle stage of containers to choose for laden container transportation. The calculation results of the model show that 90% of new containers are put into use in China, the ratio of containers scrapped in Europe and the United States reaches 63%, and 73% of containers transported from China to the United States are worn containers.

Keywords: marine transportation; container life cycle; route designing; empty container allocation

作者简介: 曹乐麒，大连海事大学，电话：18840862856，邮箱: caoleqi@163.com。
基于 AIS 系统实现 VTS 系统与引航员助航终端文本信息传递的可行性研究

李银

摘要：VTS 与在船引航的长江引航员的沟通，是 VTS 工作的重中之重。目前的几种通信手段都存在着种种缺陷，通过 AIS 系统，发送文本信息到引航员助航终端，能较好的弥补当前其他通信手段的不足，从而促进水上交通安全。本文通过实测数据，对该系统进行了可行性研究。

关键词：VTS；AIS；引航员；通信方式；文本信息发送；接收；可行性研究

Study on the Feasibility of VTS and Pilot Terminal Information Transmission System Based on AIS

Li Yin

Abstract:

The communication between the VTS and the Yangtze River pilot piloted on board is the top priority of VTS work. At present, there are various shortcomings in several communication methods. Through the AIS system, sending text messages to pilot navigation aids can compensate better for the inadequacies of other current communication methods and thus promote the safety of water transportation. Through the measured data, this article conduct a feasibility study of the system.

Keywords: VTS; AIS; PILOT; communication mode; send and receive text; feasibility study

作者简介：李银，电话：15862710303，邮箱：717293956@qq.com。
Abstract: Aiming at the characteristics of non-linear system of dynamic positioning ship and considering the influence of environmental disturbance on fixed-point positioning of dynamic positioning ship, a global exponential stability (GES) nonlinear output feedback control law is proposed in this paper. The design includes a nonlinear passive observer to filter the ship's position and heading and to estimate the velocity of the ship. Observer-filtered position and heading signal are used to design a backstepping controller with integral action, which can not only improve the dynamic response speed of the closed-loop control system, but also can compensate the slow changing environmental disturbance through the integral action, and finally the accurate and fast positioning function of the ship is realized. The global exponential stability of the total system is proved by the Lyapunov stability theory. The performance of the designed controller has been verified in computer simulation.

Keywords: Ship System; Nonlinear Control; Backstepping; Observer Design; Integral action; Lyapunov Theory
船舶机舱空气能多功能装置应用研究

吴伯才
（浙江交通技术学院）

摘要：本文介绍的船舶空气能多功能装置制取冷气、制取热水、制冷气兼制热水三种功能运行原理及其应用研究。设备用于船舶机舱可以有效改善机舱的高温工作环境和满足船员日常生活热水供应，可根据不同海况选择满足需求的最佳节能模式运行。对机舱空气能余热高效利用和工作条件的改善有着积极意义。

关键词：空气能多功能装置；制热水兼制冷；船舶余热利用

The Research on the Application of the Air Energy Multifunctional Device in the Cabins of Vessels

Wu Bocai

Abstract:
The article aims at explaining the principle and the application of air conditioning, heating water, and heating and refrigerating water with air energy multifunctional device. Using the equipment in the cabins of vessels can significantly improve the high-temperature working environment and satisfy the daily requirement of hot water supply for sailors, and can adjust to the best energy saving mode in accordance with the different sailing conditions. This research will make great sense to making full use of the waste heat of air energy in cabins and to improving working conditions in the sea.

Keywords: Air energy multifunctional device; heating and refrigerating water; making full use of waste heat

作者简介：吴伯才，浙江交通技术学院，电话：13858056396，邮箱：wubocai@zjvtit.edu.cn。
三峡大坝下游河道枯水位与航道水深资源利用关系研究

杨云平, 张明进, 张华庆, 李一兵

(1. 交通运输部天津水运工程科学研究所; 2. 长江航道局)

摘要: 航运功能是流域水资源开发利用的重要组成, 其航道开发程度与河道冲淤及枯水位密切相关。长江中下游航道素有“黄金水道”的美誉, 是支撑长江经济带建设的重要纽带, 研究其河道枯水位变化及航道水深提升空间具有重要价值。2003-2016年实测资料显示, 三峡大坝下游河道发生长距离累积冲刷, 其冲刷强度高于蓄水前预期, 为航道增深提供了有利基础; 河道冲刷的同时也引起同流量~枯水位大幅下降, 虽然最低流量和水位均增加, 但近坝段(210km)仍难以抵消河槽冲刷引起的枯水位下降, 最低通航水位相应降低; 在河槽冲刷及航道工程共同作用下, 航道水深和宽度均增加, 提前5年实现了2020年航道尺度规划目标; 在现状航道水深及碍航程度上, 坝下游航道尺度仍可进一步提高, 认为宜昌~武汉、武汉~安庆河段航道尺度至4.5m×200m、6.0m×200m(水深×宽度)是可能的。本研究对评估水库蓄水对坝下游河道水位及航道水深提高程度提供参考, 也可为航道管理提供决策支撑。

关键词: 河道水位; 航道水深; 航道尺度; 三峡大坝; 长江中下游

Relationships between waterway depth and low-flow water levels in reaches below the Three Gorges Dam

Yang Yanping, Zhang Mingjin, Zhang Huaqing, Li Yibing

Abstract:

Waterways in the middle and lower reaches of the Yangtze River: the “Golden Waterway”, are key components of the Yangtze River Economic Zone. Hence, this study analyzes low-flow water levels and expansion of waterway depths in the Yangtze River. 2003–2016 data indicate that long-distance sedimentation and scour occurs in the downstream channel of the Three Gorges Dam. High scour related to the dam leads to increased waterway depth and greatly reduces the low-flow water level, causing a corresponding decrease in the lowest navigable water level, despite an increase in both minimum discharge and water level. Waterway depth and width have increased under the combined actions of river scour and waterway engineering projects, achieving the 2020 target waterway dimensions 5 years in advance. Moreover, waterway dimensions downstream of the dam can be further increased, e.g. the Yichang-Wuhan and Wuhan-Anqing waterways could reach 4.5 m × 200 m and 6.0 m × 200 m (depth × width), respectively. These findings are a useful reference for assessing the impacts of dam impoundment on downstream water levels and depth, and can assist decision-making processes in waterway management.

Keywords: River water level; waterway dimensions; scour; Three Gorges Dam; middle and lower reaches of the Yangtze River

作者简介: 杨云平，交通运输部天津水运工程科学研究所，电话：15822753152，邮箱：yangsan520_521@163.com。
Empirical Analysis on Trip Chain Patterns across Three Urban Cities in China

Fu Xuemei
Shanghai Maritime University
xmfu@shmtu.edu.cn

Abstract: Using household travel surveys collected from three urban areas in China including Tongren, Quanzhou, and Shaoxing, this study provides an empirical analysis to investigate the influencing factors on trip chain patterns. Trip chain pattern is defined as a sequence of activities connected by multiple trips, which start at home, contain one or more home and/or non-home stops, finally end at home. More importantly, it is classified into four types according the number of home stops and activities conducted. Results of the multinomial logit model confirm that personal socio-demographic characteristics, such as education status and presence of schoolchild, have significant effects on choice of trip chain pattern. Comparisons among the three cities suggest that the decision of trip chain pattern greatly varies, which could be exclusively attributed to specific urban attributes, such as economic development and cultural background. The findings gain a deeper insight into individual’s behavioral decision on multiple trips by simultaneously accounting for the urban dimensions, which are expected to be useful for transport governors and operators.

Keywords: travel behavior; comparison; trip chain pattern; travel survey
Possibilities and Challenges of Expanding the Dimensions of the Waterway Downstream of TGD

Yang Yunping
yangsan520_521@163.com

Abstract: The waterway in the middle and lower reaches of the Yangtze River has long been known as the Golden Waterway and is an important link in the construction of the Yangtze River Economic Belt. Therefore, determining whether there is scope to expand its dimensions is a significant goal, particularly given the long-range cumulative erosion occurring downstream of the Three Gorges Reservoir (TGR). The erosion has been concentrated in the dry river channel. This combined with the regulation of the volume of the upstream reservoirs and the TGR, the minimum flow and water level of the river downstream are increasing, and creating favorable conditions under which to improve the depth of the waterway. The flow compensation effect during the dry season offsets the decline in the water level in the river channel caused by down-cutting part of the riverbed, but the minimum navigable water level of the segment near the dam still shows a downward trend. In recent years, several waterway remediation projects have been implemented in these reaches of the Yangtze River and although the waterway depth and width have been increased, they are still low in the Yichang-Anqing reach compared to the reservoir area upstream and the deep-water channel in the tidal reach downstream. A comprehensive analysis of the water depth composition and the number and length of the shoals in the waterway indicates that its dimensions can be increased to 4.5m×200m and 6.0×200 m in the Yichang-Wuhan and Wuhan-Anqing reaches, respectively. This is also feasible given the remediation technologies available currently, but remediation projects need to be coordinated with those for flood prevention and ecological protection.

Keywords: waterway dimension; condition analysis; three gorges dam; middle and lower reaches of the yangtze river
Risk Control Measures Analysis of Ship Stuck in Ice in Arctic Waters

Fu Shanshan
Shanghai Maritime University
ssfu@shmtu.edu.cn

Yan Xinping
Wuhan University of Technology
xpyan@whut.edu.cn

Zhang Di
Wuhan University of Technology
zhangdi@whut.edu.cn

Jakub Montewka (Poland)
j.montewka@wn.am.gdynia.pl

Abstract: Key elements of Formal Safety Assessments are risk analysis, risk assessment, and risk management. The latter can encapsulate regulatory measures to control and reduce the risks defined in maritime transportation systems through risk control measures (RCMs). However, due to the inherent feature of risk analysis, namely uncertainty, the effectiveness of the RCMs that are defined in light of existing background knowledge for a given system can vary significantly in real life conditions. Therefore, this paper aims to develop an approach to evaluate the effectiveness of RCMs for risks associated with ship accidents in Arctic waters, taking both accident scenarios and epistemic uncertainty into consideration. The RCMs are studied comprehensively concerning risk influencing factors, accident scenarios, and associated intermediate/outcome events of major ship accidents in Arctic waters. Fuzzy sets are incorporated to handle epistemic uncertainty involved in conditional probability tables. Risks related to a typical ship accident in Arctic waters - ship stuck in ice is chosen as a case to interpret the approach. Crews and shipowners can use such an approach for defining risk control measures that enable optimal risk mitigation and enhancement of maritime transportation safety in Arctic waters.

Keywords: Arctic waters, ship stuck in ice, risk assessment, risk control measure, effectiveness analysis, accident scenario analysis
摘要：为研究自动化集装箱码头中自动导引运输车（Automated Guided Vehicle, AGV）与双小车岸桥（Double-trolley STS）的协调调度问题，根据双小车岸桥中转平台及其容量，以双小车岸桥门架小车时间窗为约束，合理利用双小车中转平台，建立以集装箱任务最大完工时间最小化为目标的混合整数规划模型。设计启发式算法求解岸桥门架小车时间窗，采用遗传算法进行求解并给出相应的调度优化方案。结果表明：采用双小车岸桥这类新型装卸设备，通过灵活的调配后小车的装卸作业，双小车岸桥与 AGV 的协调调度实现最优，减少岸桥和 AGV 的设备等待时间，增加设备作业的灵活性，从而缩短港口整体装卸时间。

关键词：自动化集装箱码头；双小车岸桥；中转平台；时间窗；AGV 调度

Research on the Problem of STS and AGV Coordinated Scheduling in Automated Terminal

Liang Chengji, Lin Yang

Abstract:

In order to study the coordination of automatic guided vehicles (AGVs) and Double-trolley STS in automated container terminals, according to the dual-vehicle pontoon bridge transfer platforms and their capacity, The gantry crane gantry trolley time window is a constraint, the rational use of the double trolley transit platform, the improvement of the equipment coordination of the loading and unloading container task, and the establishment of a mixed integer programming model aiming at minimizing the maximum completion time of the container task. A heuristic algorithm was designed to solve the gantry crane trolley time window. The genetic algorithm was used to solve and the corresponding scheduling optimization program was given. The results show that the new type of loading and unloading equipment, such as double trolley bridges, can improve the continuity and coordination of the equipment by rational use of the transfer platform. Through the flexible loading and unloading operation of the trolleys, the coordinated scheduling of double-vehicle pontoon bridges and AGVs can be improved. Realize the optimization, reduce the equipment waiting time of the shore bridge and AGV, increase the flexibility of the equipment operation, and shorten the overall loading and unloading time of the port.

