Research on the Location of Express Company Based on Fuzzy Neural Network

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Abstract. The paper designs and optimizes the logistics network of Express Company S in County B. Through field investigation of the actual data of County B, the fuzzy comprehensive evaluation method is adopted to establish the comprehensive evaluation system of location factors of logistics distribution centers. BP neural network is used to train and get the best location plan of the new logistics network for Express Company S in County B. Then the Dijkstra method is used to establish the logistics distribution network of County B. The design and optimization of logistics network in County B can provide feasible solutions to reduce costs, improve logistics efficiency and increase the satisfaction of people.

Introduction

About 70% of express business in our country comes from online platform shopping [1-2]. Based on the gradual rise of new online retail, a new shopping mode of online and offline convergence has begun to emerge. The express industry in our country will continue to develop rapidly along with this new online retail mode. According to statistics, 49 billion pieces of express business were completed in 2018, an increase of 22.5% compared with 2017; the revenue of express business reached 600 billion yuan in 2018, an increase of about 20% compared with 2017; of which 9.2 billion pieces of business will be achieved in the first quarter, an increase of 21.3% compared with the same period. According to the "13th Five-Year Plan" of the express industry, by 2020, the express industry is expected to complete 70 billion pieces of business and achieve 800 billion yuan of revenue, corresponding to a compound growth rate of 20% to 18% in 2018-2020 [4].

According to the actual needs of County B, taking into account of the distribution, service status and existing problems of service districts, combined with the development trend of express logistics under the background of "Internet +" e-commerce, the paper designs and optimizes logistics network from aspects of County B urban planning, logistics enterprise development and so on. Through field investigation of the actual data of Express Company S in County B, and sorting the data, the fuzzy comprehensive evaluation method is adopted to establish the 4 level comprehensive evaluation system of logistics distribution center location factors. According to the fuzzy evaluation data, the BP neural network is used for training, and the scientific location and verification analysis of the alternative address of distribution center in County B for Company S is conducted. The optimal location plan of new logistics network. Finally, according to the data collected by S new network and its headquarters and service area in County B, the relevant transportation cost, profit, transport rate and transportation volume were calculated by using the data collected before. The logistics distribution network of Company S in County B was established with Dijkstra method, and the responsibility field of new and old network service area was reassigned.

Research Background and Significance

With the rapid development of the economic system, China's express delivery industry has achieved leaping development. In 2017, China's express delivery volume exceeded 40 billion, accounting for more than 40% of the total global express delivery volume [3][6], becoming the world's largest express delivery country. And it took the lead in establishing the intelligent logistics system.
Express has become the "infrastructure" of the city.

County B is one of the top 100 counties in the basic competitiveness of county economy in China. In 2017, nearly 40% of enterprises in County B built websites, and nearly 50% of them carried out the Internet marketing mode with Taobao and Jingdong [7]. Therefore, Jingdong, Shun Feng and four links one reached the regional distribution center in County B. In addition, the structural change of County B has prompted the urban population to move southward. Under the pressure of policy driven and competition, County B intends to establish a new logistics distribution center to promote its competitiveness and improve its economic efficiency.

Aiming at the actual situation of County B, this paper designs and optimizes the logistics network. With objective, systematic and scientific methods, starting from the relevant factors of distribution center location and path optimization, it analyzes the current competitive environment of logistics market in County B, takes the urban express network as the main research object, and establishes the urban express logistics network based on social cost. Design model. Through the design and optimization of logistics network of Company C in B County, it provides a feasible plan, which reduces social costs, improves logistics efficiency and increases people's satisfaction. In-depth study of logistics design and planning methods, so that knowledge can be practiced. To solve the practical problems in the development of Company S in B County, make full use of urban space, promote the healthy development of open space in the local cities, and contribute to the local efforts to win the national civilized city.

Data Collection for Alternative Address of Distribution Center in County B

In the research process, design grading questionnaire, plot interview, field investigation and other methods were adopted, mainly answering the questionnaire for the staff. The residents in the service area interviewed and surveyed the main streets in County B. Field survey was conducted to collect daily courier data from County B in February 24, 2018 and March 17th February 24, 2018 as sample data. Ensure the professionalism and accuracy of the data investigated [5].

County B has a large number of residential areas. From north to south, according to the distance from headquarters, there are foo Zhuang Yuan, Huaxin District, Anju District, Ding Zhuang estate, Zhou Lou new village, MSG garden, Lin Zhuang new village, Jin Du garden, CHINT harmony family center, central garden, former Cao Zhaoyang Jiayuan, Riverfront garden, CHINT collar court, Fairview court, Luyuan Longcheng, CHINT GUI and new Tsinghua Yuan, Xinglin District, Ankang District, local tax home, central Fortune City, small town, Yi Yi Jing, Heng Wang Jade Dragon City, waterfront court, emerald garden, home and garden and 28 gardens. The location data collection is based on the comparison of 28 factors, such as traffic conditions, social culture, road facilities, competition pressure and economic rationality.

