

# Research on Optimal Allocation of Tourism Education Resources Based on Super Network Theory

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## Abstract

Under the background of the popularization of higher education in China, colleges and universities are facing the contradiction between limited educational resources and the increasing number of students and demands. In recent years, universities have opened tourism management major, and the number of students applying for this major has increased year by year. However, the tourism education resources of colleges and universities are limited, which are reflected in the weakness of teachers in tourism management specialty and imperfect laboratory construction in some schools. However, there are still plenty of tourism education resources in some tourism schools, even the phenomenon of idle laboratories. There are also travel agencies and various tourist bases for students' internship, which are rich resources of tourism education. During the 13th five year plan, the concept of sharing became one of the five important development concepts, which is related to the economic, social, political and cultural development, and is highly positively related to the overall construction of a well-off society. As a public service product education, we should take the lead in implementing this concept. Therefore, under the limited investment of education, how to optimize the resources of tourism education resources and social tourism resources among colleges and universities can realize low-cost sharing and improve the utilization rate of resources.

## Keywords

Tourism; Educational resources; Super network; Configuration.

## 1. The Specific Problems, Significance and Research Value of Topic Selection

### 1.1. Specific Issues of the Research

The optimization of educational resources has always been a difficult problem in the development of education in China. Because of the uneven distribution of educational resources and the lack of relative supply of education at present, it is a problem that the society pays close attention to to how to construct a model to distribute the existing educational resources fairly and effectively. Tourism education resources are a branch of educational resources.

With the rise of network science, which is marked by complex network, in many practical problems, the simplification of the relationship between complex systems can be represented as the set of nodes and the edges of the connecting nodes in graph theory, which provides a new attempt for the modeling of complex systems. The super network is a network composed of multiple types of sub networks. The educational resources aggregated by multiple correlation dimensions actually form the education resources super network with different nature nodes and different nature relationships. These different nature associations and links are the clues of knowledge association, mining, development and innovation. Therefore, the problem of educational resource allocation and construction can be discussed and deeply aggregated by using the theory and method of super network.

Based on the knowledge fusion method of tourism education resources over network, this study intends to build a model of Heilongjiang Tourism Education resource system, and describes the principle of multi-agent participation and coordination in the process of construction of educational resources. It further reveals the integration and cooperation between educational resources and disciplines. It is expected to demonstrate the basic meta link model of educational resources.

## **1.2. The Significance of the Research**

The main purpose of the research on the coordinated development of Heilongjiang Tourism Education Resources and tourism industry based on the super network theory is to guide practice with theory and provide a new guiding ideology and method system for practice. Based on the theory of super network, this paper constructs the symbiotic system of the coordinated development of tourism higher education resources and tourism industry in Heilongjiang Province by strengthening the community consciousness of tourism colleges and social tourism education resources, and puts forward the countermeasures to optimize the tourism education resources in Heilongjiang Province, which is of great significance to improve the utilization rate of resources and realize the sustainable development of tourism higher education in Heilongjiang Province. The exhibition is of great significance. It has played a certain role in promoting the development of Heilongjiang Tourism.

### **1.2.1. Theoretical Significance**

At the theoretical level, it provides a new perspective and ideas for the construction of the new tourism education resource system, and reveals the construction model and mechanism of multi-agent collaborative participation, interdisciplinary interaction and integration, as well as problem-oriented, which is a further sublimation and supplement to the construction theory of Heilongjiang Tourism Education resource system.

### **1.2.2. Practical Significance**

At the application level, the resource integration method based on the super network of tourism education resources is used to construct the university education resource system. While improving the utilization rate of tourism education resources, the rich education resources are transformed into economic advantages, which is expected to provide reference for the development of Heilongjiang tourism industry.

## **2. Research Status and Concept Definition**

### **2.1. Research on the Allocation of Educational Resources**

The allocation of educational resources has always been an important field and theme of educational economics, such as the subject, scope, mode, efficiency, current situation, optimization and so on. There are many researches on the above problems, including quantitative and qualitative research, current situation description and theoretical interpretation. At present, the research of educational resource allocation can be divided into four categories: the essence of educational resource allocation, the research theory of educational resource allocation, the current situation of educational resource allocation and optimization.