Keywords: automated container terminal; double-trolley quay crane; transfer platform; time window; agv scheduling

作者简介：梁承姬，上海海事大学物流科学与工程研究院，电话：18930295693，邮箱：liangcj@shmtu.edu.cn。

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陆海滚装甩挂运输运作模式优化研究

孙倩雯¹, 靳志宏², 徐丽群¹, 孙家庆²
(1. 上海交通大学; 2. 大连海事大学)

摘要：为了充分发挥陆海滚装甩挂运输的优势，本文同时考虑内陆集发货作业与滚装船装卸作业，提出了码头甩挂、舱内甩挂及混合甩挂三种运作模式，构建了陆海滚装甩挂运输运作模式优化模型，并以多组模拟数据，采用模拟退火算法，探讨了牵引车数量、任务量、牵引车到港时间对不同运作模式选择的影响。研究结果表明，不同影响因素导致运作模式的优劣与适用范围不同。在牵引车数量较少、任务量较大、牵引车到港时间较晚且牵引费低廉的情况下，应选择码头甩挂模式；在牵引车数量较多、任务量较小，牵引车到港时间偏早且牵引费较贵的情况下，应选择舱内甩挂模式；其他情形下则采用混合模式。本研究对陆海滚装甩挂运输运作模式优化具有重要的理论意义与实践价值。

关键词：陆海滚装甩挂运输；运作模式；模拟退火算法

Operation Mode Optimization of Land-Sea Ro-ro Drop and Pull Transportation

Sun Qianwen, Jin Zhihong, Xu Liqun, Sun Jiaqing
(1. Shanghai Jiaotong University; 2. Dalian Maritime University)

Abstract:

This paper puts forward the operation modes of land-sea ro-ro drop and pull transportation including wharf drop and pull mode, cabin drop and pull mode and mixed mode. An optimization model is established, and a simulated annealing algorithm is designed to solve the problem in view of the characteristics of the model. Moreover, the influence of the number of tractors and tasks and the arrival time to the port of the tractor on the selection of the operation mode are analyzed by a multi group numerical test. Result shows that transportation enterprises should choose the wharf drop and pull mode in the case of small number of tractors and tasks, late arrival of tractors and the low traction fee. On the other hand, the cabin drop and pull mode or the mixed mode is chosen. It provides a reference for the scientific and effective decision-making of transportation enterprises.

Keywords: Land-Sea Ro-ro Drop and Pull Transportation; Operation mode; Simulated annealing algorithm

作者简介：孙倩雯，上海交通大学，电话：15941162043，邮箱：aryasun425@gmail.com。
Abstract: This paper develops an analytical model to investigate the determinants and their impacts on the forward freight agreement (FFA) trading volume for dry bulk ships from a cross-market perspective. A two-step model specification is employed to empirically test the theoretical results for the Capesize, Panamax and Supramax sectors. It is found that spot demand has the positive relation with FFA trading volume for the all three sectors. Moreover, spot demand volatility has the negative relation, while the correlation between spot demand and spot rate has the positive relation with FFA trading volume for the Capesize and Panamax sectors.

Keywords: Dry bulk; Spot price; FFA; Trading volume; Fixture demand; DCC-GARCH model
船舶自动识别系统的网络化信息保护

黄小军

摘 要：在陆上反恐形势依然不容乐观的今天，通常被认为最易收到恐怖袭击的海事界却风平浪静，然而，在这平静的背后，隐忧犹在。无疑，《国际船舶和港口设施保安规则》（ISPS）的实施为海上安全筑起了一道防火墙。执行 ISPS 规则，增添了船舶自动识别系统(AIS)后，互联网经济助推 AIS 的快速发展与应用给航运管理带来的机遇与挑战，其中船舶及港口设施信息的公开滥用，为船舶安全管理带来了安全风险，本文讨论了船舶自动识别系统公开滥用的安全风险，提出了安全建议。

关键词：船舶自动识别系统；网络化信息保护；使用权限

Network Information Protection of Ship Automatic Identification System

Huang Xiaojun

Abstract:

In today's land anti-terrorism situation is still not optimistic, generally considered the most easily received maritime boundary of terrorist attacks is a calm, however, behind the calm, concerns. There is no doubt that the international ship and port facility security code (ISPS) implementation of a firewall has been built for maritime security. Perform ISPS code, add the ship automatic identification system (AIS), after the rapid development of Internet economy booster AIS to shipping management and application of opportunities and challenges, one of the ships and port facilities information open to abuse, brought a security risk for the ship safety management, this article discussed the ship automatic identification system of the abuse of public security risks, security recommendations are put forward.

Keywords: ship automatic identification system; network information protection; access

作者简介：黄小军， 电话：18907876639，邮箱：bravehxj@163.com。
A Simulation-based Research on Real-time Traffic Volume for Container Terminals under Uncertainties

Peng Yun
Dalian University of Technology
yun_peng@dlut.edu.cn

Wang Wenyuan
Dalian University of Technology
wangwenyuan@dlut.edu.cn

Song Xiangqun
Dalian University of Technology
sxqun@126.com

Li Xiangda
Dalian University of Technology
201352026@mail.dlut.edu.cn

Chen Zhongya
Dalian University of Technology
948211540@qq.com

Abstract: The real-time traffic volume in a container terminal is very hard to predict with the random arrival of vessels and container trucks. The traffic flow in the collecting and distributing system of the container terminal is not independent. There are many random factors in the system. In order to solve the complex problem, this paper builds a traffic simulation model to calculate the real-time traffic volume of a container terminal. The model is set up to simulate the whole operation process of the container terminal considering the stochastic vessels arrival time. First, the traffic demand caused by the arrival of vessels is analyzed. Then, we study the distribution characteristics of the arrival or departure container trucks. Finally, the simulation model is established considering the collecting and distributing traffic characteristics. The proposed simulation method in the paper can reflect the port real-time traffic characteristics more comprehensively. The arrival data of the container trucks at the gate for the container terminal in north of China are used to verify the simulation model. The results show that compared with the results calculated by Chinese Standard, the simulation results are more accurate. After the statistical analysis of the real-time traffic volume, a good reference for the transportation system planning of container terminals can be provided.

Keywords: Container terminal; traffic volume; stochastic arrival time; simulation
基于网络性能视角的集装箱航运网络关键港口研究

张铖, 封学军, 蒋柳鹏, 陆玉华

（河海大学）

摘要：随着国际贸易活动的日益增多,对集装箱海运的依赖也在日趋增加,集装箱海运活动的效率将直接影响到国家间的贸易交流。本文基于复杂网络理论,从网络性能的角度对“21世纪海上丝绸之路”集装箱航运网络中的关键节点进行识别，分别从复杂网络的视角与航运的视角对关键节点的特征进行分析，并与基于度值和介数的关键节点识别方法进行对比。分析结果表明：基于网络性能的关键港口识别方法可在基于度值和介数方法的基础上,对处于连接不同局部网络位置的关键节点进行识别,该方法对于航运网络中关键港口的识别与网络结构的优化具有重要的参考意义。

关键词:“21世纪海上丝绸之路”; 复杂网络; 集装箱航运网络; 关键港口识别

Research on Key Ports of Container Shipping Network Based on Network Capacity

Zhang Cheng, Feng Xuejun, Jiang Liupeng, Lu Yuhua

(Hohai University)

Abstract:

With the increasing number of international trade activities, the dependence on container shipping is also increasing. The efficiency of container shipping activities will directly affect the efficiency of trade exchanges between countries. Based on the theory of complex networks, this paper identifies the key nodes in the 21st Century Maritime Silk Road container shipping network from the perspective of network capacity and analyzes the characteristics of key nodes from the perspective of complex networks and shipping perspectives. Comparison of key ports identification methods based on degree values and intensities. The analysis results show that the key ports identification method based on network performance can identify key nodes connected to different local network locations based on the degree value and inference method. This method is used to identify and network key ports in shipping networks. The optimization of the structure has important reference significance.

Keywords: "21st Century Maritime Silk Road”; complex network; container shipping network; key Port Identification

作者简介：张铖，河海大学，电话：15705187117，邮箱：466159115@qq.com。
Connectivity Analysis of the Global Shipping Network by Eigenvalue Decomposition

Pan Jingjing
Fujian Agriculture and Forestry University, School of Transportation and Civil Engineering; University of Sydney, Institute of Transport and Logistics Studies
pan_jingjing@126.com

Michael G H Bell (Australia)
University of Sydney, Institute of Transport and Logistics Studies
michael.bell@sydney.edu.au

Kam-Fung Cheung (Australia)
University of Sydney, Institute of Transport and Logistics Studies
kf.cheung@sydney.edu.au

Supun Perera (Australia)
University of Sydney, Institute of Transport and Logistics Studies
supun.perera@sydney.edu.au

Yu Hang
Shanghai Maritime University, School of Economics & Management; University of Sydney, Institute of Transport and Logistics Studies
geilist@163.com

Abstract: Shipping offers flexible access among countries, thus the world is connected through the global shipping network. This paper presents an efficient method to reveal the port communities in the global shipping network, which means the ports in the same community are well-connected while the ports from different communities are poorly connected. The shipping network is represented by the signless Laplacian matrix which can be decomposed to generate eigenvalues. The largest gaps between the eigenvalues are used as heuristics to determine the optimal number of communities in the network. The eigenvalue decomposition method has an advantage in detecting port community without priori assumptions on the number of communities and the size of each community. We apply the method on a dataset collected from seven leading liner shipping companies. The results show that the ports are clustered to three communities consistent with three main trade routes.

Keywords: shipping network; eigenvalue decomposition; clustering; connectivity
FPSO 上部结构可燃气云爆炸超压分布数值模拟研究

张彬，张兴东
（大连海事大学）

摘    要：为分析 FPSO 上部结构可燃气云爆炸超压分布随距离和时间的变化关系，利用 CFD 软件 FLACS 对开敞空间可燃气云爆炸实验进行数值模拟，模拟结果与实验结果相比较，最大误差为 11.49%，平均误差 5.42%。鉴于此，本研究使用该方法对实际 FPSO 船舶上部结构原油处理单元 1、2 和燃油处理单元按照 1:30 的比例建模，模拟 FPSO 一级分离器泄漏可燃气云并发生爆炸的过程。模拟结果表明：最大爆炸压力出现在甲板上，或对压力波产生较大阻障的设备上；超压在距离爆心 9 倍半径处压力逐渐减弱为 0；可燃气云火焰面以近似球面的形状由近地面向周围扩展，最大的爆炸压力出现在燃烧过程中。

关键词：可燃气云；爆炸；数值模拟；FPSO

Numerical Simulation of the Overpressure Distribution of Flammable Gas Cloud in the topside of FPSO

Zhang Bin, Zhang Xingdong
(Dalian Maritime University)

Abstract:
In order to analyze the relationship between flammable gas cloud explosion overpressure distribution and distance and time of the FPSO the topside process deck, the CFD software FLACS was applied for simulating the unconfined flammable vapor cloud explosion experiment. The maximum deviation was 11.49% compared with the experimental value, the average deviation was 5.42%. In view of this, this study uses this method to model the actual FPSO topside process deck of oil treatment module 1, 2, and fuel oil treatment in a ratio of 1:30 modeling to simulate the FPSO first stage separator leaking a flammable gas cloud and exploding. The simulation results show that the topside process the maximum explosion pressure occurs on the deck or the equipment that has a large obstruction to the pressure wave; The overpressure is gradually reduced to 0 at a distance of 9 times the radius of the blast center. The flame face of the flammable gas is similar to the shape of the sphere and the near-ground expansion spreads around, the maximum explosion pressure appears in the combustion process.

