

## *Retraction*

# **Retracted: Optimization Design and Economic Development of Cruise Travel Routes Based on Wireless Communication Networks and Genetic Algorithms**

### **Wireless Communications and Mobile Computing**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their

agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] J. Ji, W. Liu, and H. Zhen, "Optimization Design and Economic Development of Cruise Travel Routes Based on Wireless Communication Networks and Genetic Algorithms," *Wireless Communications and Mobile Computing*, vol. 2021, Article ID 5065957, 13 pages, 2021.

Research Article

# Optimization Design and Economic Development of Cruise Travel Routes Based on Wireless Communication Networks and Genetic Algorithms

Jiahui Ji <sup>1,2</sup>, Wei Liu,<sup>1</sup> and Hong Zhen<sup>1</sup>

<sup>1</sup>College of Transport and Communications, Shanghai Maritime University, Shanghai 201306, China

<sup>2</sup>China Merchants Cruise Research Institute (Shanghai) Co., Ltd., Shanghai 200137, China

Correspondence should be addressed to Jiahui Ji; 202040610008@stu.shmtu.edu.cn

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At present, domestic cruise tourism is still an emerging tourism industry. Although all regions have great enthusiasm for the development of cruise tourism, some bottlenecks have appeared due to the lack of relevant planning. In terms of cruise manufacturing, such as large-scale fin stabilizers and low-speed design of engine, crankshaft, and propeller. To solve the above problems, it is very important to optimize the design of cruise travel routes based on wireless communication networks and genetic algorithms and research on economic development. This paper proposes the use of wireless sensor network (WSN) architecture and genetic algorithms in intelligent bionic algorithms to design cruise travel route optimization. Based on the research on the basic theory of the cruise industry, this article expounds the construction and operation of world-famous home ports and my country's cruise home ports. Through the analysis and evaluation of the characteristics and development status of my country's tourism and tourism resources, the possible impact of the construction of cruise home ports on the development of my country's tourism industry under the new situation is discussed. The results of the study show that a cruise ship carrying 2010 tourists and 952 crew members will spend about 323,700 US dollars on shore tourists and crew every time it stops at its home port city. The average consumption is approximately US\$273,000.

## 1. Introduction

**1.1. Background.** The domestic and foreign tourism industry and academia have put the focus of attention on the new growth direction of cruise tourism, and the growth rate of the cruise tourism industry has attracted more and more attention. When the cruise tourism industry in our mainland began to develop, carefully count the modern cruise industry that has experienced more than 50 years of history. Everything you touch can be called a new thing. Therefore, during the “Twelfth Five-Year Plan” period, the state ministries and commissions will establish a cruise terminal. Safety issues are placed in an important position in planning and layout, and mandatory requirements and regulations have been made in terms of comfort, observability, and environmental protection, and construction standards are required to be in line with the world, and the cruise tourism industry is stabilized

and sustainable. Deepen the development of coastal cruise (tourism) home port construction, and now, the cruise tourism industry has been placed at the strategic height of national tourism and port development. The economic benefits of the tourism industry and the cultural community will still focus on the research of the construction of the wharf. The economic development law of the impact of the cruise industry on national life is not deep. It is better to have a thorough understanding of other disciplines. It is limited in the cruise tourism industry. Sporadic exploration and phenomenon exploration are also related to the shorter development time of cruise tourism. Therefore, there are relatively few research directions on its connotation, and there are few researches on its system and systematic research. At present, domestic cruise tourism is still a new type of tourism. Although all regions have great enthusiasm for the development of cruise tourism, some bottlenecks have appeared

due to the lack of relevant planning. The development of cruise tourism has gradually slowed down due to factors such as the epidemic.

*1.2. Significance.* Cruise tourism, as one of the high-end tourism products, is conducive to enhancing the competitiveness of my country's tourism industry. The cultivation of high-end tourism reflects the new stage of tourism development. Mere tourism cannot meet the needs of domestic tourists. More and more mid-to-high-end tourists prefer individual travel. Cruise tourism can enrich the form of domestic residents' tourism products and better meet people's growing material and cultural needs. Cruise travel is still a relatively new thing in China. At present, coastal port cities maintain great enthusiasm for the development of this emerging tourism industry. Mastering the elements, structure, and functional system of the system can provide a theoretical basis for regional cruise tourism planning and improve the scientific and practical significance of tourism planning. The cruise tourism industry will further promote the development of my country's tourism industry.

*1.3. Related Work.* With the sustained and rapid development of my country's economy, national income continues to increase, and the level of tourism consumption rises accordingly. Bahja et al. pointed out that the purpose of this study is to discover the relative importance of influencing factors in booking cruise vacations. Based on the literature review, this research focuses on the relative importance of six factors in the decision-making process of cruise customers: cruise holiday prices, cruise duration, distance from cruise ports, routes, cruise companies, and cruise ship environmental protection. Online comments. **Design-Methods/Approaches** through choice-based joint (CBC) analysis, the complexity of the decision-making process of cruise customers at multiple levels involving these six attributes was examined. The reason for choosing CBC is that it is a realistic method of making purchase decisions in the form of trade-offs. Online surveys collect data anonymously. The survey is distributed through Amazon's Mechanical Turk (Mturk) platform, and there are few related studies in China [1]. Hu et al. pointed out that an artificial neural network (ANN) was proposed as an effective method to help multichannel ultrasonic flowmeter (UFM) reduce its measurement error when determining the flow rate of complex flow field. However, the effectiveness of the ANN method depends to a large extent on the network architecture specified by the designer, as well as the initial weights and layer deviations provided. This hinders the widespread use of ANN in actual UFM. This paper proposes a genetic algorithm (GA) optimization ANN method (GANN) for UFM. GA is used to determine the ANN architecture based on its efficient parallel advantages in global search, to replace the traditional trial-and-error method or empirical method. In addition, the initial weight and bias are optimized by GA, which can prevent the network from falling into a local minimum and make it have good generalization ability. The test is implemented on a numerical model that simulates a six-path UFM. The UFM is installed

in a downstream single bend or a double bend. The complex flow field passes through it, but there is still a certain error [2]. Kim et al. pointed out that in the autonomous navigation system of an unmanned surface vehicle (USV), setting the path is essential to reach the target point and avoid obstacles. Therefore, it is necessary to consider the marine environmental load to determine the optimal path decision algorithm. In this research, a genetic algorithm is used to determine the optimal path of the USV with the shortest travel time under environmental loads. Use numerical simulation to determine the optimal path. First, the chromosome composed of the ship's steering angle per unit time is used to represent the ship's path under environmental load. In the configuration of the decision algorithm, the following three objective functions are derived: avoiding obstacles, reaching the target point, and minimizing travel time. By integrating the three objective functions, a new fitness function is proposed, but there is still a small error [3].