#### **2.1.1. Research Status of Foreign Higher Tourism Education Resources**

Compared with the development of tourism higher education in China, the development of tourism higher education in foreign countries has the characteristics of early start, rapid development and high achievements. At present, there are many countries with more developed higher tourism education abroad, among which the development of Tourism Vocational Education in the United States, Switzerland and Australia is the most prominent. The

United States is one of the more developed countries in Tourism Vocational Education in the world. The teaching content of Tourism Vocational Education in the United States focuses on skill training, and the teaching practicability is very strong. It mainly cultivates practical talents in the tourism industry. Most of these institutions belong to community colleges, vocational and technical colleges and universities and vocational schools founded by major hotel groups in the United States. Among them, the tourism higher vocational education of Cornell University, University of Hawaii, Florida International University and other schools is also influential in the country. The Hotel Management Institute of Lausanne, founded by the Swiss Hotel Association in 1893, is the first school in the world with the nature of Tourism Vocational Education (including higher tourism education). As the symbol of European tourism vocational education, the school of hotel management in Lausanne, Switzerland, believes that what it is engaged in is a typical vocational education, and its goal is to cultivate tourism talents who are competent for all the work in the hotel. This kind of education concept has influenced the European tourism vocational education for a whole century, known as the "Lausanne model", which is recognized as the best model of hotel management personnel training in the world.

In the research on the regional distribution of tourism education resources, the number of literatures is very small, and there is only one published in 2006 entitled "GIS applications as a tool for tourism planning and development" education: A case Study of Chalkidiki, which is a case study, lacks certain universality.

### **2.1.2. The Current Situation of the Research on the Resources of Higher Tourism Education in China**

From the literature retrieved by China zhinet, the research content of Higher Tourism Education in China mainly focuses on the following aspects: Exploration of the training mode of tourism talents (Wang Dawu, 1999; shengzhengfa, 2008; huangjingbo, liujuan, Li Chun, 2011). The reform conception of higher tourism education. In this aspect, most scholars first point out the current situation and problems of Higher Tourism Education in China, and then put forward a series of reform strategies to adapt to the latest development trend of Higher Tourism Education (dongguanzhi, 1999; zhanghuixia, 2006; Zhang peiyin, sunqi, Shi Changbo, 2006; baojigang, Zhufeng, 2008; Gaopeng, yanghaihong, 2008; pansuling, 2009). Comparative study on Tourism Education between China and foreign countries. Scholars draw on advanced ideas and models from foreign tourism education and introduce them into tourism education in China, which provides reference for the development of tourism education in China (Yang Yan, 1998; wangyanping, 2003; Wang Hong, 2004; Lu Yingchun, 2007; Wei Jiewen, Wu Jun, 2007; zhangchunmei, zoudwen, 2008; hanbina, lvjingjing, 2010). The construction of the teaching mode. The teaching mode which has been formed now includes multimedia assisted teaching mode (Hulin, 2004), school enterprise joint teaching mode (jiangbinghua, 2004), experience teaching mode (wangqingrong, 2006), project-based teaching mode (qinyalin, 2006).

In the research of higher education resources, some scholars pay attention to the integration of educational resources. Zhang Qing (2008) constructs the tourism education system of Shandong Province in the concept of resource optimization. Wang Weiwei and Zhang Ying (2010) put forward the idea of integration of tourism education resources in Liaoning. In addition, few mathematicians mention the distribution and differences of higher tourism institutions when analyzing the current situation of Higher Tourism Education in China, but only from the quantitative analysis. So far, the paper has not yet appeared to study the regional distribution of tourism education resources by using the spatial theory, the super network theory and statistical analysis method. Therefore, this field is a blank in the research of tourism education.

## 2.2. Definition of Educational Resources (Different from the Distribution of Educational Resources)

Many scholars equate the allocation of educational resources with the distribution of educational resources. For example, Jin Xibin believes that "resource allocation is to allocate limited economic resources among different needs.". The distribution of educational resources is a reasonable and effective distribution of educational resources among all kinds of education within the education system. " The whole study directly transfers the concept of economic resource allocation to the field of education, and the allocation of educational resources becomes the distribution of educational resources. In his master's degree thesis, Lu defines the allocation of educational resources as "governments at all levels or other investors, and within a certain period of time, they allocate their limited educational resources, including financial, material, human and technological resources, to all kinds of schools at all levels through different channels, ways and procedures, so as to achieve good school running benefits." Compared with the former, the definition emphasizes the main body and purpose of resource allocation. The allocation process still adheres to the principle of supply of distribution, and in essence, it equates resource allocation with resource allocation.