Fuzzy Evaluation of B County

According to the evaluation model of distribution center location in County B, expert evaluation of 28 districts in County B was conducted by using the "preset network staff score questionnaire". Questionnaires were collected from 87 employees in County B, and 80 valid questionnaires were received. The recovery rate was 91.9%, and data collected from County B Service area were collected. The importance of each index value is equal, so the average value is used as the evaluation result.

Based on the evaluation results of 28 alternative addresses in the paper, due to the size of the distribution center which limits its radiation capability and the number of service areas, a collection of site options is proposed according to the requirements of policy makers. I= (Heng Wang Jade City, waterfront court, emerald garden, home garden and Shangri-La garden), five alternative distribution center data are input into BP neural network algorithm trained by study. The training results were Y= (1.453, 1.462, 1.461, 1.428, 1.329). The correlation coefficient of training value is 0.9999998, the validity is 0.99994, the fitting degree of sample test is 1, the fitting degree of comprehensive evaluation result is 0.9999998, and the accuracy of test result is high. The training results are fitted with the target values as shown in Figure 1.
Aiming at the location problem of distribution center of Company S in B County, the fuzzy comprehensive evaluation method is adopted to establish the 4 level comprehensive evaluation system of logistics distribution center location factors. The system contains 4 first level comprehensive indicators and 20 sub class indicators, which comprehensively covers the factors affecting the location of logistics distribution center of Company S in County B. According to the data of County Service Area in County B, combined with the evaluation opinions of experts (staffs in the company), the detailed data of B county's selected districts were collected, and BP neural network training was used. 20 sets of data were used as training samples, and the evaluation results were taken as output values to verify the effectiveness of the network training. In the selected four groups of test samples, the best results are obtained by using the BP neural network training which has been trained, and the data are obtained to select the best network points.

Implementation of Dijkstra Algorithm

According to the image distance measurement software Mark Man, get the B County coordinate map. According to the comprehensive situation of B county service area, we use MATLAB to generate B County distribution network map.

From the above results, the optimal path between the old and new outlets of distribution center of Company S in B county is:

$$\text{Dist}_{dj} = 562.6267$$

That is to say, it is the shortest route from the old network to the new one through the Sunshine Age, the former Cao Chaoyang Jiayuan and the beautiful Huating to complete the turnover of goods in the network.

Using the shortest path problem to establish a mathematical model, we can also select the distribution range, and use Dijkstra algorithm to select the shortest distribution path.

According to the distribution distance comparison table, based on the above distribution range, we can see that only County B has a distance of 190.2 kilometers from original to original distribution. After carrying out the network optimization design, the distance of distribution is saved by 90.1 kilometers, and the distribution distance is saved by 47.37% of the original delivery distance.

Based on the distribution scope planning, according to the Dijkstra algorithm, the shortest path between the network and service area is calculated, and the design and optimization of B County logistics network are carried out. The distribution distance, distribution efficiency and distribution cost are analyzed, and the optimization results are compared. New outlets (waterfront court) are distributed in 18 districts, such as Ding Zhuang estate, Jin Du garden, central garden, new Tsinghua Yuan, Riverside Garden, Luyuan Longcheng, GUI He District, collar Xiu Yuan, Ankang District, local tax home, Xinglin District, Fairview court, central Fortune City etc.. The headquarters distributes eight districts: Fulu Manor, Huaxin District, Anju District, Zhoulou New Village, MSG Elegant Residence, Harmonious Home, Linzhuan New Village and Jiayuan, former Cao Chaoyang. B county saves 90.1 kilometers of distribution distance, saves 47.37% of distribution distance and improves distribution efficiency by 16.9%. Distribution cost was reduced by 37.42%. The reduction of distribution distance and distribution cost greatly reduces the social cost, saves social resources,
improves the distribution efficiency, improves the people's satisfaction, and increases the competitiveness of Logistics Company S in the County B logistics market.

**Conclusion**

In the county's policy of removing counties, the urban population moved southward, and new choice of Company S outlets located on the south side of the city. Compared with the third-party express logistics, the more reasonable choice of new outlets and distribution scope can better enhance the competitiveness of B in the county. At the same time, the north of the city will be set up as an industrial zone in the future. The headquarters can better serve the enterprises with dedication. The division of labor and cooperation between the north and the South will have a bright future.

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