*1.4. Main Content.* Through the research on the basic theories of the cruise industry, it expounds the construction and operation status of world-famous home ports and my country's cruise home ports and analyzes the role and significance of the construction of cruise home ports to port cities; through the characteristics and development status of my country's tourism industry and tourism resources The analysis and evaluation of China's tourism industry pointed out the characteristics and shortcomings of the development of my country's tourism industry, on this basis, a detailed analysis of the process, influencing factors, and methods of tourism liner route optimization design. Based on the above theoretical basis and current research, this article adopts the "alternative route method" to establish a route optimization design model based on space leasing and studies how the liner company chooses routes and arranges other routes when considering the space leasing factors, so as to make the liner company as a whole minimize operating costs; adopt the "stage modeling method" to establish a route optimization design model based on joint dispatch of ships, and study alliance members to use joint dispatch of ships to open new routes. Then, a genetic algorithm was designed, and the two models were solved and analyzed using MATLAB software, which verified the adaptability and effectiveness of the model.

## 2. Optimized Design Method for Travel Routes

*2.1. Wireless Sensor Network (WSN) Architecture.* A typical WSN architecture [4] is shown in Figure 1, which is composed of single-hop nodes and sink nodes. The nodes first form a perceptual network in a self-organizing manner and then collect information through mutual cooperation. After preliminary fusion processing, select the appropriate path to transmit by multihop relay. The relay node can integrate the data.

Single-hop nodes can only exchange data within a limited range with neighboring nodes, and when accessing to nodes that are far away, they must use multihop relay data transmission.

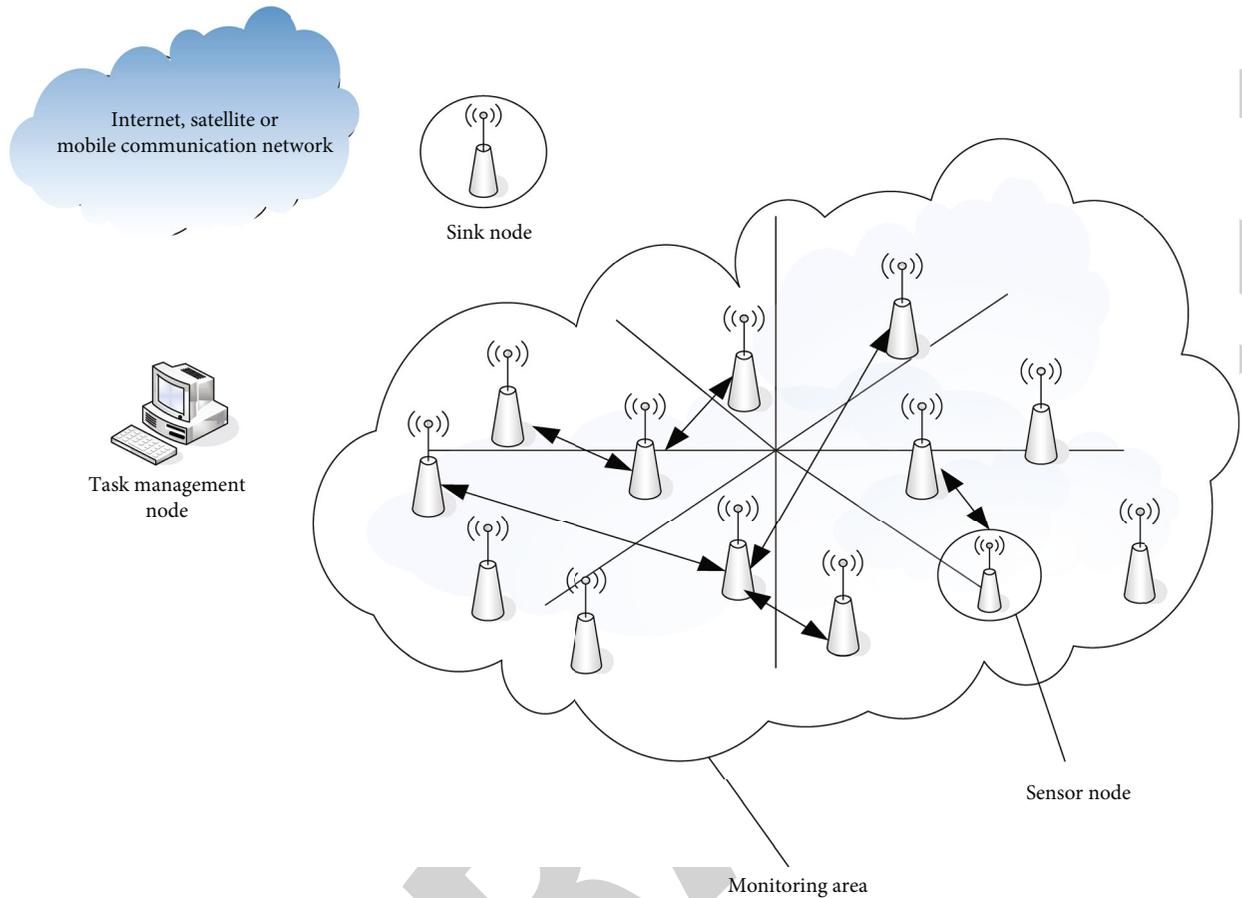


FIGURE 1: Typical WSN architecture.