The allocation of educational resources not only considers the target needs of the education system, but also considers the attributes and structure of educational resources. This not only ensures the educational resources needed for the realization of the educational system objectives, but also avoids the waste of resources, and maximizes the efficiency of resource allocation. The allocation of educational resources should not only consider the supply and demand principle of resource allocation, but also consider the balance between the two.

## 2.3. Definition of Tourism Education Resources

### 2.3.1. Resources and Educational Resources

The definition of resources covers a wide range of contents and has different understandings in different fields. In the dictionary of modern Chinese, resources are defined as the source of all wealth; in the dictionary of modern Chinese, "resources" is defined as the natural source of production and living materials; from the sociological point of view, "resources" refers to the various objective existing forms or objects that can create material and spiritual wealth, which are divided into natural resources and social resources. With the continuous development of society, human beings further divide resources into renewable resources and non renewable resources.

Although there are many different versions of the definition of resources, from the above understanding, the so-called resources are an object relative to the subject human, and this object is useful to human beings. Therefore, all useful to human beings, whether natural or social resources, can be collectively referred to as "resources". The resource is scarce, and human should make rational development and utilization on the basis of clearly recognizing this characteristic. The concept of educational resources is the projection of economic concept in the field of education. It not only has the meaning of resources in economics, but also has the unique connotation of education. Educational resources are an important part of the education system, which means the sum of a series of resources that can guarantee and promote educational behaviors to achieve the established goals, including human resources, material resources, financial resources, information resources, system resources, policy resources, etc. Among them, human resources (educatees, educators, teaching administrators, etc.), material resources (teaching equipment, media, machines, etc.), financial resources (resources used by the state, social organizations, individuals or other subjects in the form of currency for educational input) are the most basic forms of educational resources, which is the basis and guarantee for the smooth progress of educational activities.

### 2.3.2. Higher Tourism Education Resources

There is no clear definition of tourism education resources. However, tourism management is a new subject in the field of education, and the educational resources used in tourism management are within the scope of educational resources in Colleges and universities, and also have their own characteristics. Therefore, the definition of tourism education resources in this paper is: the collection of various resources existing in Colleges and universities, serving various tourism education activities and playing a certain function of tourism education value. Tourism education resources can be divided into hardware tourism education resources and software tourism education resources. Hardware tourism education resources mainly refer to the resources of tourism laboratory; software tourism education resources mainly include tourism teachers resources, tourism curriculum resources and tourism books and periodicals resources. Considering the allocation of tourism education resources and the possibility of collecting data, the main contents of the research include the resources of tourism education, extracurricular practice base and scenic spots.

### 2.4. Definition of the Concept of Super Network

At present, the research on the super network is still in its infancy. Some concepts have not been recognized. However, there are already some people who define the super network from different perspectives. There are two definitions of the super network, namely, the network-based super network and the hypergraph based super network. The network-based super network is defined by Denning Given [5], the meaning of which is a network composed of a network, namely a network in the network. Esrada and others believe that all networks that can be represented by hypergraphs are hypernetworks. This study mainly studies educational resources network based on hypergraph theory. The definition of the figure is as follows:

Definition of hypergraph: let be a set if (1)  $E_i \neq \varnothing (i = 1, 2, \dots, m)$  (2)  $U_{i=1}^m E_i = V$ .

It is called binary relation  $H = (V, E^h)$  Is a hypergraph. The elements of  $V$  are called the nodes of the hypergraph,  $E^h$  if two vertices belong to the same hyperedge, they are called adjacent; if the intersection of two hyperedges is not empty, they are called adjacent. As shown in Figure 1 (a), hypergraph  $H = (V, E)$ , Vertex set  $V = \{v_1, v_2, v_3, v_4, v_5, v_6\}$ , hyperedge set  $E = \{E_1, E_2, E_3, E_4, E_5\}$   $E_1 = \{v_1, v_2, v_3\}$ ,  $E_2 = \{v_2, v_3, v_4\}$ ,  $E_4 = \{v_2, v_4\}$ ,  $E_5 = \{v_1, v_5\}$ . We can get different representation of nodes by using bipartite graph (b),  $v_1, v_2, v_3, v_4, v_5, v_6$  representative node,  $E_1, E_2, E_3, E_4, E_5$  it stands for hyperedge.