Keywords: flammable vapor cloud; explosion; numerical simulation; FPSO

作者简介：张彬，大连海事大学，电话：18940813837，邮箱：zhangbindmu@hotmail.com。
基于无人驾驶船舶的《避碰规则》修改之管见

朱金善
(大连海事大学)

摘 要：随着船舶通信导航、智能控制、船舶设计与建造等技术的迅猛发展，以及船舶通航环境的日益变化，现行《国际海上避碰规则》是否能够满足即将投入使用的无人驾驶船舶的发展需要已成为海运界研究的热点问题。从《规则》的适用对象及“船舶”的定义出发，分析了现行《规则》适用无人驾驶船舶存在的障碍及其原因；在此基础上提出修改“互见”的定义，将《规则》第二章第三节及第19条的标题均改为“船舶在非互见中的行动规则”，修改第19条中有关款项的内容；阐述了《规则》中不宜为无人驾驶船舶增设特殊规定的理由；以期《规则》能够适用无人驾驶船舶，指导无人驾驶船舶之间，以及无人驾驶船舶与有人驾驶船舶之间的避碰实践。

关键词：《国际海上避碰规则》；无人驾驶船舶；互见；能见度不良

Opinions on the Revision of International Regulations for Preventing Collisions at Sea

Zhu Jinshan
(Dalian Maritime University)

Abstract:
With the rapid development of technologies such as marine communication and navigation, intelligent control, vessel design and construction, and the changing of vessel navigation environment, whether the existing International Regulations for Preventing Collisions at Sea (COLREGs) meets the development needs of unmanned ship to be put into operation becomes a popular issue in the maritime industry research. Starting from the applicable object of COLREGS and the definition of “vessel”, this paper analyzes the existing obstacles and causes to the application of the COLREGS to unmanned ship; on the basis of this, the definition of “in sight of one another” was proposed to be amended, changing the titles of Section 3 of Chapter 2 and Article 19 of the COLREGS to “Conduct of vessels not in sight of one another” and amending the relevant provisions of Article 19; the reason why it is not suitable to add special provisions for unmanned ship in the COLREGS is expounded. In the hope that the COLREGS can be applied to unmanned ship to guide the practice of collision avoidance among unmanned ships as well as between unmanned ships and manned ships.

Keywords: International Regulations for Preventing Collisions at Sea; unmanned ship; in sight of one another; restricted visibility

作者简介：朱金善，大连海事大学，电话：18900982502，邮箱：zjinshan888@126.com。
Research on Route Capacity Allocation of Island Tourism

Sun Ling
Shanghai Maritime University
sunl@shmtu.edu.cn

Xuhao
Shanghai Maritime University
apricot0927@qq.com

Liu Wei
Shanghai Maritime University
weiliu@shmtu.edu.cn

Abstract: Island tourism has been more and more popular with tourists, gradually developing into a hot spot of tourism. Throughout the domestic and international academic research, there is less research on the route design and capacity allocation of island tourism. So this paper focuses on this topic and conducts research, which in practice not only can solve the problem of tourism routes in Zhoushan Dinghai, but also provide references for the academic study in the future. This paper first analyzes the influencing factors of island tourism routes. Then, in view of this, the design model of island tourism route is established with the minimum operating cost of island tourism vessels as the objective function. On the basis of the route decision, the capacity allocation model is constructed with gamma equation. Finally, with the planning of Zhoushan City, this paper makes an empirical analysis on the southern islands of Dinghai District, drawing the relationship between the ship size and the number of ships in order to meet the number of tourists in Zhoushan, and then designs the corresponding ship schedule of island tourism.

Keywords: island tourism; ship route planning; capacity allocation; ship schedule
基于消费者偏好的近海型邮轮产品设计

杨忠振 1，郭威佑 2

(1. 宁波大学; 2. 大连海事大学)

摘要：近海型邮轮旅游产品属中低端邮轮游产品，邮轮沿近海岸线航行，行程多为1-5天。尽管近海型邮轮游契合我国大众的消费水平，但目前中国邮轮旅游市场上几乎看不到这种产品。为基于细分的市场需求，设计价廉物美且能保障运营者获得合理利润的近海型邮轮游产品，本文构建了以运营者利润最大为目标的优化模型，确定近海型邮轮游产品的价格、挂靠港和发班时间。模型考虑消费者选择行为，基于离散选择理论构建效用函数，再根据产品选择的游客数随效用变化的特点确定运营收益。在案例分析中，选取东北地区旅游出行者实施问卷调查，利用调查得到的消费者偏好信息确定消费者偏好模型的参数，进而得到以大连港为邮轮母港的近海型邮轮旅游产品的最优设计方案。

关键词：邮轮旅游；近海型邮轮游；效用函数；邮轮母港；离散选择

Offshore Cruise Product Design Based on Consumer Preference

Yang Zhongzhen, Guo Weiyu

(1. Ningbo University; 2. Dalian Maritime University)

Abstract:

The offshore cruise tourism is medium and low-end cruise products. In offshore cruise tourism, the cruise ship navigates along the shoreline, and the travel time is usually 1-5 days. The offshore cruise tourism fits the level of China's mass consumption, but at present, this kind of product can hardly be seen in the Chinese Cruise Market. In order to design the offshore cruise products that can be based on the demand of subdivided market and guarantee the reasonable profit of the operators, this paper constructs the optimization model which aims at the maximum profit of the operators to determine the price, the port of call and the shift time of the offshore cruise tourism products. The model considers consumer choice behavior. Based on discrete choice theory, we construct the utility function. Then we determine the operating profit based on the characteristic of the number of tourists choosing the product depending on the change of the utility. In the case analysis, we carry out a survey of tourists from the Northeast and use the consumer preference information obtained from the survey to determine the parameters of the consumer preference model. Then we can get the optimal design scheme of offshore cruise tourism products.

Keywords: cruise tourism; offshore cruise tourism; utility function; cruise home port; discrete choice

作者简介：杨忠振，宁波大学，电话：15397219631，邮箱：yangzhongzhen@nbu.edu.cn。
Abstract: How to promote the development of coastal container shipping industry is a hot issue that the industry and academia pay close attention to at present. However, the current research is not rich and retrospective literature is inadequate, so this article reviews and summarizes the research in this area. The domestic and foreign literature and research are investigated from the aspects of transportation, operations research, management science and so on. In this paper, the related literature is reviewed in terms of modes of transportation competition, competition and cooperation among shipping enterprises and construction of container water transport network. This paper discusses and assesses the status quo in this area: (1) Study the law of choice of transport modes for the shipper and get two major research ideas on the mode of transport competition by analyzing. (2) With the acceleration of the construction of shipping alliance, the research based on the mechanism of shipping alliances has gradually increased, which provides a powerful reference to study the non-cooperative game of shipping enterprises. (3) More and more scholars try to solve the strategic planning problem, tactical design problem and operation management problem of container water transport network at the same time. This paper discusses certain theoretical limitations of the surveyed research and also offers suggestions for future research on container water transport networks. The optimization design of coastal container water transport network is essentially a kind of special network optimization design problem based on multi-party game. It is necessary to further explore the optimization of water transport network based on the existing research.

Keywords: coastal container shipping industry; non-cooperative game; optimization design; multi-party game
基于几何语义遗传算法的船舶行为预测

张义萌，文元桥，周春辉，黄亮，韩栋，顾尚定
(武汉理工大学)

摘 要：由于船舶行为是动态、不确定的，船舶行为预测研究是海事领域关注的热点，但大多数研究关注于大尺度的交通流预测，对单船船舶行为预测的研究较少。本文基于几何语义遗传算法，使用水上交通大数据对船舶轨迹进行预测，并根据预测轨迹提出预测船舶转向行为算法。长江渡船的实例表明遗传算法对船舶轨迹的预测符合船舶的实际行为，转向行为预测算法能够准确预测船舶的转向行为，因此能够实现船舶行为预警。

关键词：船舶行为；遗传算法；预测；AIS 信息；水路运输

Ship Behavior Prediction Based on Geometric Semantic Genetic Programming

Zhang Yimeng, Wen Yuanqiao, Zhou Chunhui, Huang Liang, Han Dong, Gu Shangding
(Wuhan University of Technology)

Abstract:
Since ship behavior is dynamic and uncertain, the research on ship behavior prediction is a hot topic in the field of maritime affairs. However, most studies focus on large-scale traffic flow prediction and few researchers dedicated to predict micro ship behavior. Based on geometric semantic genetic programming, this paper predicts the ship's trajectory by using big data of water traffic, and proposes the algorithm of predicting ship's steering behavior based on the predicted trajectory. The example of Yangtze ferry shows that the genetic programming predicts the ship's trajectory in line with the actual behavior of the ship, and the steering behavior prediction algorithm can accurately predict the steering behavior of the ship, therefore, the early warning of ship behavior can be realized.

Keywords: ship behavior; genetic programming; prediction; AIS information; waterway transport

作者简介：张义萌，武汉理工大学，电话：13296685378，邮箱：1036513297@qq.com。
Research of Fruits Logistics Network between Mexico and China

Shen Lixin
Dalian Maritime University
slx_1106@163.com

Estefania Lopez(Mexico)
Dalian Maritime University
estefy_lp19@hotmail.com

Abstract: The One Belt One Road promotes regional cooperation and integration among the countries. There are other multilateral trade agreements such as the Trans Pacific Partnership (TPP), where Mexico is included, and the China-ASEAN Free Trade Area (CAFTA), that building closer regional ties. In the last year, the two groups agreed to promote greater economic cooperation to facilitate trade flows among these groups and China.

The development of trade in fruits and vegetables between China and Mexico keep growing, Mexico is among the main countries that export more agri-food products. According with The Statistical Division (FAOSTAT 2016) of the Food and Agriculture Organization of the United Nations (FAO), in 2016 Mexico was the world's largest exporter of avocados and the third berry exporter. Avocados from Mexico achieved a growth rate of over 400% in 2016. The categories that showed great potential in 2015 include the growth of imports of berries in China, such as blueberries, raspberries, blackberries, blackberries and raspberries.

The development of trade in fruits and vegetables between Mexico and China allows both countries to improve the logistics network. Based on the research on the current trade of fruit and vegetable logistics in China and Mexico, the main mode of fruit and vegetable logistics transportation between China and Mexico is by shipping transportation.

It is recognized that avocados and other fruits have a short storage life, Mexico face a challenge to maintain the quality of the fruit when are exported over long distances. According to the director of the avocado exporters organization, the preservation of product quality and the cold chain are one the biggest logistical challenges in the avocado transport to China.

Therefore, in order to improve the quality and safety of fruit and vegetable exported from Mexico to China, the risk assessment model will be carried out for export maritime logistics fruits and vegetables from Mexico to China. The validity of the model will be verified and two cases will be used to help the study, finally the results will be discussed and evaluated, and effective risk control measures will be given.

The Mexican fruit export supply chain still has much to learn. This study will be a step in the right direction for the development of trade and logistics of the supply chain between Mexico and China, will reduce the risks in the logistics transport of fruits, reduce costs and losses and at the same time provide information for future research.

Keywords: Mexico; One Belt One Road; Cold-Chain; Fruits of Mexico; Fruit logistics
川江货车滚装运输与公路货运的技术经济比较

夏晶
(重庆交通大学)

摘要：川江地区货车滚装运输是一种新型公水联运的运输方式，在服务长江经济带内外联通方面发挥了重要的作用。文章以忠县—宜昌的公路运输与滚装运输两种运输方式为研究对象，采用比较法，利用 2016 年度运输数据对滚装运输的成本、效率、碳排放、安全性四方面的技术经济指标进行评估。最终得出滚装运输在成本、碳排放、安全性四个方面均表现出良好的技术经济优势，但运输效率较公路运输处于劣势地位。

关键词：运输经济学；水路运输；滚装运输；技术经济比较；碳排放

Technical and Economic Comparison between the Roro Transportation and Road Freight

Xia Jin
(Chongqing Jiaotong University)

Abstract:

The roro transport of trucks in the Chuanjiang area is a new type of transportation mode for public water transportation. It plays an important role in serving the internal and external connectivity of the Yangtze River Economic Belt. The article takes Zhongxian -Yichang road transportation and roro transportation as the research objects, adopting the comparative method, and uses the 2016 annual transportation data to analyze the cost, efficiency, carbon emission and safety of the roro transportation. to evaluate. In the end, it is concluded that roro transportation shows good technical and economic advantages in terms of cost, carbon emission and safety, but the transportation efficiency is at a disadvantage compared with road transport.