Compared with sensor nodes, the sink node has strong data processing capabilities and large storage space and has strong advantages in wireless communication and anti-interference. It is mainly used to issue data collection instructions [5] to control the behavior of each node in the network, integrate the data collected by each node, and interact with external networks. Since a single-hop node must use a multihop relay data transmission mode when it is connected to a node that is far away, the principle of combining a single-hop node with a sink node can be derived.

Figure 2 shows the clustered WSN architecture, in which nodes are mainly divided into three types: aggregation point, cluster head node [6], and aggregation point. A fixed or movable member node in the cluster first transmits the sensing data to the cluster head node. The cluster head node realizes the aggregation, fusion, and caching of the sensing data in the cluster and transmits the monitoring data to the wired network for users to query and use.

## 2.2. Intelligent Bionic Algorithm

### (1) Ant colony algorithm

The key to the shortest path in the ant colony's foraging process lies in the release and perception of pheromone by ants [7]. It has the advantages of strong parallelism, positive

feedback, and easy parallel implementation and is easy to combine with other algorithms, thereby improving the performance of the algorithm. But there are disadvantages such as long search time and slow convergence speed.

### (2) Particle swarm algorithm

This paper proposes an algorithm based on information sharing among bird groups during the foraging process of flying birds. Each individual in the PSO algorithm [8] is called a "particle," which represents a potential solution. The particle updates its position and velocity by tracking two "extremums" in each iteration, that is, individual extremum and global extremum.

### (3) Genetic algorithm

The algorithm uses the population to represent the solutions of a set of problems and uses genetic operators to select, crossover, and mutate the existing population, so that individuals with higher fitness have more opportunities to pass on to the next generation and gradually evolve the population, to the state containing the approximate optimal solution [9].

## 2.3. Basic Knowledge of Genetic Algorithm

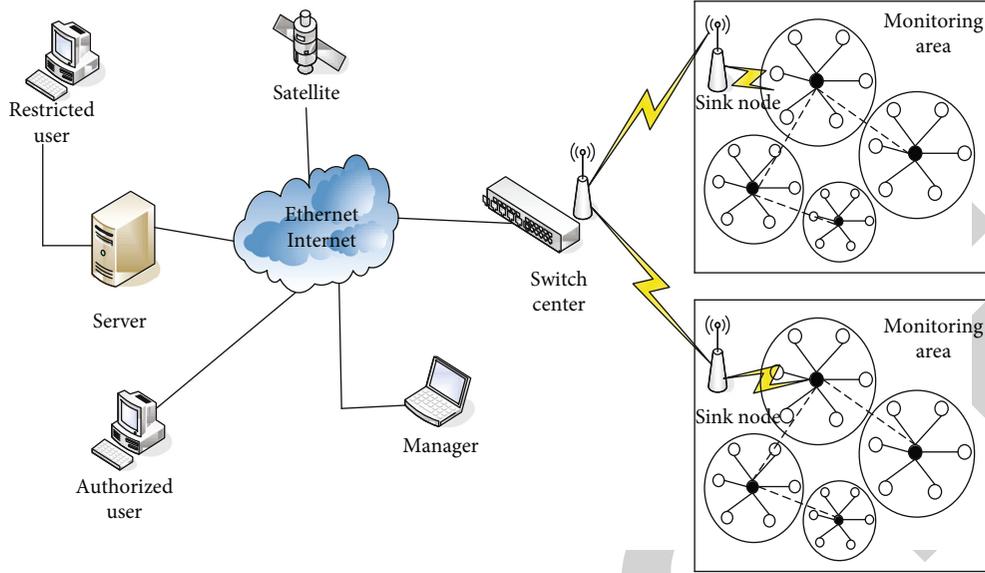


FIGURE 2: Clustered WSN architecture.

## (1) Genetic coding

When using the genetic algorithm [10] to solve the optimization problem, it is necessary to establish a corresponding relationship between the problem to be solved and the space of the genetic algorithm, and the establishment of this corresponding relationship is manifested in the operation of encoding and decoding the chromosomes. The coding method should be selected appropriately according to the different problems to be solved. The choice of coding method will affect the performance and efficiency of the algorithm. Therefore, how to choose a suitable encoding method is very critical to genetic algorithms. Genetic coding includes several aspects such as coding principles, common coding methods, and coding characteristics. The advantage of a genetic algorithm is that the problem parameters are encoded into chromosomes and then optimized, instead of the parameters themselves, so as to ensure that the algorithm is not restricted by function constraints.

**Binary encoding.** Binary encoding is to use binary characters 0-1 to represent the solution of the problem. If a binary string  $S$  of length  $l$  is used to represent the variables in the interval  $[a, b]$ , there are

$$x = a + [S] \times \frac{b - a}{(2^l - 1)}. \quad (1)$$

Among them,  $S$  represents the value represented by the binary string. Encoding and decoding should keep the same code.

**Real number encoding.** Real number encoding is to use real numbers to represent the solution of the problem. Real number coding not only improves the accuracy of the algorithm but also solves the storage space requirements of the coding. Its biggest advantage is its high accuracy and easy search in large spaces.

**Symbol coding** [11]. Symbol coding is not only to solve the problem of specific expertise but also to better mix with other approximation algorithms. But it makes the crossover and mutation operations of genetic operations inconvenient. Some common character encoding methods are nothing more than Unicode, ASCII, GBK, GB2312, and UTF-8 [12].

**Coding characteristics.** Genetic coding is the basis of the evolution process of genetic algorithms and affects the performance of the algorithm. Choosing a suitable coding method can not only describe the problem better but also solve the problem well.

## (2) Fitness function and scale transformation

The fitness value is a standard for evaluating the pros and cons of individual populations [13]. In genetic algorithms, the objective function to solve the problem is usually taken as the individual fitness function (FitnessFunction), and sometimes, the objective function is transformed into a fitness function. Therefore, choosing an appropriate fitness function not only determines the convergence speed of the genetic algorithm but also affects the global optimization problem. There are mainly the following three main fitness functions.