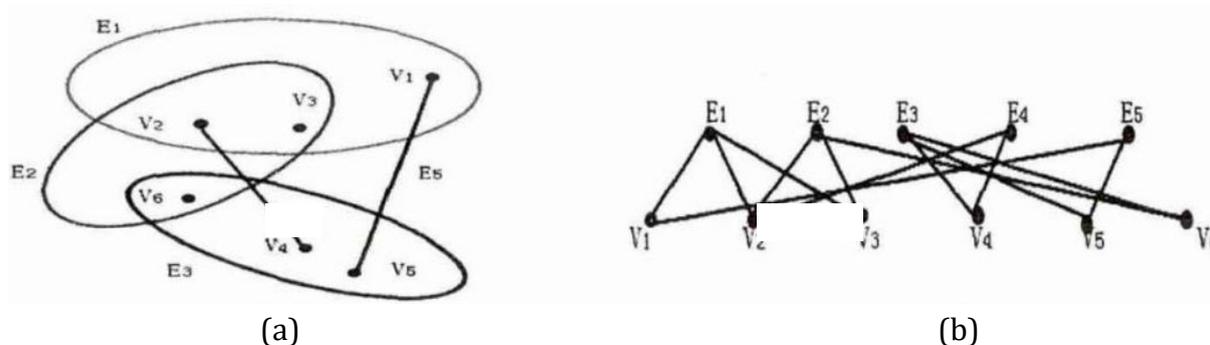


Figure 1. Diagram of dichotomy and Hypergraph

### 2.5. Definition of Tourism Education Resources

The scope of this study is Heilongjiang university tourism education resources, including the existing resources of university tourism education, university practice base (travel agency), the allocation of tourism resources, with each practice base, tourist attractions as the super edge,

with university tourism education resources as the node, using the super network to explore the distribution of these resources, and the super network modeling.

### **3. Establishment of Super Network Model of Heilongjiang Higher Tourism Education Resources**

According to the previous analysis of the status quo at home and abroad, most of the research focuses on the influence of the topology of the super network, and the influence on the importance of the nodes and edges of the super network is still in the preliminary stage. However, combined with the reality of this study, the construction of tourism education resources in Heilongjiang is not only affected by the structural attributes of school tourism major, but also affected by the topological structure of Heilongjiang Tourism Agency and tourist attractions. Therefore, this paper combines these three points to build a super network model of Heilongjiang Tourism Education Resources.