Keywords: Transportation Economics; Water Transportation; Roro Transport; Technical and economic comparison; Carbon emission

作者简介：夏晶，重庆交通大学，电话: 18725714400，邮箱: xiajing1111@yeah.net。
Integrated Inventory of Fresh Agricultural Products Supply Chain under "Agriculture Super-Docking"

Shen Lixin  
Dalian Maritime University  
slx_1106@163.com

Li Fucheng  
Dalian Maritime University  
chongzi920701@163.com

Abstract: Fresh agricultural product mainly refers to fruits, vegetables, seafood, meat, flowers, milk and eggs, etc. Its main features are perishable, not easy to preserve, low residual value, high circulation loss, difficult to transport, etc. Security and freshness of the products is the first factor for people when buying the fresh agricultural products, multi-level supply chain circulation pattern is hard to keep the products fresh. Agriculture Super-Docking, it refers to farmers who provide agricultural products to supermarkets through farmer professional cooperatives and directly establish a stable cooperative relationship between farmers and supermarkets, as a rapid circulation mode of agricultural products supply chain, it perfectly matches the public's demand for fresh agricultural products. The enterprise is not easy to hold much stock of the fresh agricultural product, because it’s not easy to be preserved. However, if the inventory is too low, it will increase the purchasing cost and cause the opportunity cost loss. Strengthening the inventory management of fresh agricultural products is beneficial to maintain the balance for supply and demand of market and improve the competitiveness of enterprises. The inventory management research for secondary supply chain (represented by suppliers and retailers) is relatively comprehensive, but in view of the three-level supply chain is relatively lack, especially the research for three-level supply chain inventory management based on "Agriculture Super-Docking" mode.

"Farmer professional cooperative+Distribution center+supermarket" is the new mode of "Agriculture Super-Docking", as the extension of "Farmer professional cooperative+supermarket" mode, through cooperation with third party logistics service providers to establish distribution center, overcoming the dispersion of consumer group sand concentration of fresh agricultural products mass production manner, the cross-regional circulation cannot be guaranteed under the freshness and quality of fresh agricultural products and a series of problems. Although the level of supply chain increases the fresh agricultural products circulation node. But considering of distribution center in this mode, through the information of farmer professional cooperatives and supermarkets such as production and supply, ordering and selling, sending an order request to the farmer professional cooperatives, and then the distribution center is unified to formulate the logistics distribution process, farmer professional cooperative and supermarkets in this kind of model just focus on their own production and sales, and do not need to consider the management
of the logistics operation, implement a unified planning of inventory management for agricultural products supply chain based on "Agriculture Super-Docking" mode. We probe the strategy for integrated inventory management of fresh agricultural products supply chain based on "Agriculture Super-Docking" mode, analyzes the difference of influence factors of inventory level at each hierarchy of supply chain. Under "Farmer professional cooperative + Distribution center + supermarket" mode, consider the level of supply chain members are multiple, and market demand for the influence factors of product freshness and selling price, combined with Ghare and Schrader’s classical metamorphic inventory formula, achieving the establishment of the "Agriculture Super-Docking" inventory integration model, and in this model, distribution center provides products processing, transportation and distribution services and participates in the sales process. At the same time, introduce the revenue sharing contract to achieve supply chain coordination optimization. The objective function of this model is the profit of the whole supply chain, the decision variables of this model are the replenishment frequencies and single replenishment amount for members of the supply chain at all levels within the limited period, through the improved genetic algorithm to solve the model, the genetic algorithm is improved by adding the adaptive crossover operator and adopting the elite retention strategy, at the same time, the catastrophe step is added to avoid the precocity of the algorithm and get into the local optimal value. The results of the model are solved by this genetic algorithm is to set up the best replenishment strategy for supply chain members, maximize the profit of the whole supply chain. And analyzes the influence factors of Farmer professional cooperative, distribution center and supermarket inventory model, studies the change of their profits and the profit of whole supply chain, Put forward the adjustment suggestion in the whole operation planning process of supply chain. The research of fresh agricultural product supply chain inventory management under "Agriculture Super-Docking" mode, intend to improve the supply chain income, reduce the cost of inventory management, reduce the purchase price of fresh agricultural products, achieve win-win situation.

**Keywords:** Agriculture Super-Docking; Fresh Agricultural Product Supply Chain; Three-level Integrated Inventory; Replenishment strategy; Genetic Algorithm
大型船舶用锚操纵

彭延领
（上海港引航站）

摘要：本文通过对以往失控船舶应急用锚的统计分析和对锚设备的深入研究，特别是对前进中的大型船舶用锚机松一定长度的锚链后，锚设备的受力进行分析，提出了大型船舶用锚操纵的设想，并在一定的环境和情况下进行了操纵。其安全性和有效性得到了验证。大型船舶能用锚操纵，不仅对目前的船舶操纵而且对将来无人驾驶船舶都有重大意义。

关键词：拖锚；锚设备；锚机；锚机拉力；锚链张力；无人驾驶船舶

Maneuver a Large Vessel by Dredging Anchor

Peng Yanling

Abstract:
Based on the statistical analysis about the previous emergency using anchors by a vessel not under command and careful study on anchor system, especially force analysis of anchor equipment while walking back some shackles on deck by undergoing vessel, the idea of maneuvering a large vessel by dredging anchor is proposed and put into practice under certain circumstances and conditions. The safety and effectiveness of the idea have been verified. The idea is very important for maneuvering not only large vessels now but also unmanned vessel in the future.

Keywords: dredging anchor; anchor equipment; windlass heaving force; chain tension; unmanned vessel

作者简介：彭延领，上海港引航站，电话：15921130006，邮箱：1809408872@qq.com。
Research on Network Evolution of key Ports in China under the Belt and Road Strategy

黎燕
evelynkiss@163.com

Abstract: With the rapid development of science and technology in the information age, the complex network system is becoming human activities irreplaceable part of life. In the vision and action documents released by the State Council of CPC in March to promote "the Belt and Road", the construction of the Maritime Silk Road has become an important strategy for national development. Therefore, it’s important and necessary to study the network evolution research of ports group.

This paper made simulated network of 15 coastal ports to be strengthened in the documents. We also established the shipping network evolution model by using improved BA model, based on the growth and preferential attachment of node degree distribution with nodes attractions. The result shows that the model has short average distances between the ports but strong clustering coefficient, and the model has the scale-free network properties and follows the power-law distribution showing that ports need further constructions.

Keywords: the Belt and Road, Ports group, Network evolution, Improved BA model, Scale-free network properties
安全态势图避让法

廖秉军
（中远海运发展股份有限公司）

摘  要：本文总结了经验丰富的船长和驾驶员高效决策的原理和方法，用有规律的一系列图形的方法反映出船舶碰撞风险识别和管控的避碰全过程，提出了“安全态势图”的相关概念及基本用法。提出“安全态势图”可作为研发能够适应复杂水域各种局面的符合航海实践的“船舶避碰辅助系统”的理论基础。

关键词：安全态势图；领域；船舶避碰辅助系统

Collision Avoidance Method Based on “Safety Situation Diagram”

Liao Bingjun

Abstract:
This paper summarizes the principle and method of experienced captains and officers efficient decision-making, reflect the whole process of ship collision avoidance risk identification and control method of a series of figures regularly, solve the existing collision theory it is difficult to meet the “rules” and good seamanship requirements, put forward the related concept of “safety situation diagram” and the basic usage. It is suggested that “safety situation diagram” can be used as a theoretical basis for developing “Marine Collision Avoidance auxiliary support system” which is suitable for various situations in complex environment.

Keywords: safety situation diagram; Domain; Marine Collision Avoidance auxiliary support system

作者简介：廖秉军，中远海运发展股份有限公司，电话：13922273210，邮箱：286261800@qq.com。
浅谈我国绿色航道发展现状及问题对策

李攀，沈建霞
（苏交科集团股份有限公司）

摘 要：当前关于绿色航道的研究成果较少，技术方法尚不成熟。在绿色发展理念下建设绿色航道备受关注。通过对文献资料的检索，总结了国内绿色航道发展现状及存在问题，尝试提出了绿色航道建设的技术路线和对策措施，为后续研究提供一些指导性意见。

关键词：绿色航道；节能减排；绿色施工；绿色养护

Status and Countermeasures to Issues in Development of Green Channel in China

Li Pan, Shen Jianxia

Abstract:
There are few research achievements on green channel at present, and the technical methods are not yet mature. Construction of green channel under the concept of green development has attracted much attention. Through the retrieval of literature, the status and problems of green channel development in China were summarized, and the technical routes and Countermeasures for green channel construction were put forward, providing some guidance for future research.

Keywords: green channel; energy-saving and emission reduction; green construction; green maintenance

作者简介：李攀，苏交科集团股份有限公司，电话：18851175120，邮箱：lp98@jsti.com。
Quantitative Failure Risk Modeling Method for Safety Barrier of Maritime Accidents

Wu Bing

Abstract:

In order to full understand the role of influencing factors in maritime accidents, from the perspective of failures of different elements in causation analysis, a quantitative failure risk modeling method based on failure mode and effects analysis (FMEA) and belief rule base for safety barrier of maritime accidents is proposed. First, the human factors interaction method is introduced to identify the four failure modes of safety barrier, and the belief evaluation model is proposed to assign the probability of the four failure modes in each accident. Second, the FMEA for each failure mode is carried out, through which the belief rule base of safety barrier is established, and the activated rules for different failure modes are selected in terms of the values of risk factors for each case. Afterwards, the method for obtaining the weights of risk factors, weights of activated rules and activation weights are proposed, and evidential reasoning method is utilized to synthesis the activated rules for each failure mode. The synthetic result, essentially, is the risk level for each failure mode of many accidents. Lastly, 64 accident investigation reports during the period 2000 to 2010 are used to verify the proposed model. The result demonstrates that not only the failure risk of human element is high, but also the risk of external factors and tools/equipment are high.

Keywords: Maritime Accidents; Failure Risk; Belief Rule Base; Evidential Reasoning; Human element

作者简介：吴兵，电话：15171442668，邮箱：bing.wu@whut.edu.cn。
基于拓扑地图的无人艇路径搜索方法

顾尚定，周春辉，文元桥，周杰，张奇，何帆
（武汉理工大学）

摘要：针对目前路径规划容易陷入局部最优以及搜索时间较长的问题，提出了一种基于拓扑地图的无人艇路径搜索方法。首先，分析空间物体的拓扑位置关系。其次，利用空间物体的拓扑位置关系建立拓扑地图，避免大量网格化的路径搜索造成时间复杂度的提升，同时避免搜索陷入局部最小值。最后，对建立的拓扑地图采用 Dijkstra 算法进行最优路径选择。实验结果表明，基于拓扑位置关系的无人艇路径搜索方法在满足最优路径的情况下，能降低算法复杂度，同时也能避免路径搜索陷入局部最优的问题。

关键词：拓扑关系；路径搜索；Dijkstra 算法；空间关系

USV Path Search Based on Topological Map

Gu Shangding, Zhou Chunhui, Wen Yuanqiao, Zhou Jie, Zhang Qi, He Fan
(Wuhan University of Technology)

Abstract:
Aiming at the problem that path planning is easy to fall into the local optimum and the search time is long, a method based on topological map for unmanned path search is proposed. First, analyze the topological location of space objects. Secondly, the topological map is constructed by using the topological positional relationship of the space objects to avoid the time complexity increase caused by the extensive gridding path search, and to avoid the search falling into the local minimum. Finally, the Dijkstra algorithm is used to select the optimal path for the established topology map. Experimental results show that the UAV-based topology search method can reduce the complexity of the algorithm while satisfying the optimal path, and can also avoid the problem of the path search falling into the local optimum.

keywords: Topological Location; Path Search; Dijkstra Algorithm; Spatial Relationship

作者简介：顾尚定，武汉理工大学，电话：18086441186，邮箱：gshangd@163.com。
Recent Development of Chinese Port Cooperation Strategies

Huo Weiwei  
Yancheng Teachers University, College of Business  
huoweiwei298@163.com

Zhang Wei  
University of Tasmania, Australian Maritime College  
Vera.Zhang@utas.edu.au

Chen Peggy Shu-Ling(Australia)  
University of Tasmania, Australian Maritime College  
p.chen@utas.edu.au

Abstract: The Chinese governments have worked out numbers of schemes at national or provincial levels to encourage port cooperation. The new geo-economic policy the Belt and Road Initiative brings new opportunities and challenges for port cooperation and development in China and the regions along the Belt and Road. This paper analyses port collaboration strategy adopted and implemented in China. It identifies the evolution of domestic port cooperation in China and the modes of international port cooperation of China. The paper concludes the trend of domestic port cooperation is towards the provincial port group. It also draws the insightful conclusion that the majority of international port cooperation cases of China happened along the Belt and Road after the year 2013. This paper proposes the implications with regard to the dynamic port cooperation development for Chinese ports and terminal operators. In theory, the research enriches the current studies by discussing the recent development systematically on port cooperation incentives and trend in China, as well as the modes of China’s international port cooperation strategy. In practice, it draws implications on the performance evaluation and risks associated with Chinese port cooperation strategies.