Directly transform the objective function into a fitness function [14]; if the objective function is a maximization problem, then

$$\text{Fit}(f(x)) = f(x). \quad (2)$$

If the objective function is a minimization problem, then

$$\text{Fit}(f(x)) = -f(x). \quad (3)$$

This method is simple and intuitive but requires that the probability of choosing roulette is not less than zero, and this fitness function may contradict this, and some functions are

universal and inhomogeneous,  $C_{\min}$  is the minimum estimate of  $f(x)$ , and  $C_{\max}$  is the maximum estimate. If the objective function is a minimization problem, then

$$F(f(x)) = \begin{cases} C_{\max} - f(x), & f(x) < C_{\max}, \\ 0, & \text{other.} \end{cases} \quad (4)$$

If the objective function is a maximization problem, then

$$F(f(x)) = \begin{cases} f(x) - C_{\min}, & f(x) > C_{\min}, \\ 0, & \text{other.} \end{cases} \quad (5)$$

Among them,  $C_{\min}$  is the minimum estimate of  $f(x)$ .

This is an improvement to the first method, called the "boundary construction method" [15]. Its disadvantage is that it is difficult to estimate the threshold first, and its accuracy cannot be guaranteed.

If the objective function is a minimization problem, then

$$\text{Fit}(f(x)) = \frac{1}{1 + C + f(x)} \quad C \geq 0, C + f(x) \geq 0. \quad (6)$$

If the objective function is a maximization problem, then

$$\text{Fit}(f(x)) = \frac{1}{1 + C + f(x)} \quad C \geq 0, C - f(x) \geq 0. \quad (7)$$

Among them,  $C$  is a conservative estimate of the bounds of the objective function [16].

In view of the above three common fitness functions, the common scale transformation methods generally have the following three types.

Linear adjustment [17]. Suppose the original fitness function is  $f(x)$ , and the transformed fitness function is

$$f'(x) = a * f(x) + b. \quad (8)$$

Among them,  $f'(x)$  is the fitness function;  $f(x)$  is the objective function;  $a$  is a normal number, which scales  $f(x)$ ;  $b$  is a constant coefficient, which is mainly used for parallel movement.

Power function adjustment.

$$f'(x) = f^k(x). \quad (9)$$

Among them,  $f'(x)$  is the fitness function;  $f(x)$  is the objective function;  $k$  is a normal number, which is an empirical coefficient. Generally, a constant related to the optimization problem is obtained through multiple experiments.

This type of transformation can overcome the linear transformation of the objective function, but the disadvantage is that the scalability is poor. There are certain problems in using the objective function as the base of the power function, that is, the objective function is not necessarily a positive number, and combined with the objective function to determine the power exponent  $k$  has certainly been difficult.

Index adjustment [18]. The adjustment formula is

$$f'(x) = e^{-a^{*f(x)}}. \quad (10)$$

Among them,  $f'(x)$  is the fitness function;  $f(x)$  is the objective function;  $a$  is a normal number.

The idea of exponential transformation of the objective function comes from the process of simulated annealing (simulated annealing, SA) in the exponential transformation of the objective function, the mandatory selection depends on the coefficient  $a$ , and the smaller  $a$ , the greater the mandatory selection [19].

### (3) Genetic operator

Selection operator. In the process of genetic algorithm, the selection of the selection operator [20] needs to be considered very carefully, because the selection of the selection operator is appropriate, which plays a key role in the performance of the algorithm. The frequently used selection operators are as follows.

Roulette selection method. In genetic algorithms, roulette selection is currently the most used method of selecting individuals. The probability of being selected can be expressed as

$$P_{si} = \frac{f_i}{\sum_{j=1}^n f_j}. \quad (11)$$

Among them,  $n$  is the population size,  $i$  is an individual in the population, and  $f$  is the fitness corresponding to the individual.  $f$  is directly proportional to  $P_{si}$ . The idea of the best individual preservation method best reflects the survival of the fittest in the biological community, also known as the elite retention strategy [21].

Expected value method. If the number of individuals in the population is small, inaccurate statistical judgments will occur when the roulette selection method is used, resulting in certain errors. Therefore, the desired method came into being. The following is the idea of the expected value method. For a single individual in the population, calculate the expected value of the selected next generation:

$$M = \frac{f_i}{f} = \frac{nf_i}{\sum f_i}. \quad (12)$$

If an individual in the population is selected by the next generation, and pairing and crossover operations are required, then the individual selected by the next generation will be calculated by the expected value minus 0.5; and if the individual is selected but did not participate in pairing and crossover, then the initially calculated expected value of the selected individual is subtracted by one.

In the above process of calculating and adjusting the expected number, if the expected value of a single individual is not greater than or equal to zero, then this individual must be removed so that it does not participate in the selection operation.

Immune operator [22, 23]. In order to maintain the diversity of the population, the concepts of affinity, similarity, and concentration in immunology are introduced. At the same time, a new selection criterion is adopted in the selection operator, that is, aggregation fitness. A specific introduction will be made in the following.

**Similarity.** Similarity is the degree of similarity between antibodies and other antibodies, antibodies and antigens, and similarity is expressed by affinity. Similarity measurement methods are based on information entropy [24], based on Euclidean distance, based on gene value distance, and based on quality percentage.

First, define  $P_{ij}$  as the probability that the  $i$ th symbol ( $i = 1 - s$ ) appears at the locus, namely,

$$P_{ij} = \frac{\text{The total number of the } i\text{th symbol appearing on locus } j}{N}. \quad (13)$$

Then,  $H_j(N)$  is the information entropy of the  $j$ th gene:

$$H_j(N) = \sum_{i=0}^N (-P_{ij} \lg P_{ij}). \quad (14)$$

Average information entropy of all groups:

$$H(N) = \frac{1}{M} \sum_{i=1}^M H_j(N). \quad (15)$$

According to the theory of entropy, the calculation of the similarity between two antibodies:

$$A_{ij} = \frac{1}{1 + H(\text{avg})}. \quad (16)$$

In the formula,  $H(\text{avg})$  is the average information entropy of antibody  $i$  and antibody  $j$  [25].

### 3. Experiments on Optimization Design of Tourist Liner Routes

#### 3.1. Route Design

##### (1) Determine the route structure

The route structure of tourist liners can be roughly divided into four categories: point-to-point route structure, pendulum route structure, circumnavigation route structure, and trunk and branch route network. The route layout of the tourist ship is as follows:

**Point-to-point route [26].** It is the simplest and most basic route layout. There are only two ports, and ships can transport goods back and forth between the two ports. Figure 3 shows the network topology diagram.

