



Research Article

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The location of logistics center by AHP-GP based on convenient idea

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ABSTRACT

In this paper, it use an improved without consistency test of AHP site to select to solve the problem of logistics center. The constraint problem of AHP methods cannot solve the limited resources, thus, we combined the AHP and goal programming (GP) method.

Key words: AHP; goal programming; logistics center; location model

INTRODUCTION

At last, we propose a AHP- GP material flow based on center location model. This model is mainly suitable for the constraint. Under the condition of limited resource, we will optimize the combination of a plurality of logistics center location. When the constraints of the resource become large, the model accuracy and rationality will decrease. The selection of Logistics center location is a very complex issue, and involves legal, regulations, planning, land use rights, logistics business category, logistics facilities, financing ability, traffic environment, natural conditions and other factors [1-5]. Therefore, logistics center location need to be decided by combining qualitative analysis and quantitative analysis together, or by using integrated methods In the construction, we will often use a combination of qualitative and quantitative analysis of analytic hierarchy process (Analytic Hierarchy Process, AHP) [6,7].

Considering the actual process in the location of logistics center, it can be part of the limited resource constraints, therefore, the general constraint conditions of the calculation regarded the AHP as a constraint condition and other resources are regarded together as to form GP. And goal programming (Goal Programming, G P) is an AHP-integrated model, which is based on GP, and can effectively solve the limited resource constraints, location problems in a region of the flow center.

THE CONCEPT AND CLASSIFICATION OF LOGISTICS CENTER

In Europe and the United States, Logistics center refers to the distribution center. Foreign logistics distribution center is rising in twentieth Century twenty or thirty years, sixty or seventy years later, the logistics distribution center in Japan, South Korea and Europe and the United States have obtained the rapid development. Also, the logistics center is developing rapidly in China, as if overnight. Throughout 9.6-million-square-kilometer land, everywhere is the development of logistics enterprises, logistics center construction phenomenon. For example in Shanghai, the logistics industry has been one of the 4 pillar industries, which is planning 5 major logistics park: Pudong airport, port city, Waigaoqiao, Puxi Taopu and Cui Zhuang. The government plan to establish a center to train 20 local industry associations and talent and construct 3-5 city distribution centers. In Guangzhou, for the city logistics infrastructure construction investment about 10000000000 Yuan to support the relevant enterprises allocating land, credit, tax, and has 4 major logistics park: the East Department of production data center, the western commercial center, storage center, South North Trade center.

China's government departments organized and planned to promote the construction of logistics center, which began in twentieth Century and early 90's. "The national standard of the people's Republic of China ", the term of logistics was defined: the user order information, large quantities of goods were transferred to the upstream suppliers for

centralized storage, processing and other operations, and facilities and the structure mass transport to downstream users. All of these should meet the following requirements: mainly oriented society service; logistics function is perfect; perfect information network; radiation range; and few varieties, mass; storage, handling capacity; unified management, logistics business. Li Changjiang (2002) defines the logistics as: material displacement comprehensive, regional, mass concentration, it sets the business flow, logistics, information flow and capital flow into a whole and become the intermediary between production and marketing enterprises.

AN OVERVIEW OF THE BASIC METHOD OF THE LOGISTICS CENTER LOCATION

An overview of gravity method

Gravity Method is the most commonly used method of location problems. The gravity method applies to continuous linear distance region. Also, it will investigate lots of place. The gravity method includes two key factors: one is the research on logistics demand, another is the study of logistics system resources, which aims to find a transportation cost lowest point (not to consider the mode of transport). In a region, if multiple logistics resource node has been determined, then they can grasp the average demand of logistics. In this way, they can analyze logistics resource node overall minimum freight regions as the best location of logistics center.

Applying the principle of center of gravity method in location of logistics center is to use the method for object system of gravity, which determines the location of the logistics network. The center of gravity method of logistics cost most of the transportation cost, which will replace the logistics cost, logistics, transportation costs. The logistics node is proportional to distance, minimum logistics cost, thus the location problem transferred into a number of logistics center and logistics network flow plane space distance between the points of the hour, the optimal solution the problem.

The hierarchy analytic process

AHP is a method of evaluation, and its decision was made from a combination of qualitative and quantitative. The method is based on the analysis of basic level factors, and the weight of each factor is determined by the number of layers. The application of AHP rely on different factors to study the logic (for the study of many factors, the main factors of screening needs to use the key factor analysis method; factor on this type is relatively strong by cluster analysis). The relation and logical relation of each element were admitted into layers. Among these levels, they required a two comparison of calculation to determine through calculation of analysis so as to provide basis for further selection.

The analytic hierarchy processes are introduced in detail. Zou Du (2009) obtains the influence factors through the analytic hierarchy process to sort the importance of influencing factors of logistics center planning and site selection method in order to find its importance: the impact on the ecological environment, close to the freight hub; the impact on the surrounding enterprises, close to large enterprises; the impact on the environment landscape / price factors, close to the main road traffic. Construction engineering quantity and investment restrictions perfect road transport network, using the existing infrastructure, labor factors. But the AHP judgment matrix has some subjective influence factors.