Keywords: Port cooperation; Chinese ports; Domestic provincial port groups; International port cooperation
系泊方式对浮箱系泊系统水动力性能影响分析

彭泽宇
（江苏中路工程技术研究院有限公司）

摘 要：对于水上系泊系统，系泊方式对于整个系泊系统的系泊力和运动精度有着非常重要的影响，有必要分析不同系泊方式对系泊系统运动性能和系泊缆动力性能的影响，揭示系泊方式对系泊系统的作用和影响机理。基于势流理论，结合大型水动力学软件 AQWA，以一种简单的矩形浮箱式结构物为典型示例，根据浮箱基本参数及相关技术要求，考虑系泊半径、系泊点数、系统布置形式等影响系泊性能的主要因素，建立系泊系统动力分析计算模型。分析结果表明：在讨论范围内，随着缆绳系泊半径的增加，系泊半径对最大系泊力的影响逐渐减少；随着系泊点数的增加，系泊系统对浮体的定位能力明显增加；不同系统布置形式受力均匀性差别不大。关键词：系泊方式；系泊系统；浮箱；水动力分析

The Effect of Mooring Pattern on the Hydrodynamics Performance of the Buoyancy Tank Mooring System

Peng Zeyu

Abstract:
For floating mooring system, mooring pattern for the mooring force and motion precision of the mooring system has very important influence, it is necessary to analyze different mooring methods on mooring system movement performance and the influence of the mooring line dynamic performance, revealing the mooring way the role and influence mechanism of mooring system. Based on the potential flow theory, combined with the large water dynamics software AQWA, with a simple rectangular pontoon structures as the typical example, based on the floating body and related technical requirements, considering the main factors influencing the mooring performance of mooring radius, mooring points and the arrangement of mooring system, the dynamic analysis and calculation model of mooring system is established. The results show that within the scope of the discussion, the influence of mooring radius on maximum mooring force decreases with the increase of mooring radius; With the increase of mooring points, the mooring system has significantly increased the positioning ability of floating body. There is not much difference in force uniformity in different arrangements.

Keywords: mooring pattern, mooring system, tank, hydrodynamic analysis

作者简介：彭泽宇，江苏中路工程技术研究院有限公司，电话：18551782778，邮箱：503185042@qq.com。
考虑港口吞吐量预测及其不确定性的码头规模随机优化模型

唐国磊

摘 要：为减少投资风险，保证港航双方的共同利益，在确定码头投资规模时必须考虑港口吞吐量预测的不确定性。本文提出一种利用后验的吞吐量状态转移概率和吞吐量预测似然概率来描述港口吞吐量预测及其不确定性的码头最优规模的随机优化模型，并详细给出码头规模随机优化模型的目标函数、顺序递推方程等。研究结果表明考虑港口吞吐量预测及其不确定性的随机优化模型比确定性模型具有较好的可靠性和鲁棒性。

关键词：港口规模；吞吐量不确定性；随机优化；后验状态转移概率；似然概率

Stochastic Optimizing Port Scale Considering Port Cargo Throughput Forecast and Its Uncertainty

Tang Guolei

Abstract:
To reduce investing risk and maximize the mutual benefits of both ports and ship owners, the uncertainty of port cargo throughput forecast should be considered when optimizing the port scale. This paper proposes a port scale stochastic optimization model cooperating the forecast and its uncertainty through a posterior transition probability and likelihood probability. This model’s objective and recursive equations are also discussed in detail. The results demonstrate that the proposed stochastic optimal model provides better reliability and robustness comparing the deterministic solution.

Keywords: port scale; throughput uncertainty; stochastic optimization; Posterior transition probability; likelihood probability

作者简介：唐国磊，电话：13940952366，邮箱：tangguolei@outlook.com。
不同材质活性炭脱硝性能实验

邝海浪，纪玉龙
(大连海事大学)

摘 要：活性炭较高的比表面积和化学活性，使其表现出良好的吸附能力和催化性能，尤其在烟气脱硫脱硝领域有很好的发展前景。本文以焦油煤质活性炭、果壳活性炭、椰壳活性炭为催化剂，NH₃为还原剂，研究了其在不同条件下的脱硝性能。实验表明，在无氧条件下，三种活性炭的脱硝性能均较差，在高温时，活性炭表面含氧官能团发生分解生成CO，能大大提高脱硝性能，但将会对活性炭结构造成不可逆损害。有氧气存在时，活性炭的脱硝性能有一定程度的提高。

关键词：活性炭；柴油机尾气；脱硝；含氧官能团；一氧化碳

Experimental Study of Denitrification Performance Using Different Material Activated Carbon

Kuang Hailang, Ji Yulong
(Shanghai Maritime University)

Abstract:

Because of the high specific surface area and chemical activity, activated carbon has excellent adsorption capacity and catalytic performance. It has good future especially in the field of flue gas desulfurization and denitrification. This paper studied the denitrification performance under different conditions by using tar-coal activated carbon, nutshell activated carbon, coconut shell activated carbon as catalyst and NH₃ as reducing agent. Experiment results show that without oxygen, the three types of activated carbon have poor denitrification performance. At high temperature, the oxygen-containing functional groups on the surface of activated carbon decompose to CO, which can greatly improve the performance of denitrification, but will cause irreversible damage to the structure of activated carbon. The presence of oxygen has a great influence on the denitrification performance of ativated carbon.

Keywords: activated carbon; diesel exhaust; denitrification; oxygen-containing functional groups; carbon monoxide

作者简介：邝海浪，大连海事大学，电话：18742512787，邮箱：441443904@qq.com。
视频图像中的船舶目标检测

吕艺俊  
(集美大学)

摘要：船舶目标检测，是指从视频图像中将运动变化区域中的船舶目标提取出来的检测技术。本文介绍了用固定的摄像头拍摄海上航行船舶的视频图像，从视频图像中检测出目标船舶的方法。该方法为基于边缘检测的三帧差法与基于中值法的背景减法结合的船舶目标检测算法。实验表明这种二者互相结合的方法相对于单一方法能够更有效、准确、可靠地提取出船舶目标。

关键词：船舶目标检测；Canny 边缘检测；三帧差法；背景减法

Ship Target Detection of the Video Images

Lv Yijun  
(Jimei University)

Abstract:
Ship target detection refers to the detection technology that extracts the ship targets in the motion-varying region from the video image. This article describes the method of capturing a video image of a sea-going vessel using a fixed camera and detecting a target ship from a video image. This method is a ship target detection algorithm combining three-frame difference method and background subtraction based on median method. This combination of the two methods is more effective, accurate and reliable in extracting ship targets than a single method.

Keywords: ship target detection; Canny edge detection; three-frame-difference method; background subtraction

作者简介：吕艺俊，集美大学，电话：13110921383，邮箱：1076491720@qq.com。
Comparison of Economic Contribution Between Xiamen Port and Other Ports

Xue Ya’ou
Shanghai Maritime University
18355128418@163.com

Liu Wei
Shanghai Maritime University
weiliu@shmtu.edu.cn

Sun Ling
Shanghai Maritime University
sonnezyzzyva@aliyun.com

Abstract: In order to promote the development of Xiamen Port and make it possible to give full play to its own comparative advantage. A comparative analysis of the economic contribution rate of Xiamen Port and other major ports in China. Using principal component analysis to analyze and study the economic contribution rate of Xiamen Port and other major ports in our country and put forward corresponding measures for the problems existing in the development of Xiamen Port. After analysis, Xiamen Port can improve its management ability through upgrading infrastructure level, enhancing urban development, improving water depth and expanding economic hinterland and other measures to enhance competitiveness.

Keywords: Xiamen Port; Principal Component Analysis; economic contribution rate; Suggestions
Modeling and Optimizing of Vessel Fuel Consumption Based on Grey-box Model

Yuan Zhi
(Wuhan University of Technology)

Abstract:
During the process of transportation, the vessel fuel consumption not only increases a lot of cost, but also emits a large amount of gas such as CO2 which also causes pollution to the atmosphere to varying degrees. Accurate and high-efficiency vessel fuel consumption can achieve the best energy efficiency. In this paper, after considered the various influencing factors of vessel fuel consumption, building model based on the gray-box model theory. We analyzed and solved the model using neural-network. Moreover, we also considered the impact of waves and further optimized the model to maximize energy efficiency. In this way, not only reduce the costs of shipping, but also decreases the emission of polluting gases.

Keywords: vessel fuel consumption model; maximum energy efficiency; gray-box model; neural-network

作者简介：袁智，武汉理工大学，电话：13277072318，邮箱：wisdomyuan@126.com。
内河客船抗倾覆气囊优化布置研究

龙培基，陈海泉
（大连海事大学 轮机工程学院）

摘 要：为了对抗倾覆气囊进行了合理设计，本文通过对防倾覆气囊折叠展开过程的数值模拟，研究了气囊在不同充气过程中，气囊的应力、体积和温度的变化，来探讨设计的防倾覆气囊的安全系数。

关键词：抗倾覆气囊；充气展开；气囊折叠

Study on Optimal Arrangement of Anti-Capsizing Airbag for Inland River Passenger Ship

Long Peiji, Chen Haiquan
(College of Marine Engineering, Dalian Maritime University)

Abstract:

In order to resist the reasonable design of the overturned airbag, this paper studied the variation of the stress, volume and temperature of the airbag in different inflating process through the numerical simulation of the folding and unrolling process of the anti-capsizing airbag. To explore the safety factor of the designed anti-capsizing airbag.

Keywords: Anti-heeling airbag; risk assessment; Air bag folding

作者简介：龙培基，大连海事大学轮机工程学院，电话：18018968303，邮箱：270119543@qq.com。
Port Economic Contribution Based on Input - Output Method - A Case of Xiamen Port

Zeng Xufeng
Shanghai Maritime University
735506890@qq.com

Sun Ling
Shanghai Maritime University
sonnezyzyva@aliyun.com

Liu Wei
Shanghai Maritime University
weiliu@shmtu.edu.cn

Abstract: Input-output model is a model that through the preparation of input-output table, using linear algebra tools to establish a mathematical model to reveal the various sectors of the national economy, reproduction of all aspects of the internal linkages, and accordingly economic analysis, forecasting and scheduling of the budget plan. A port not only facilitates the transport of an urban area but also plays a very important role in the economic development of an urban area. This thesis will introduce a method to estimate the contribution of port to urban economy through the reconstruction of input-output model and the theory of multiplier, combined with the specific data of Xiamen Port. At last we will display the method combining with the data of Xiamen Port.

Keywords: Input-output model, Multiplier theory, Port, Economic contribution
Research on Joint Dispatch of Port Berth

Zhang Lijuan
sdlgjtyclgc@163.com

Abstract: At present, port berths scheduling is mainly single port and multi berths scheduling. With the expansion of container ports, the development of ports has appeared different levels, identical location, duplication of functions and hinterland crossover, to a certain extent, the disordered competition between the ports has been formed, which is very unfavorable to the economic development of the regional ports. A single port can not rely solely on its own scale development, and the linkage between ports is the inevitable trend of its future development. Under the mode of port cluster linkage, the optimal allocation of port resources will be realized by the joint dispatch of ships in multiport and multi berth. In this paper, aiming at the problem of berth scheduling in port cluster linkage mode, a collaborative optimization model of port and berth based on the minimization of total port time in a ship is established. An empirical study is carried out on the assumption of the coordinated operation of multiple berths in a port with multiple ports. The results show that by optimizing the allocation of port cluster resources, the time and cost of ships in port can be effectively reduced, so as to enhance the competitiveness of port itself and the port utilization rate.

Keywords: Berth Scheduling; Port Berth Linkage; Container
邮轮港口规划设计

赵林

摘要：近年来，随着我国经济社会稳步发展和人民生活水平日益提高，邮轮旅游市场呈现持续快速发展态势，邮轮运输正在成为我国水路运输新的增长点。做好邮轮港口的规划与设计，抢占邮轮产业发展的先机，促进城市产业结构调整，提高服务水平，具有重要意义。

关键词：邮轮港口；邮轮经济；规划设计

Planning and Design of Qingdao Cruise Port

Zhao Lin

Abstract:
In recent years, as China's economic and social development and people's living standards are rising steadily, the present state of the cruise market sustained and rapid development momentum, cruise transportation is becoming a new growth point of water transportation in our country. It is of great significance to plan and design the cruise home port, seize the opportunity of the development of the cruise industry, promote the adjustment of urban industrial structure, and adjust the service level.