There are several ports on the pendulum route. The ship passes through a series of ports from the port of departure to the port of destination and then returns to the port of depar-



FIGURE 3: Point-to-point route network topology diagram.

ture from the port of destination along the same port, as shown in Figure 4.

There are many ports on the circumnavigation route, and ships sail one way between the ports. Global routes generally adopt this route layout. In one voyage, some ports can be hoisted twice, as shown in Figure 5.

Dry-branch network [27] is as shown in Figure 6.

Figures 6 and 7 are more typical trunk-to-branch travel route networks. The difference is that the port in Figure 6 is only connected to the hub port, and the ports are not connected to each other. In Figure 7, the feeding port is not only connected to the hub port but also connected between feeding ports. The combination of trunk and branch can achieve complementary advantages.

##### (2) Route allocation and space allocation

The income of ships operating on the same ship on different routes is different, and the income of ships operating on different routes on the same route is also different. According to the number and types of liner routes studied, the problem of liner route allocation can be divided into the following three aspects, as shown in Table 1.

These two problems of a single ship are relatively easy, as long as certain conditions are met; it is necessary to study them. How to arrange various types of ships on multiple routes is a complicated problem. The research of ship stowage only needs to meet the constraints of water flow, flow direction, time, and cost.

**3.2. Influencing Factors in the Optimization Design of Tourist Liner Routes.** Affecting tourism passenger and cargo transportation demand, route type, route cost [28], and shipper inventory cost are important factors in the optimal design of tourist liner routes. In tourism liner transportation, freight volume refers to tourism transportation volume, and its transportation demand is determined by the transportation demand of tourism goods.

##### (1) Type of ship

Large ships have strong loading capacity and economies of scale, but they are prone to empty warehouses, and their loading capacity is weak and flexible. The types of ship income for different route configurations are different.

##### (2) Sailing speed

Since only increasing the speed will lead to a sharp increase in fuel consumption, the speed has a significant effect on the total speed. Among them, fuel consumption costs account for more than 75% of operating costs. The speed also affects decision-making at all levels: the



FIGURE 4: Pendulum route network topology.

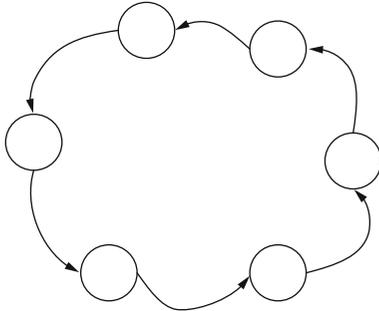


FIGURE 5: Wrap-around route network topology.

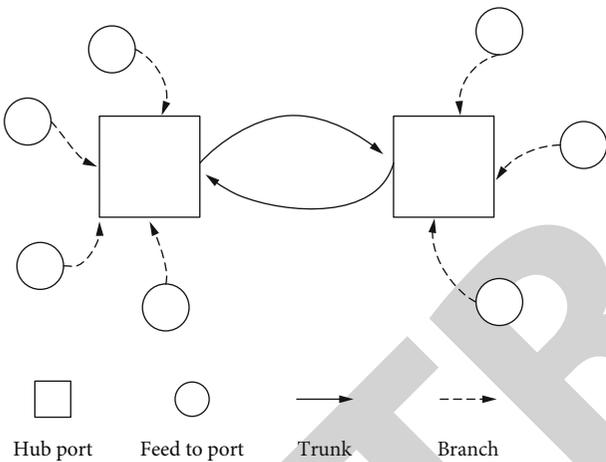


FIGURE 6: Dry-branch network topology.

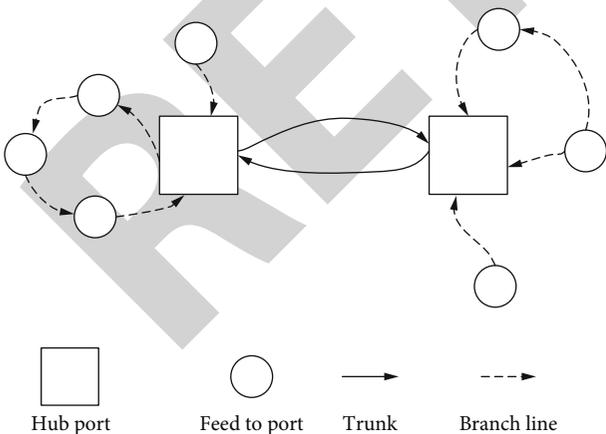


FIGURE 7: Dry-branch network topology.

composition of the fleet requires the speed of ships to be balanced. A small number of ships means that each ship in the fleet needs a faster speed; when the delivery time is more flexible, the speed of the ship in the dispatch phase decision-making is particularly important.

(3) Route type

The route layout is different, and the ships are also different. At present, the main line layout is mainly based on trunk and branch lines. Generally, the main trunk has sufficient cargo sources, long distances, long voyages, large ship operation uncertainties, large ships with large loading capacity, and good ship performance. Large ships are arranged on the trunk, and the branch line transportation distance is short.

Tourism is a standardized transportation unit, and many goods are suitable for tourism transportation. Therefore, it is difficult to estimate the price of goods for a specific tour. However, the transit storage time related to the tourism transportation system can be calculated and optimized. In tourism transportation, there are two links involving commodity storage: the dock storage link where commodities are waiting to be loaded at the dock yard and the in-transit inventory link where the commodities are in transit. The storage cost during transportation is an indispensable cost in the circulation link. Compared with other modes of transportation, the dock storage link is unique to sea transportation. Tourist commodities are transported to ports in advance to wait for loading on ships. Commodities are generally stored in the terminal yard for a period of time, thus incurring cargo storage costs. Shippers are more sensitive to the price and time of cargo transportation. On the basis of controlling operating costs, the higher the frequency of route service, the more attractive the shipper will be. Therefore, the shipper's inventory cost is also the main influencing factor of the route optimization design.