Other methods

Delphi Fa is the expert scoring method, or for the expert discussion method, which is the first 40 Helmer in twentieth Century and Norman Dalkey. The Rand Co will promote the use of this method. The Olaf Delphi method in object is relevant experts, which is the anonymous expert opinion. The principle is based on the location of objective based data, using expert knowledge and experience, and constantly repeated changes, which can make a comprehensive analysis of the location research and seek the characteristics and law of development, and a location method. This method has broad representation, but its disadvantage is too subjective, lacking of uniform standards.

Delphi Fa's step is composed of experts group; let all the experts raise issues related to facility location and requirements. At the same time, they will ask the experts' need, then all the experts without talking to each other and each expert submitted materials and opinions respectively, and a list of experts comparative analysis, feedback, information, new materials and opinions of experts comprehensive expert opinion; comprehensive analysis.

LOGISTICS CENTER BASED ON AHP- G MODEL

AHP (Analytic Hierarchy Process,) is proposed by an USA operations research scientist T. L. Sa TTY in twentieth Century 70 years. Its initial application in the area of services is a kind of multi objective decision making qualitative analysis and quantitative analysis method, which has the characteristics of reliable, flexible and practical. AHP is a simple and convenient method for quantitative analysis of the non quantitative event system engineering. Also, it is a method of t subjective judgment of people for quantitative description. Therefore, it has been widely used in many complex systems, which is difficult to analyze with quantitative method. The process can be seen in consistency test in AHP, which is indispensable.

In practical application, people generally adjust judgment matrix roughly, but often effective. After all, after several adjustments in order to validate the consistency, the possibility cannot be ruled out. In order to solve the problem, we will use the concept of optimal transfer matrix in this paper, the AHP was improved and was natural to meet the requirements of consistency, which can be directly in the calculated weight values. As to its component, we can see in figure 1.

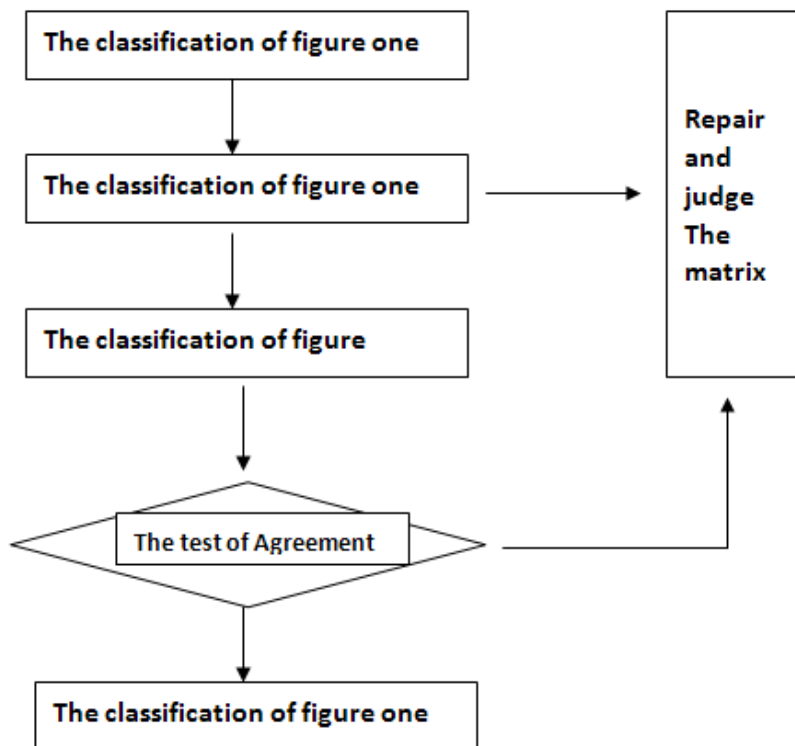


Fig 1. The flow chart of AHP

Propose there is a matrix:

$$A = [a_{ij}], \quad B = [B_{ij}], \quad C = [c_{ij}] \in R^n \times n$$

Definition 1:

- if $a_{ij} = 1/a_{ji}$, then A is called reciprocal matrix;
- if $b_{ij} = 1/b_{ji}$, then B is called anti-symmetric matrix.

Definition 2:

A is the reciprocal matrix, if $a_{ij} = a_{ik} / a_{jk}$, then A is said to be consistent; if B is anti-symmetric matrix, and the $b_{ij} = b_{ik} + B_{kj}$ then B is called transfer.

By above knowable, if A is a uniform array, $B = LgA(b_{ij} = l_{gaij})$ is transitive. Similarly, if B is transitive matrix, then is the same.