Keywords: cruise port; economy of cruise line; planning and design

作者简介：赵林，电话：13070826060，邮箱：z1_qingdao@163.com。
静态障碍物及多船会遇环境下水面无人艇局部路径规划

张新宇¹，陈华²，李俊杰¹，王程博¹
（1. 大连海事大学航海学院；2. 北海市北部湾（广西）经济区建设管理委员会办公室）

摘要：针对水面无人艇的特点，结合避碰规则对会遇态势划分，建立水面无人艇近距离安全会遇距离模型，以水面无人艇的总路径最短和航向改变量最小为目标函数，提出一种基于多目标遗传算法的水面无人艇局部路径规划方法。该算法中选择算子采用序值和拥挤距离的策略，交叉算子采取小生境选择机制的双选择交叉策略，变异算子保持种群多样性，种群修剪算子保留最优种群。最后通过多船会遇及静态障碍物的局面进行路径规划仿真，仿真结果表明 USV 能在多船会遇局面中找到满足目标函数的最优路径，并成功地避开目标船舶及静态障碍物。

关键词：水面无人艇；会遇态势；近距离安全会遇距离模型；多目标遗传算法；路径规划

Local Path Planning of Unmanned Surface Vessel in the Environment of Static Obstacles and Ships

Zhang Xinyu, Chen Hua, Li Junjie, Wang Chengbo

Abstract:
According to the characteristics of unmanned surface vessel (USV), the combination of collision avoidance rules divided the encounter situation. The close-range encounter safety model of USV was established. With a total of USV shortest path and the minimum amount of course change as the objective function, a local path planning method for unmanned surface vehicle based on multi-objective genetic algorithm was presented. In the algorithm, selection operator with tournament strategy was based on rank allocation and crowed distance, crossover operator was based on niche selection mechanism of double selection crossover strategy, mutation operator was used to keep the population diversity, population pruning operator was used to meet the excellent population. Finally, through the situation of multiple ships and static obstacles for path planning simulation, the simulation results demonstrate that the USV can find the optimal path to meet the target function in the situation of multiple ships, and successfully avoid the target ships and static obstacles.

Keywords: unmanned surface vessel(USV); encounter situation; close-range encounter safety model; multi-objective genetic algorithm; path planning

作者简介：张新宇，大连海事大学航海学院，电话：18900982755，邮箱：zhang.xinyu@sohu.com。
Master Layout and Handling Systems of Fully Automated Container Terminals

Luo Xunjie

Abstract: Phase IV project of Yangshan Port, is the largest and the most advanced of fully automated container terminals today in the world. The key challenges are larger size, more transshipment volume, longer deepwater quay, narrower yard land, no any model also no design code. Based on this great and real project case, paper is to analysis related goals and condition for the project infrastructure, to design and optimist the handling systems, related equipment types with key technical parameters, to create the master layout planning on vessel operation system in seaside, horizon transportation system, yard operation system and truck operation system in landside, also make layout planning for other accessory function areas, such as road network, office building, gatehouse, OOG yard and workshop, and setting related parameters. As result, to achieve the project goals, also could be a good reference or model for other automatic terminal project.

Keywords: container terminal, fully automation, master layout, handing system
A Critical Review on the Trends, Causal Factors, and Implications of Cruise Accidents in Asia

Yui-yip Lau  
vylau@hkcc-polyu.edu.hk

Ka-chai Tam  
kctam@hkbu.edu.hk

Adolf K.Y. Ng (Canada)  
adolf.ng@umanitoba.ca

Hong-Oanh Nguyen (Australia)  
o.nguyen@utas.edu.au

Natalia Nikolova (Australia)  
natalia.nikolova@utas.edu.au

Abstract: The paper undertakes a critical review on the trends, causal factors, and implications of cruise accidents using information related to marine casualties and incidents. It investigates how different factors may enhance cruise liners to develop comprehensive safety measurement for future research and policymaking based on a historical account on 48 cruise ship accidents in Asia between 1972 and 2014 and a detailed investigation on the fire that took place in the Grand-class cruise ship Star Princess in 2006. The study unlocks how human and organizational factors contribute to cruise accidents and offers constructive solutions on how cruise liners and policymakers should develop comprehensive safety measures and policies, respectively, especially in Asia where the cruise industry is growing at a substantial rate.

Keywords: cruise; shipping; accidents; human error; Asia
Exploring the Cooperative Space of Asia Cruise Port Cities under the 21st-Century Maritime Silk Road

Xu Hao  
Shanghai Maritime University  
apricot0927@qq.com

Tao Song  
Shanghai Maritime University  
18817283926@163.com

Fu Shanshan  
Shanghai Maritime University  
ssfu@shmtu.edu.cn

Abstract: With the focus of the world cruise tourism continues eastward, the cruise industry development is very rapid momentum in Asia. In particular, the twenty-first Century Maritime Silk Road pours a new driving force into the Asian cruise tourism. Under the new strategic background, the cooperation space of Asian cruise port cities is enhanced. In terms of the present cruise routes, there are extensive cruise connections among Yangtze River Delta region, Japan and Korea. Tourist routes are quite rich; However, cruise tourism routes are scarce between China and Southeast Asian countries. Therefore, basing on this background, the paper discussed cooperation and cooperation space of cruise cities in Southeast Asian. Through the fuzzy-AHP method, some ports & cities were analyzed and selected to plan new routes. Finally, aiming at the possible problems in cooperation, the paper gave some suggestions and Countermeasures.

Keywords: Maritime Silk Road; Southeast Asia; Cruise city; Cooperation
我国港口资源整合存在的问题和建议

胡鑫龙, 刘伟, 孙领
（上海海事大学）

摘 要：2017 年的 3 月份，交通运输部新闻发言人吴春耕就表示，交通运输部将从优化港口总体布局、推进港口资源整合、推动港口转型升级等方面推动港口供给侧改革。港口资源整合是 “十三五” 期间，港口发展的重要内容之一。货物不足、运力过剩、港口行业产能过剩、盈利下降等问题日益凸显，如何在资源整合中达到最优化成了重中之重。

关键词：资源整合; 优化港口总体布局; 供给侧改革

Problems and Suggestions on the Integration of China's Port Resources

Hu Xin-long, Liu Wei, Sun Ling
(Shanghai Maritime University)

Abstract:

In march of 2017, Wu Chungeng, spokesman of the Ministry of transport, said that the Ministry of transport will promote the reform of port supply side from the following aspects: optimizing the overall layout of the port, promoting the integration of port resources and promoting the transformation and upgrading of ports. The integration of port resources is "13th Five-Year" period, one of the important contents of port development. Problems such as insufficient freight, excess capacity, overcapacity in port industry and declining profits have become increasingly prominent. How to optimize resources integration has become the top priority.

Keywords: resource integration; optimize the overall layout of the port; supply side reform

作者简介：胡鑫龙，上海海事大学，电话：13858895017，邮箱：714401928@qq.com。
粤港澳港口集群协同化智能疏运平台建设构想

梅叶
（青岛港湾职业技术学院）

摘要：粤港澳经济圈是历史发展形成的国家经济的重要格局。粤港澳港口集群具有鲜明的外向型、密集频繁的国际国内航线布局、强大的吞吐能力、广阔的区域辐射面、港城融合驱动一体化的特点。工业4.0技术成果推广与“一带一路”战略深度推进，必将打通粤港澳港口之间的管理差异化的壁垒，加深价值认同，破解技术瓶颈，促进粤港澳港口集群率先实现区域交通资源协同化整合，构建协同化智能疏运平台，走上绿色、共享、智能、高效、安全、便捷、包容的发展道路。

关键词：工业4.0；一带一路；智能交通；共享经济；战略驱动

Conception Of Consolidating Intelligent Shipping Platform for Port Cluster In Guangdong

Mei Ye

Abstract:

The economic circle of Guangdong, Hong Kong and Macao is an important pattern of national economy formed by historical development. The port cluster of Guangdong, Hong Kong and Macao has distinctive characteristics of export-oriented, dense and frequent international and domestic routes, powerful power handling capacity, broad regional radiation and integration of city and port. Industria 4.0 technology promotion and “The Belt and Road” strategy to promote the depth of management, will open up the difference between Hong Kong and Macao port of the barriers, deepen the value identity, break the technical bottlenecks, promote the Hong Kong and Macao port cluster to realize regional traffic resource co integration, collaborative and intelligent transportation platform, the path of development of green, sharing smart, efficient, safe, convenient, and inclusive.

Keywords: Industry 4.0; The Belt and Road; Intelligent transportation; Sharing economy; Strategic drive

作者简介：梅叶，青岛港湾职业技术学院，电话：15969806120，邮箱：mmei.ye@163.com。
基于排放清单的靠港船舶岸电应用博弈分析

彭宜蔷，封学军，张艳，陆玉华
（河海大学港口海岸与近海工程学院）

摘 要：本文以内河集装箱港口为研究对象，基于船舶排放清单（emission inventory，EI）研究成果提出了大气污染物排放治理成本的计算方法，在此基础上对靠港船舶岸电项目当中的利益相关者展开了整体性分析，提出了岸电项目实施效益的博弈双矩阵模型，将大气污染物排放社会成本的研究成果作为博弈模型的关键约束条件，得到了不同情景下的均衡策略。最终对南京龙潭港进行了实证研究，有利于定量判断船舶大气污染防治的环境保护政策和减排补贴方案。

关键词：靠港船舶；排放清单；利益相关；岸电政策优化；双矩阵博弈

Game Analysis of Ship-Shore-Electric System Based on Emission Inventory

Peng Yiqiang, Feng Xuejun, Zhang Yan, Lu Yuhua

Abstract:
Based on the research results of the ship emission inventory, this paper puts forward the calculation method of the air pollutant emission control cost, on the basis of which the stakeholders of the ship's shore electricity project are analyzed, and the game double matrix model is put forward. The research results of the social cost of atmospheric pollutant emission are the key constraints of the game model, and the equilibrium strategies under different scenarios are obtained. Finally, the empirical research on the Longtan port in Nanjing is beneficial to the quantitative judgment of environmental protection policy and subsidy scheme.

Keywords: ship moored by port; emission inventory; stakeholders; optimization of shore electricity policy; double matrix game

作者简介：彭宜蔷，河海大学港口海岸与近海工程学院，电话：18972559225，邮箱：402827816@qq.com。
A Study on the Horizontal Transportation Systems in the Fully Automated Container Terminals

Luo Xunjie
上海国际港务集团有限公司
xluo106@yahoo.com

Abstract: One of key problems for designing of both handling system and a master layout of an automated container terminal (ACT) is to choose and optimize horizontal transportation system. Based on current condition of the handling system of ACTs in the world, this article presents a comparative study between AGV system and (A)SHC system by a both qualitative and quantitative analysis covering on factors such as technical specifications, productivity, capacity, energy consumption, investment and costs, technological advancement, etc. The results are useful references on how to optimize the horizontal transportation system of an ACT project.

Keywords: automation; container terminal; horizontal transportation; handling system; optimization and comparison
Abstract: The Navigational Data (NAVDAT) is a novel shore-based digital broadcasting system that has an outstanding performance over long distances and works on 495-505 kHz or medium frequencies. At present, the NAVDAT is used to broadcast maritime safety information and other service information to ships within the coverage of the communication signals by using a one-way downlink broadcast mode. In general, the possible forms of information transmitted by NAVDAT include messages, texts, binary files, and images. Therefore, it can be used to update electronic charts conveniently. In the field testing, one single NAVDAT base-station is capable of covering an A2 sea area through networking technology. NAVDAT systems are practical for broadcasting maritime safety information, which is a vital part of a modern GMDSS system and e-Navigation. Since 2013, the Donghai Navigation Safety Administration (DNSA) has taken the lead in launching the research and test projects of NAVDAT systems. Facing the complex environment of the Yangtze River estuary waters, DNSA has encountered many difficulties, including how to meet the high demands of vessels, the design of NAVDAT client terminals, the optimization of NAVDAT base-stations and the updating of relevant facilities. At the beginning of 2016, DNSA formally started NAVDAT service in several test-beds, which generally broadcast navigational warning, and received a very good response from navigators. This paper outlines the framework of the NAVDAT system of China and accomplishes the corresponding supply/demand analysis of users, which can be a guideline for further system construction.