**4. Construction of Cruise Home Port and Its Significance Analysis**

*4.1. World's Port Cities Generally Attach Importance to the Construction of Cruise Home Ports*

*4.1.1. Distribution of Main Cruise Home Ports in the World.* The cruise industry is the most developed in North America, including Miami, New York, Seattle in the United States, and Vancouver in Canada, all of which have cruise home ports. In Europe, the per capita income level is much higher than the world average, which determines the prospects for the development of the European cruise industry. In contrast, Asia has fewer home ports for cruise ships, mainly Singapore, Hong Kong, Malaysia, and Japan, as shown in Table 2.

After research and analysis, most cruise home ports have the following characteristics:

They are all coastal cities, the port area is close to the city center, and the water depth and channel conditions are good; the number of cruise ships and the flow of cruise ships are large. Generally speaking, there are more than 200 cruise ships visiting each year and more than 300,000 tourists. These cities are tourist attractions in themselves, and the surrounding tourist attractions are of good quality.

TABLE 1: Types of route allocation problems.

	Single route	Multiple routes
Single ship type	Single route single ship type	Multiroute single ship type
Multiship type	—	Multiroute and multiship type

TABLE 2: Distribution of major cruise home ports in the world.

Area name	English name of the city	Chinese name of the city	Area name	English name of the city	Chinese name of the city
North America	Jacksonville	Jacksonville	North America	Canaveral	Canaveral
	Los Angeles	Los Angeles		Tampa	Tampa
	Long Beach	Long Beach		London	London
	San Diego	San Diego		Amsterdam	Amsterdam
	New York	New York	European region	Copenhagen	Copenhagen
	Galveston	Galveston		Hamburg	Hamburger
	Philadelphia	Philadelphia		Stockholm	Stockholm
	Seattle	Seattle		Barcelona	Barcelona
	Vancouver	Vancouver		Rotterdam	Rotterdam
	Miami	Miami		Hongkong	Hong Kong
Everglades	Everglades	Asia	Singapore	Singapore	

4.2. *Significance of Cruise Home Port Construction.* Cruise home ports [29] have become part of the world's port cities with extremely fast economic growth and broad development prospects. The strong consumption drive and the huge drive of related industries have created a multi-industry industrial chain in the cruise economy. At the same time, it will also drive oil increase, fresh water, food, ship maintenance, etc., and create a large number of employment opportunities for the home port.

4.2.1. *The Home Port of Cruise Ships Has a Huge Impact on the Cruise Economy.* Coastal cities in developed countries and regions in the world generally attach importance to the construction of cruise home ports and are committed to developing the cruise industry chain to drive employment and promote economic growth. North America has become the world's largest cruise market due to its large number of adjacent ports and islands, an early start, and agglomeration of related industries. At the same time, the region is also the most important source of cruise passengers. The United States has become the center of cruise tourism in North America because of its large number of high-quality cruise home ports such as the Port of Miami, Port Canaveral, Port of Los Angeles, and Port of San Francisco. Therefore, the impact of the cruise economy on American society can be reflected to a greater extent by cruise ships. The significance of home port construction is as shown in Figure 8.

The main reasons for the impact of the cruise economy on the U.S. economy are as follows: the consumption of catering, accommodation, tourist attractions, and other activities before and after boarding by cruise tourists and crew; cruise management companies rent office equipment, hire staff, and carry out tourism promotion in the port city where they are located; expenses incurred; the daily consumption of employees hired by the cruise company after

opening a new route, such as car fuel, catering, hotel accommodation, and transportation costs; the cost of the cruise ship itself, such as ship maintenance fees, berth usage fees; management companies in the cost and other expenses incurred by the port for the logistical supply of the cruise ship. It can be seen from Table 2 that in 2006, the cruise economy generated US\$17.643 billion in economic income for the United States, bringing about 154,000 jobs. The economic impact can be divided into core projects and noncore projects. The core items of the US cruise economy include tourist and crew expenses, port services and cruise line services, travel agency services, and air services. The resulting economic income is 9.583 billion US dollars, accounting for 54% of the total US cruise economic income. Among the core projects of the cruise economy, ports and cruise line services have the most economic revenue, accounting for 33% of the total revenue of the core projects of the cruise industry, and the number of jobs created accounted for 49% of the total number of jobs created by the core projects of the cruise industry. Travel agency service fees accounted for 29% of the total revenue of the core projects, air service fees accounted for 21%, and cruise tourists and crew consumption accounted for 17%. Figure 8 illustrates the revenue composition of the core US cruise projects.

As shown in Figure 9, port and cruise line services refer to the services provided by ports for cruise ships calling at the port, including tugboats, pilotage, port agency, loading and unloading, tourist reception, and warehousing. In 2019, cruise companies paid US\$3.142 billion in port service fees in the United States, an increase of 25% over 2018. Among them, 20% of the increase is due to the increase in the number of tourists boarding in the United States, employee salaries accounted for 20%, and the remaining 60% is due to the increase in service costs per tourist, such as security inspection fees, port services fee.

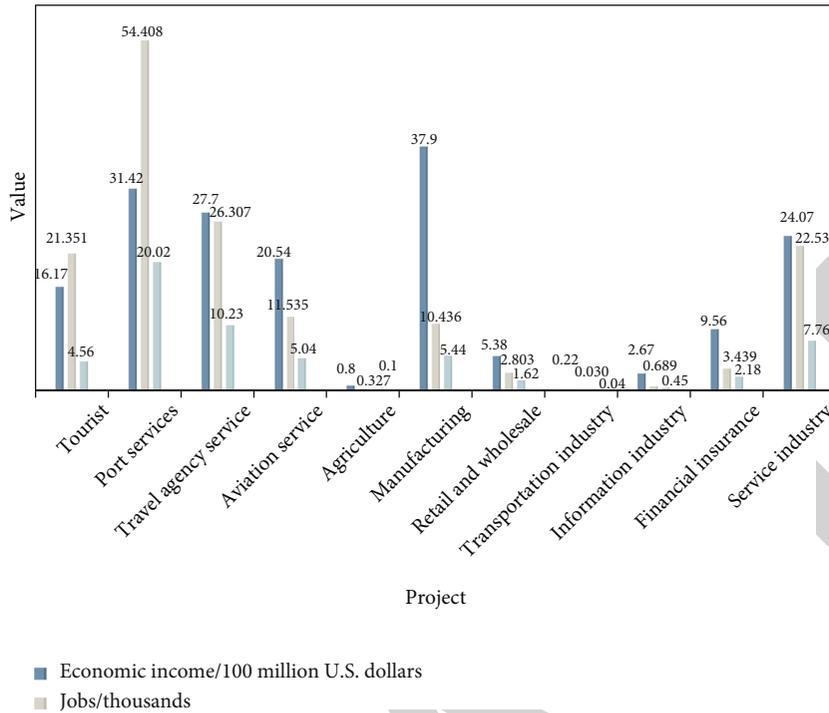


FIGURE 8: The impact of the cruise economy on the U.S. economy (2019).