The improved AHP is consistent with test in this process. Consistency test is a key link in the traditional AHP calculation, which is indispensable. Although its inspection process is not very complex, but if the judgment matrix is not consistent with the test, it will have to readjust the original judgment matrix and recalculate all the process. Through using the concept of optimal transfer matrix, the AHP is improved properly, and make it natural to meet the requirements of consistency without need for consistency checking. Then directly calculates the weights value. Through analysis and examples, results calculated by the improved AHP are more accurately. Its essence is to set up an intelligent regulator in the original AHP.

LOCATION PRINCIPLE

A large number of successful cases on the location problem, the qualitative analysis is more important and the qualitative analysis is the premise of quantitative analysis. In the qualitative analysis, it is necessary to determine the principles. Principle of location specific is in Fig2.

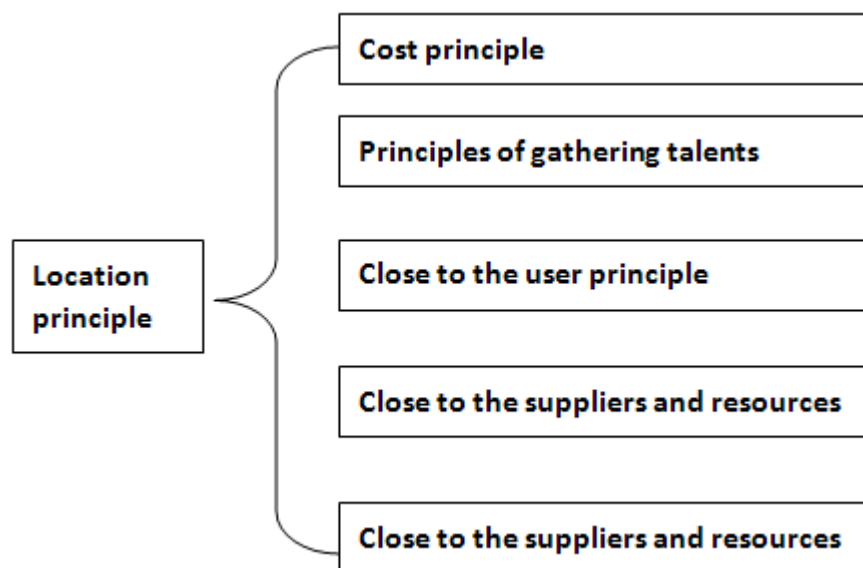


Fig 2. Location principle

Cost principle. The enterprise is the economic entity, economic benefits for the enterprise are important. Fixed costs of the initial construction, changes in the cost of the operation, the annual income products sold later, all of these things decide the location.

Principles of gathering talents. Talent is the most precious resource of enterprise, and business address is rightly chosen to attract talent. Conversely, for enterprises caused by the relocation of staff living inconvenience, it often occur the loss of staff.

Close to the user principle. For the service industry, almost without exception, they are required to follow this principle, such as a bank, post office, hospital, school, cinema, retail stores all etc.. Many manufacturing enterprises will build a factory to consumer market nearby in order to reduce the costs and losses.

Close to the suppliers and resources. Companies rely on suppliers and resource depends on this principle: firstly, enterprise or business or parts of the park will be a number of outsourcing production, processing. The supplier, resources are distance in relation to the transport cost of logistics. Secondly, local suppliers, resource aggregation can make the maximum use of resources, saving the cost of operation.

Long-term development. Enterprise site selection is a kind of strategic management activities, so they will have the strategic consciousness. Site selection must consider the reasonable layout of enterprise productivity, which wants to consider the market development to get new ideas and new technology. In the current world economy, it becomes more and more integration under the background of the times to consider how to participate in international competition.

LOGISTICS CENTER OF AHP- G BASED ON LOCATION MODEL

AHP involves many quantitative and qualitative factors because of the location of logistics distribution center, and the AHP method of multiple objectives are decision-making method, which is combined quantitative and qualitative methods. But this method does not take the limited resources of some practical problems into account, and thus get the method become infeasible. The utility model is used in this paper based on AHP- G P.

ANALYSIS OF VARIABLES IN THE MODEL

The determination of the variables in the model is the first step in the decision-making model.

Here the hypothesis:

$N = \{1, 2, \dots, N\}$, for a possible logistics center address set.

For each specific address in the planning, there are only 2 possible, namely at the address set up logistics center or not at the address set up logistics center with the address. The decision variables of X_i , can take 1/0 expressed in setting up a logistics center and the address can take 1/0, which is said to choose the address as a logistics center. Namely, the decision variables of the model can be expressed as: $X_i = 0$ or $X_i = 1$, according to the characters of logistics center.

This paper puts forward 4 objectives, which constraints logistics center location in common, weight gain. AHP method is regarded as another important constraint condition, the formation of constrained goal programming.

CONCLUSION

With the rapid development of logistics industry, more and more scholars begin to study the location of logistics centers theory. In this paper, it is a supplement and expansion of AHP- GP model and the location theory of logistics center based on the model proposed. Mainly it applied to constraint in the limited resources, optimize the combination of a plurality of logistics center location scheme at the same time. There are also shortcomings, which need to develop and improve further. Constraint condition is larger when the resources is not a constraint function.

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