Keywords: Navigational Data (NAVDAT); 495-505 kHz; e-Navigation; NAVDAT system
机构改革大背景下对航运公司安全与防污染监管职责的思考和建议

赵倩，王延磊
（广州海事局）

摘要：目前航运公司安全与防污染监管工作存在职责交叉、多重执法和权责不一致等情况，在当前国务院机构改革的大背景下，涉及水上安全管理部门职责面临重新整合优化，本文分析航运公司安全与防污染各相关部门监管职责和执法依据，提出明晰职责、权责对等的监管职能调整思路，避免多头执法模式，力图从根本上解决困扰航运公司监管工作多年的各项问题，以提高政府监管效能及航运公司安全与防污染管理水平。

关键词：机构改革；安全与防污染监管；权责一致；职能调整

Suggestions on the Safety and Pollution Prevention Supervision Duties of Shipping Companies Under the Background of Institutional Reform

Zhao Qian, Wang Yanlei

Abstract:
There exist such issues as overlapping responsibilities, duplicate law enforcement and responsibility inconsistent with power of the shipping company safety and pollution prevention supervision. In the background of the state council institutional reform and function transformation, safety management of waterborne transportation departments face integration optimization. This paper analyses the shipping company safety and pollution prevention by the relevant departments duties of supervision and law enforcement basis. Put forward the adjustment thought of the regulatory function of clear responsibility, powers and responsibilities consistent, to avoid duplicate law enforcement mode, trying to solve the problems fundamentally that plagued the supervision of the shipping company for many years, and improve the effectiveness of government supervision and the shipping company safety and pollution prevention management level.

Keywords: institutional reforms, safety and pollution prevention supervision, powers and responsibilities consistent, function adjustment

作者简介：赵倩，广州海事局，电话：13925080301，邮箱：sunnyrhythm@163.com。
吊舱式推进器结构优化分析

陈海泉，龙培基，吴俊杰
（大连海事大学 轮机工程学院）

摘 要：针对吊舱装置在螺旋桨推力作用下结构内部存在局部应力集中和变形等问题，本文从立柱斜度及立柱前后圆弧半径比两方面对吊舱装置进行优化设计，建立吊舱模型，采用有限元分析的方法进行受力分析，并通过结果对比，提出小功率船舶吊舱式推进器优化改进的方法。

关键词：吊舱；优化设计；受力分析

Structural Optimization Analysis of Podded Propeller

Chen Haiquan, Long Peiji, Wu Junjie
(College of Marine Engineering, Dalian Maritime University)

Abstract:
As a new type of ship propulsion system, podded propeller is developed in recent years. It has broad prospects in the field of ship propulsion. Under the effect of propeller thrust, the podded device exists local stress concentration and deformation. From the pillar slope and the arc radius of curvature ratio, this article does some optimization design for podded device. Podded propeller model is set up, and the forced condition is analyzed by means of finite element analysis. Finally, through comparing, this article designs a podded propeller that is suitable for low power ships.

Keywords: POD; Optimization Design; Finite Element Analysis; Forced Condition

作者简介：陈海泉，大连海事大学轮机工程学院，电话：，邮箱：18580122017@163.com。
基于吞吐量的港口区域污染扩散研究

武伟佳，刘小宇，庄义彬，马晓凤，钟鸣，刘少博
(武汉理工大学)

摘 要：港口区域污染日趋严峻，严重危害周围环境，极易诱发各种呼吸和心脑血管疾病，对港口工作人员和周边居民的身心健康造成不可逆转的伤害。而集卡作为码头设备的主要运输工具和能源消耗设备，是港口区域大气污染物的主要来源之一。因此在对内河港口区域大气环境研究的基础上，确定 CO、SO2 和 NO2 为港口环境质量的评价因子，以集装箱吞吐量为基础数据，估算 2017 年各类大气污染物的排放总量，建立港口污染物扩散影响模型并对未来几年港口区域的污染排放和扩散进行预测。研究结果表明，2017 年 CO、NO2 和 SO2 的污染浓度已超过国家限定的最大值，污染程度为 NO2>CO>SO2。该计算方法为港口集卡污染计算提供了新思路，为港口管理及环境保护部门制定政策提供了依据。

关键词：吞吐量；集卡；污染排放；扩散

A Study of Air Pollution Diffusion at River Ports Based on Throughput

Wu Weijia, Liu Xiaoyu, Zhuang Yibin, Ma Xiaofeng, Zhong Ming, Liu Shaobo
(Wuhan University of Technology)

Abstract:

The pollution of the port area is becoming more and more serious, which seriously endangers the surrounding environment and the health of workers and residents nearby. It can easily induce various respiratory, cardiovascular and cerebrovascular diseases. Container trucks as the major transporting vehicle at the terminals, is one of the main source of air pollution at ports. Therefore, based on our study of atmospheric environment in an inland port area, the concentration level of CO, SO2 and NO2 are used as the factor to evaluate the quality of air at the port. Based on the container throughput, the total discharge of various pollutants by container trucks in 2017 was estimated. A diffusion model of pollutants is developed and pollutant emissions and diffusion over the next few years at the port area is predicted. The results show that the pollution concentration of CO, NO2 and SO2 in 2017 has exceeded the maximum value permitted by national regulation, and the pollution concentration is ranked as: NO2>CO>SO2. The method proposed provides a new way for estimating the pollution emission and diffusion, which provides a good basis for the formulation of related policies by port authority and environment protection agency.

Keywords: throughput; container truck; pollution emissions; diffusion

作者简介：武伟佳，武汉理工大学，电话：，邮箱：981254533@qq.com。
基于 GM(1,1)预测模型的国际航运复苏因素模糊聚类分析

李春晓
（广州海事局）

摘 要：运用 GM(1,1)模型对国际航运复苏态势进行预测，同时应用模糊聚类分析的方法与理论，综合考虑影响国际航运复苏的各种因素，建立国际航运复苏因素分类数学模型。通过对国际航运复苏因素的分类，进一步反映国际航运复苏各因素之间的内在联系，为抓住航运市场反弹点，进一步复苏国际航运市场提供参考依据。

关键词：GM(1,1)模型；模糊聚类分析；国际航运复苏

Fuzzy Cluster Analysis of International Shipping Recovery Factors Based on GM(1,1) Prediction Model

Li Chunxiao

Abstract:
Using GM (1, 1) model to forecast the international shipping recovery, at the same time, application of fuzzy clustering analysis method and theory, comprehensive consideration of various factors affecting international shipping recovery, establish a mathematical model of international shipping recovery factor classification. Through classification of international shipping recovery factors, and further reflect the inner link between international shipping recovery factors, to seize the shipping market rally point, provides some references for the further recovery of international shipping market.

Keywords: GM (1,1) model; fuzzy clustering analysis; International shipping recovery

作者简介：李春晓，广州海事局，电话：13825147360，邮箱：275878819@qq.com。
基于物元分析的航道水域夜航环境风险评价

黄成
（大连海事大学）

摘 要：为了准确地识别航道水域夜航环境的风险因子并对其进行客观、合理地评价，从而规避该风险并保障航道水域船舶的夜航安全。在查阅分析大量文献的基础上，结合专家意见确定航道水域夜航环境风险评价指标体系，运用层次分析法和熵权法确定各指标的主、客观权重，采用物元综合评价法对航道水域夜航环境风险进行科学地评价：通过查阅相关标准和文献确定航道水域夜航环境风险因子的经典域和节域，将实测的定量定性指标数据代入关联函数计算得出对应等级的关联度，乘以权重集后确定该水域环境的风险等级。选取天津港三条航道进行实例评价，得出船舶在航道 B 夜航为低风险，在航道 A 和航道 C 夜航为一般风险，实例结果与航道实际情况一致，验证了该方法的有效性。

关键词：航道水域；船舶夜航；风险评价；物元分析；熵权法

Night Navigation Environmental Risk Assessment of Waterway Based on Matter Element Analysis

Huang Cheng
(Dalian Maritime University)

Abstract:
In order to accurately identify the risk factors of night navigation environment in waterways and evaluate them objectively and reasonably, the risk was avoided and the night sailing safety of ships in waterways was guaranteed. On the basis of consulting and analyzing a large amount of literature, combining with the opinions of experts, the index system of environmental risk assessment of night navigation in waterway navigation was determined. The analytic hierarchy process (AHP) and entropy method were used to determine the main and objective weights of each index. Scientifically evaluate the night-time environmental risk of water area: determine the classical domain and domain of night-time environmental risk factor of waterway navigation by referring to the relevant standards and documents, substitute the measured quantitative and qualitative index data into the correlation function and calculate the corresponding value of the degree of correlation, Multiplied by the weight set to determine the risk level of the water environment. Taking the three navigation routes of Tianjin Port for example evaluation, it is concluded that night navigation is low risk in channel B and night navigation in channel A and channel C is a general risk. The result of the example is consistent with the actual situation in the channel, which verifies the effectiveness of the method.

Keywords: fairway waters; ship navigation at night; risk assessment; matter element analysis ; entropy method

作者简介：黄成，大连海事大学，电话：18042680940，邮箱：18042680940@163.com。
Managing Transport Operations at Container Terminals for Environmental Improvement

Ge Ying-en
Shanghai Maritime University
yege@shmtu.edu.cn

Abstract: With the increase of global trade, ships and port emissions has been increasing with potential impact on global air pollution and climate. Hence, managing container transport at container terminals based on the idea of green ports is a crucial issue to improve the environmental pollution. In this paper, firstly, the transportation system at container terminals from the three dimensions of traffic vehicles, terminal logistics and transportation systems is introduced; secondly, the pollution from transportation systems at container terminals was concluded, and the ships and on-land vehicles with diesel engines are the main sources; then, four challenges are proposed based on the analysis of the research existed; finally, we concluded the main measures adopted by port authorities and studied in literatures to conduct environment construction. The measures include electricity and automation for handling equipment, reducing gate congestion, alternative fuels, emissions reduction from ship, lean and green operations, and port energy management.

Keywords: transport operations; container terminal; green port; emission reduction; environmental improvement
富春江船闸改造工程围堰稳定性及周边水力学计算方法

武杨，张堂杰
（苏交科集团股份有限公司）

摘要：开闸泄洪期间施工围堰处于泄洪主消能区时，需进行施工围堰安全监测。通过对过流围堰的变形、渗流、压力、水位和水流进行监控量测，进行围堰安全性分析并研究周边水力学计算方法。作为国内首个在运行水电枢纽改扩建工程，监测成果对碍航闸坝的改造有着示范性作用，为同类工程提供借鉴。

关键词：船闸改扩建；施工围堰；围堰安全；水力学计算

Cofferdam Stability and Hydraulics Calculation Method of the Fuchunjiang Ship Lock Project

Wu Yang, Zhang Tangjie

Abstract:
It is essential to implement the security detection of construction cofferdam when releasing flood downstream because it is located in the main dissipation area. The cofferdam safety and Hydraulics calculations will be analyzed by monitoring the deformation, seepage, tension, water level and water flow of overtopped cofferdam. As the first extension and reconstruction project of hydropower complex in operation, the data from acquisition system contribute to the reconstruction of the gate dams obstructing shipping, which provide references for the similar projects.