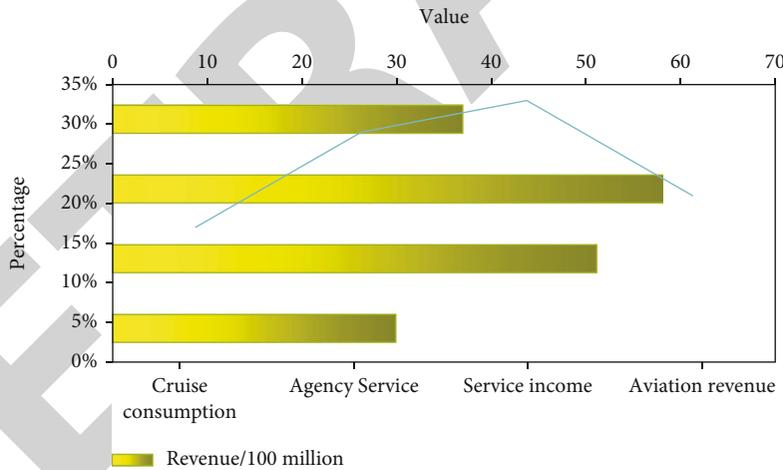


FIGURE 9: Revenue composition of core items of the U.S. cruise economy.

There are 54408 job creations for shipping services and related projects, and salary income is 2.002 billion US dollars. It can be seen that compared to the overall impact on a country or region, the cruise economy has a more direct and intense impact on port cities. In addition to the cruise economy's core projects, which have a direct impact on the U.S. economy, related industries such as manufacturing, retail and wholesale, and transportation driven by the cruise economy have also had a huge impact on the U.S. economy. In 2006, the economic income of cruise economy-related industries was US\$8.06 billion, 40,000 jobs were created, and wage income was US\$1.759 billion.

4.2.2. *The Home Port of Cruise Ships Can Bring Greater Benefits Compared to the Port of Call.* The revenue of the cruise home port generally accounts for the main part of the whole tour, as shown in Figure 10. The per capita local consumption of tourists who boarded at the port of call along the way was US\$123.36, and 4.953 million people spent a total of US\$611 million, accounting for 29% of total cruise travel consumption. In addition, the per capita consumption of the crew on the cruise ship is US\$47.48, which can bring local income of US\$253 million, accounting for 12% of the total cruise consumption.

According to the US investigation agency BREA's research on the shore consumption of cruise ship tourists

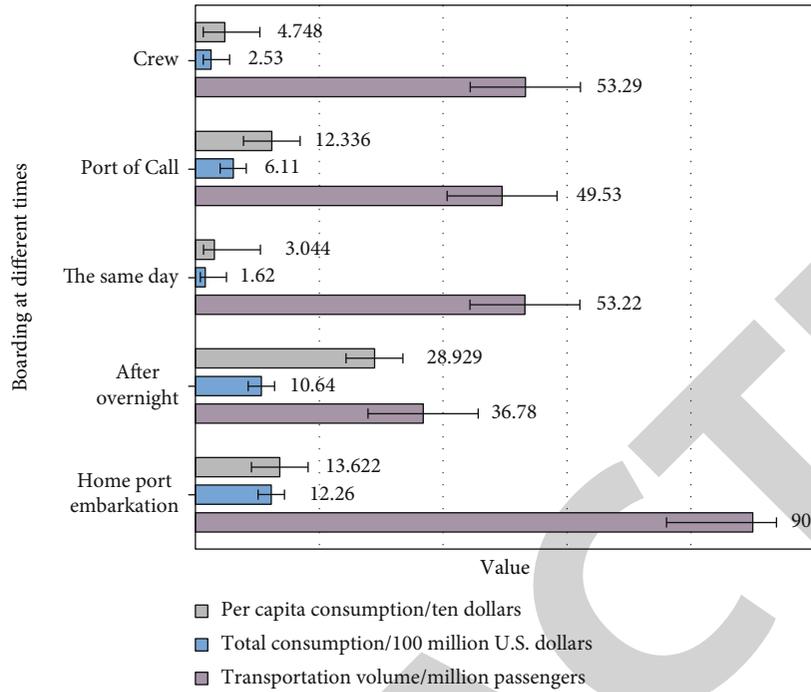


FIGURE 10: The consumption of cruise tourists before and after boarding in the United States (2018).

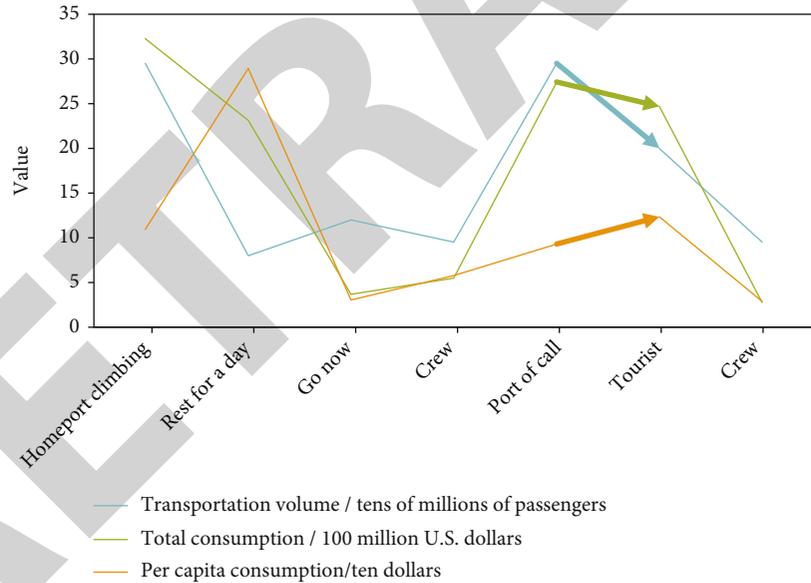


FIGURE 11: The results of the survey on the consumption of cruise tourists.

and crew members, a cruise ship carrying 2010 tourists and 952 crew members docked in this port city every time, and the total consumption of tourists and crew members on shore was about 323,700 US dollars. For each cruise ship with the same capacity, each time they call at this port, the average cost of tourists and crew on shore is approximately US\$273,000, as shown in Figure 11.