#### **3.1. Super Network Analysis of Tourism Education Resources**

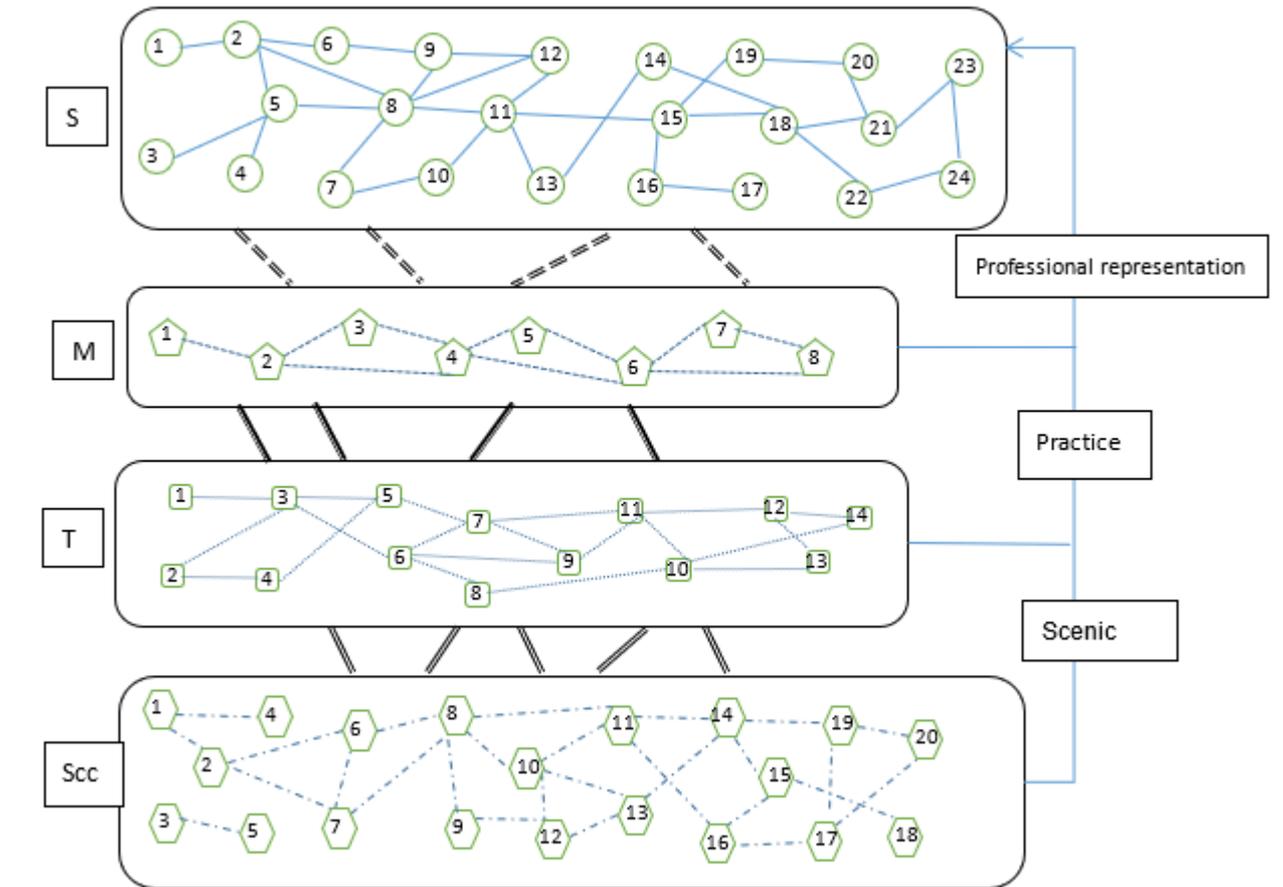
Tourism education resources are influenced and regulated by local social, economic, cultural and human resources. In reality, hypernetworks generally contain multi-layer, multi-level, multi-dimensional, multi-attribute or multi criteria characteristics. In the previous analysis of the characteristics of tourism education resources, this paper thinks that the allocation mechanism of tourism education resources is: through the study of various tourism majors, learning and researching different types of tourism education resources in a certain field of interest, going to travel agencies for internship in the later stage, or transferring the focus to various scenic spots. It is not difficult to find that there are many layers in the learning network of tourism education resources, including students and their majors, tourism education resources, travel agencies and scenic spots. In particular, these single areas can form their own network, that is, tourism education resources network nested with other networks. The traditional simple network model can only express one of the attributes. This paper must split and interpret the multi-dimensional attributes of information, and use topic subnet and intention subnet respectively to represent the "specialty" and "resource" subjects in the tourism education resource network from the school professional resources and semantic content, which also meets the needs of students in the establishment of tourism education resource super network model Mechanism. Therefore, based on the literature review, this paper intends to introduce the super network model to interpret the tourism education resource network. Because the multi-level and multi-attribute of the super network can restore the real education resource network to the greatest extent and represent the global characteristics of the network. Especially the super network.

Multi layer subnet can realize the layered layout of complex network, and represent the propagation mechanism between multi-layer subnet. However, because the hypernetwork model contains multi-layer subnets, and there are internal relations within and between them, the setting of subnets and the definition of related relations in line with the dissemination characteristics of tourism education resources are also a major difficulty in this paper.

#### **3.2. Structure and Subnet Distribution Design of Hypernetwork Model**

According to the above, in the modeling of tourism education resources, we must include students, tourism education major, Heilongjiang travel agency and Heilongjiang tourist attractions, in order to truly and completely express the mechanism of resource communication in the network of tourism education resources. At the same time, according to the multi-dimensional attribute of the information content in the resource network, the tourism education resource information must be deconstructed and processed. Therefore, considering the four types of subjects involved in the tourism education resource network and the inherent

multidimensional nature, this paper introduces the super network model and constructs a super network model based on these four types of subjects, that is, students, tourism education majors, Heilongjiang travel agencies and Heilongjiang tourist attractions are the four layer subnets of the super network model. Therefore, the hypernetwork model structure of Heilongjiang Tourism Education Resource Network Based on hypernetwork designed in this paper is shown in Figure 2 below.