Keywords: ship lock extension; construction cofferdam; cofferdam safety; Hydraulics calculations

作者简介：武杨，苏交科集团股份有限公司，电话：18112901534，邮箱：wy147@jsti.com。
基于短波无线电气象传真中央管理控制系统的优化设计

王翔
（交通运输部东海航海保障中心）

摘 要：为我国船舰提供自主、可控的海上气象传真信息，通过自主优化设计，完成了整套基于短波无线电气象传真中央管理控制系统的调度、播发。本系统，由中央控制单元、同步时间单元、信息调制单元、信息检测反馈单元等组成。代表我国首次，采用了融合校验修正的同步授时方法、连续相位调制技术（CPM）等创新方法和关键技术，通过上海台站，按照世界气象组织（WMO）和国际海事组织（IMO）公约的相关要求播发海上气象传真信息。

按照系统设计，实践表明：该系统能完成气象传真图的信息采集、调制、检测和播发工作，通过中国远洋海运集团有限公司新苏州轮和新威海轮接收比对，气象传真图总体效果好、图形界面清晰、线条流畅，为我国提升海事助航水平拓展了新渠道。

关键词：无线电气象传真；同步授时方法；连续相位调制技术；信息检测反馈技术

Optimization Design of Control System Based on Shortwave Radio Meteorological Fax

Wang Xiang

Abstract:

This paper provides independent and controllable maritime meteorological facsimile information for our country's ships. Through the independent optimization design, the complete set of modulation and broadcasting based on the central management and control system of shortwave radiofrequency fax is completed. The system consists of the central control unit, synchronization time unit, information modulation unit, information monitoring feedback unit. For the first time on behalf of our country, we have adopted innovative methods and key technologies such as Synchronous Timing and Time Synchronization with Calibration and Correction, Continuous Phase Modulation (CPM), and other key technologies. Through Shanghai Station and in accordance with the World Meteorological Organization (WMO) and the International Maritime Organization Related requirements broadcast maritime weather fax messages. According to the system design and practice, the system shows that the system can accomplish the data acquisition, modulation, detection and broadcasting of the meteorological facsimile chart. Through the comparison and comparison of the new Suzhou Hub and Xinwei Seashafts of China Ocean Shipping (Group) Co., Ltd., the overall meteorological facilitation effect is good, Graphical interface is clear, smooth lines, for our country to enhance the level of maritime navigation expanded new channels.

Keywords: radio weather fax; synchronous timing method; continuous phase modulation technology; information detection feedback technology

作者简介：王翔，交通运输部东海航海保障中心，电话：18621009163，邮箱：2444984719@qq.com。
集装箱码头场桥调度优化模型研究

郭文文，计明军，祝慧灵
（大连海事大学）

摘要：为提高码头堆场作业效率，研究了出口箱作业过程中的多场桥调度优化问题。结合岸桥作业子计划与堆场贝位箱量分布，以场桥在每个子任务中从堆场贝位提取的箱量以及场桥的行驶路径作为决策变量，建立目标为场桥作业贝位数最少及行驶路径最短的两阶段数学模型。从单场桥和双场桥作业的角度，设计算例利用 CPLEX 对模型进行求解，检验了模型的准确性，并与顺序作业法、贪婪作业法及遗传算法进行对比，结果表明两阶段模型有效地减少了场桥移动距离。

关键词：集装箱码头；场桥调度优化；路径规划；两阶段模型

Study on Optimization Model of Yard Crane Scheduling in a Container Terminal

Guo Wenwen, Ji Mingjun, Zhu Huiling
(Dalian Maritime University)

Abstract:

To improve the efficiency of terminal yard, this paper focuses on the yard crane scheduling problem during export loading operations. Considering the partial tours of quay cranes and stacking status of yard bays, decision variables are the number of containers that a yard crane picks up at each yard-bay for each partial tour and the sequence of operation yard-bays that a yard crane visits during the partial tours of quay cranes. This scheduling problem is formulated as the two-stage programming, which aims at minimizing the total operation bays and yard crane routing distance. From the point of view of single yard crane operation and double yard cranes operation, an example is designed to solve the model by CPLEX, which verifies the accuracy of model. And numerical examples are compared with the sequential method, greedy method and genetic algorithm. Results show the model can effectively reduce the yard crane routing distance.

Keywords: container terminal; yard crane scheduling; route planning; two-stage programming

作者简介：郭文文，大连海事大学，电话：18909857823，邮箱：gww@dlmu.edu.cn。
直线型液压马达脉动分析

吴俊杰，张人之，陈海泉
（大连海事大学 轮机工程学院）

摘 要：针对直线型液压马达的脉动问题，对瞬时角排量脉动和瞬时角扭矩脉动的问题进行分析，建立马达曲轴连杆机构的运动学方程，使用 Matlab 软件对运动学模型进行仿真分析，详细的分析了直线型液压马达在不同缸数时脉动问题，并比较了奇数缸和偶数缸液压马达的脉动规律。结果表明，缸数为奇数缸时，马达的瞬时角排量脉动率和瞬时角扭矩脉动率大致为与之相差一个缸数的偶数缸液压马达一半左右，且马达脉动率随着总缸数的增加而逐步减小，且减小的幅度随马达总缸数的增加而降低。

关键词：液压马达；脉动分析；曲轴连杆；Matlab 软件

Analysis of Pulsation of Linear Hydraulic Motor

Wu Junjie, Zhang Renzhi, Chen Haiquan
(College of Marine Engineering, Dalian Maritime University)

Abstract:
To suppress the pulsation problem for the linear hydraulic motor, the pulsation problems of instantaneous angular displacement pulsation and instantaneous angular torque were analyzed. The kinematics equations of the motor crankshaft linkage were established. The kinematics models were simulated and the dynamic was carried out in Matlab/Simulink Simulink environment. The pulsating problem of the linear hydraulic motor in different cylinder numbers were analyzed in detail. At the same times the pulsating law of the hydraulic motor of odd and even cylinder were compared. The results showed that when the number of cylinders is an odd number, the instantaneous angular displacement pulsation and the instantaneous angular torque pulsation of the motor are just half of the hydraulic motor of a contiguous even cylinder. And the pulsation rate of the motor gradually decreases with the increase of the number of the total cylinder. And the decrease is reduced with the increase of the number of the motor's total cylinder.

Keywords: hydraulic motor; pulsation analysis; crankshaft connecting-rod; Matlab/Simulink software

作者简介：吴俊杰，大连海事大学轮机工程学院，电话：18580122017，邮箱：18580122017@163.com。
Anti-grounding Ship Route Planning Based on Artificial Fish Swarm Algorithm

Dai Ran, Zhang Chaoyue, Chen Changyuan, Chen Xiao
(Dalian Maritime University)

Abstract:
An automatic method to solve disadvantages that VTS operators in work usually assist ships to avoid grounding by experience is proposed. The practical details which should be taken into consideration in ship route planning are analyzed. The fitness function for minimizing total ship route length under constraints is developed which takes shoal region, and the limitations in the turning angle and turning point number into account. The artificial fish swarm algorithm and the route adjustment method is used to established anti-grounding ship route scheme. The results show that the route which is planning by algorithm meet the requirement of the design. This method has the advantages in terms of fuel consumption and safety.

Keywords: VTS; Ship anti-grounding; Artificial fish swarm algorithm; Ship route planning

作者简介：戴冉，大连海事大学，电话：13504285065，邮箱：dmu_dairan@163.com。
集装箱货运需求不定下的最优船槽数量转换方法

栾鑫，程琳，刘微微
（东南大学）

摘要：在集装箱货物运输和调度管理过程中，针对需求随机产生、不确定情形下的干货槽与冷藏槽转换数量问题，本文首先通过蒙特卡罗仿真模拟方法计算获取船舶的最优化调度顺序，并提出了四类动态联动的集装箱延迟或拒绝策略；再依据此顺序对船上两类船槽的数量加以转化，然后设计了一种启发式迭代算法，最终在最优顺序基础上确定了能够使得集装箱数量总延迟最小以及公司收益最大化的船槽数量分布。同时以法国海运集团运营的一条航线为具体算例进行剖析和讨论，进一步实验结果表明：运用该算法优化后，公司的平均收益值总体能有效提升7.43‰，可见此算法具有可观的应用前景及推广价值，且其可移植性与适应性良好。

关键词：交通运输经济；船舶调度问题；启发式算法；不定需求；船槽转换；动态联动；最优化理论

Optimal Ship Slot Quantity Conversion Method with Uncertain Container Freight Demands

Luan Xin, Cheng Lin, Liu Weiwei
(Southeast University)

Abstract:

In the process of container cargo transportation and dispatching management, we needed to solve a problem of the dry and reefer containers conversion quantity under an uncertain and/or random demand situation. Firstly, the ship optimal deployment sequence was determined by a Monte Carlo simulation method in this paper, and four types of dynamically linked container delay or rejection strategies were proposed, then the number of two different kinds of ship slot was converted according to this order. Further, a heuristic iterative algorithm was designed subsequently, which could minimize the total delay of these two types of containers and maximize the profit of corporate shipowner based on the optimum sequence (two objectives). Moreover, a shipping route operated by the French Maritime Group was used as a specific case (numerical example) for further analyzing and discussing. The experimental results show that the company’s average profit value will be improved by 7.43‰ effectively and separately after the optimization of this algorithm. In addition, it can be seen that the heuristic algorithm has a considerable application prospect and worth popularization with its favorable portability and adaptability.

Keywords: transportation economy; fleet deployment problem; heuristic algorithm; demand uncertainty; ship slot conversion; dynamic linkage; optimality theory

作者简介：栾鑫，东南大学，电话：15605198516，邮箱：xinluan@seu.edu.cn。
模拟柴油机尾气动态配气系统的设计

汪宗御，纪玉龙
(大连海事大学)

摘 要：目前柴油机作为公路和水路运输的主动力装置仍被大范围应用，柴油机尾气后处理技术也获得广泛关注，经济方便、可重复的获得不同条件下的柴油机尾气是柴油机尾气后处理技术的前提。本文采用质量流量控制器设计并搭建了柴油机尾气动态配气系统，经测试，系统的气密性良好，配气误差小于 5%，满足设计要求。该系统可用于柴油机尾气脱硫脱硝技术的研究以及催化剂性能评价等。

关键词：柴油机尾气模拟；脱硫,脱硝；配气系统；质量流量控制器

Design of Dynamic Gas Supply System on Diesel Exhaust Simulation

Wang Zongyu, Ji Yulong
(Dalian Maritime University)

Abstract:
At present, diesel engine is still widely used as the main power plant on highway and waterway transportation. The after-treatment technologies of diesel exhaust have also received extensive attention. How to obtain diesel exhaust under different conditions conveniently and reproducibly is the precondition of after-treatment technology. In this paper, a dynamic gas supply system for diesel exhaust was designed and built by mass flow controller. After testing, the system has good airtightness and the gas supply error is less than 5%, which meets the design requirements. The system can be used for the research on diesel exhaust desulfurization and denitrification, and also the evaluation of catalyst performance, etc.

Keywords: diesel exhaust simulation; desulfurization; denitrification; gas supply system; mass flow controller

作者简介：汪宗御，大连海事大学，电话：15942854303，邮箱：15942854303@163.com。
Scheduling Twin Automated Stacking Cranes with Consideration of Capacities of Buffer Space at ACT

Yin Yuqi
Shanghai Maritime University
yyq5403@163.com

Ge Ying-en
Shanghai Maritime University
yege@shmtu.edu.cn

Abstract: This paper investigates the twin automated stacking crane (ASC) scheduling problem, considering the capacity constraint of the buffer space, at an automated container terminal. Both ASCs traverse on two same tracks along the two sides of a block and transport containers between the storage position and I/O points and, simultaneously, ALVs transfer containers between I/O points. This paper aims to minimize the sum of the makespan of ASC operations and the holding time of ALVs for a batch of tasks by scheduling twin ASCs. The scheduling problem is formulated as a mixed-integer linear program model. Numerical experiments show the effectiveness of the formulated model, and their results suggest that the increasing capacities of buffer spaces can reduce the holding time of ALVs and the increasing number of ALVs can reduce the makespan for twin ASCs handling a batch of tasks. This paper closes with a set of concluding remarks.

Keywords: automated container terminal; automated stacking crane; scheduling optimization; sequencing problem; mixed-integer linear program
Research on High Frequency Radio Meteorological Fax System at Sea

Wang xiang

Abstract:

In accordance with the corresponding provisions of the SOLAS Convention, the relevant States Parties shall undertake the obligation of providing land-based and space-based radiocommunications, disseminate information by text and images, warn and inform the ships in the past of paying attention to the adverse maritime meteorological conditions, and achieve the goal of safe navigation. China has conducted a meteorological fax service-related business, but about 2000 has been stopped. Before 2016, all our ships, including meteorological facsimile maps from Kagoshima station in Japan, had affected the safety of some ships. In 2016, through independent research and development, we completed the research on the key technologies of maritime high-frequency radio meteorological facsimile system. Through experiments and verification, we achieved the goal of complete and reliable data transmission and clear and accurate data reception. There are still some shortcomings. The future and future directions for conducting research and the prospect of digitizing high-frequency communications and IF communications are put forward. This has opened up a new system of providing strong maritime communications support services to better serve the marine power and the Belt and Road Initiative channel.

Keywords: maritime high-frequency weather fax system; information source push system; meteorological fax map receiving unit

作者简介：王翔，交通运输部东海航海保障中心，电话：18621009163，邮箱：2444984719@qq.com。