4.3. Public’s Cognition Analysis of the Significance of My Country’s Cruise Home Port Construction

(1) Perception of cruise travel

There are differences in public perception of cruise tourism. Among the 100 respondents, 78% of the respondents believe that cruise ships have ocean and port scenery, and 65% of the respondents believe that it has good development prospects in China. In this sense, most of the survey respondents have a relatively accurate understanding of cruise tourism and have a good prospect for its development. Some believe that it is expensive, long, and poor in safety, as shown in Figure 12.

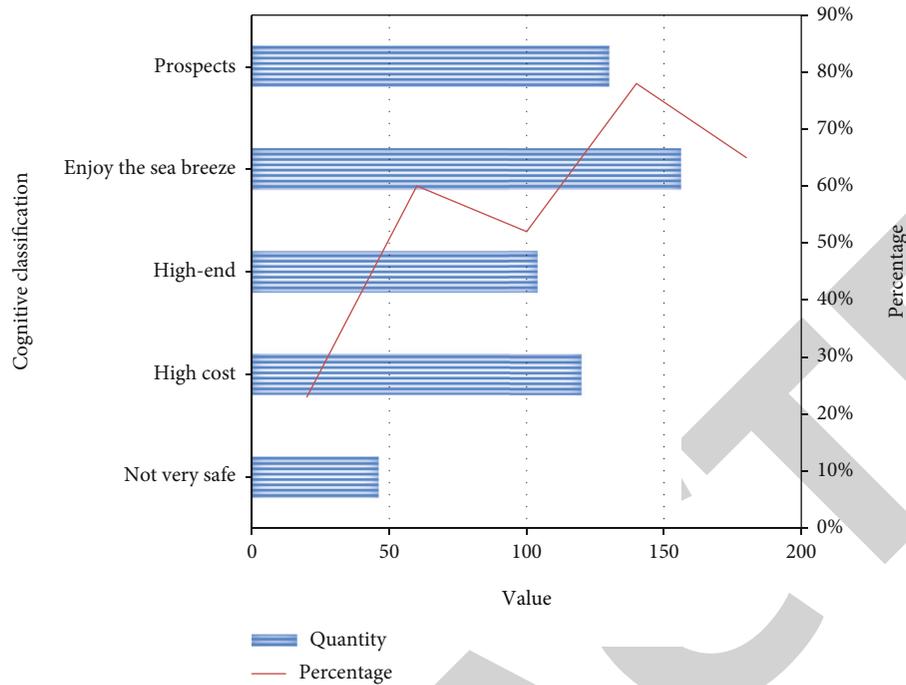


FIGURE 12: Respondents' perception of cruise travel.

TABLE 3: Respondents' perception of the significance of cruise home port construction.

	Benefits higher than ports of call and small terminals	Drive consumption and increase employment	Improve the development of the service industry	Improve international image	Is a double-edged sword
Percentage	70%	70%	57%	68%	39%
Quantity	140	140	114	136	78

(2) Cognition of the significance of cruise home port construction

In terms of the significance of the construction of cruise home ports, more than 70% of the interviewees believe that, compared with ports of call and small terminals, cruise home ports have greater economic benefits [30] and have a great impact on stimulating consumption and employment. It should be pointed out that 39% of the interviewees believe that the construction of cruise home ports may have a negative impact. It is recommended that when constructing cruise home ports, various factors should be considered to avoid damage to the marine ecology, avoid duplication of construction, and make overall planning, as shown in Table 3.

5. Conclusions

The current domestic research on cruise tourism is still in the preliminary stage of exploration. Due to the limitation of the author's own research ability and knowledge level, the research of this article is still relatively superficial, and there are still many shortcomings. Further research is needed from the theoretical point of view. Some conclusions

still have a certain degree of one-sidedness. Research methods and the methods also need to be further deepened and innovated. There are many aspects that need to be further deepened. The theoretical research needs to be further improved, for example, the research on the operating mechanism of cruise tourism and the research on specific modes of the development of cruise tourism. In the research of cruise tourism, there are still relatively few studies in the microscopic field. Current research is mainly qualitative research, and quantitative research needs to be further explored. The coordination between related industries, the optimization of the regional economic structure, and the promotion of the coordinated development of the regional economy also need to be studied. Due to limited conditions, it is impossible to conduct interviews with foreign cruise tourists, which limits the research level of this article's product development. In short, the research on the optimization design of my country's cruise travel routes is highly innovative, but the research is difficult, and there are many areas worthy of in-depth research. This is also the direction of the author's future study and work. In recent years, cruise tourism has been one of the fastest-growing industries in my country's economy. With the development of cruise tourism, cruise tourism will become a new growth point in

my country's tourism industry. Cruise tourism can not only drive the consumption of tourism itself but also promote local economic growth. I hope that a little bit of humble opinion can play a finishing touch, which can make China's cruise tourism get more attention, and thus open up a unique path suitable for the development of my country's cruise tourism industry. China, as a new force in the tourism market, is becoming an unstoppable force. Momentum is moving forward.

## Data Availability

No data were used to support this study.

## Conflicts of Interest

There are no potential competing interests in our paper. And all authors have seen the manuscript and approved to submit to your journal. We confirm that the content of the manuscript has not been published or submitted for publication elsewhere.

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