**Figure 2.** The super network model in the context of complex network of tourism education resources

According to the analysis of the resource communication mechanism edge intensity in the network, it is found that the differences of different student nodes on resource communication must be considered, that is, different students have different influence in communication. The information transfer between students and students in tourism education resources is realized by "communication" and "intersection". Therefore, this paper constructs student subnet to represent the transfer of resources between students, which involves the subject of real space

interaction. Meanwhile, the relationship between the subnets is constructed by the relationship of mutual association, and the higher the penetration of student subnet nodes indicates the relationship. The more other students, the stronger the influence, thus realizing the different portrayal of the influence of students.

Tourism education resources can spread and enlarge information through similarity between majors. When refining the subject of resources, the existence of similar relationship must be considered. Therefore, this paper uses the professional subnet to represent the subject of tourism education resources, and uses the similarity between majors as the connection between the professional subnets. The higher the degree of entry, the greater the influence of the major.

Internship expresses the relationship between students and society. Students can improve their practice through travel agency. This paper sets the relationship between student subnet and professional subnet to share students' professional resources, and the relationship between professional subnet and travel agency subnet is internship. It belongs to the Semantic Connotation of specialty. The relationship between professional subnet and travel agency subnet is the scene. The district expresses the direction of students' future development, and is subordinate. Finally, for the effectiveness of students' network resources, it is necessary to ensure that the key node identification method based on the model can meet the requirements of fast processing of large-scale data, that is, to build the basic model quickly and effectively.

Type is the foundation and key. Therefore, the sub network segment of the super network model based on Heilongjiang Tourism Education Resource Network is as follows, and the nodes and the edge information of the four-layer subnet are as follows:

(1) Student sub network: students are the main body and the relationship between students is the edge, which reflects the relationship between students and students through the dissemination of real resources.

(2) Major sub network: taking professional content as node, different majors represent different nodes in tourism education resources. The similarity between majors is that there is a relationship between two majors, and there is a side to represent the relationship between the major and the specialty.

(3) Travel agency sub network: Taking the internship of travel agency as its attribute as the node, the internship node is a part of improving students' specialty. In this super network model, different travel agencies represent different nodes. Because the travel agency attributes are expressed by covering the distribution of regions, the nodes containing the same region have certain similarities, so as to construct the edge connection.

(4) Scenic sub network: in the tourism education resources network, students can express the resources through the scenic spots in China. The distribution of scenic spots as scenic spots nodes shows that there is correlation and the connection is constructed.

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## References

- [1] BROOKES B C. The foundations of information science: Part IV. Information science: the changing paradigm [J]. Journal of Information Science, 1981 ( 1 ) : 3-12.

- [2] BROOKES B C. The foundations of information science: Part III. Quantitative aspects: objective maps and subjective landscapes [J]. *Journal of Information Science*, 1980 ( 10) : 269-275.
- [3] BROOKES B C. The foundations of information science: Part I. Philosophical aspects [J]. *Journal of Information Science*, 1980 ( 5) : 125-133.
- [4] Kellogg S, Booth S, & Oliver K. A Social Network Perspective on Peer Supported Learning in MOOCs for Educators [J]. *International Review of Research in Open & Distance Learning*, 2014, 15(5):263-289.
- [5] Gillani N, Yasseri T, Eynon R, et al. Structural limitations of learning in a crowd: communication vulnerability and information diffusion in MOOCs [J]. *Scientific Reports*, 2014 (4):6447-6447.
- [6] Yang D, Sinha T, Adamson D, et al. Turn on, tune in, drop out: Anticipating student dropouts in massive open online 105courses [C]. *Proceedings of the 2013 NIPS Data-Driven Education Workshop*. 2013: 11-14.
- [7] Breslow L, Pritchard D E, DeBoer J, et al. Studying learning in the worldwide classroom: Research into edX's first MOOC. *Research & Practice in Assessment*, 2013 (8): 13-25.
- [8] Sheffi Y. *Urban transportation network: Equilibrium analysis with mathematical programming methods* [M]. Prentice Hall, 1985.
- [9] Nagurney A & Dong J. *Supernetworks: decision-making for the information age* [M]. Elgar: Edward Publishing, 2002.
- [10] Nagurney A & Dong J. Management of knowledge intensive systems as supernetworks: Modeling, analysis, computations, and applications [J]. *Mathematical and computer modelling*, 2005,42(3): 397-417.