Research on Location Selection of Fresh Agricultural Products Warehouse Based on E-commerce Platform

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Abstract: At present, the demand for fresh agricultural products on the platform is constantly rising. The logistics links such as distribution, transportation and storage of fresh agricultural products are issues that e-commerce companies need to study. The rational and perfect location design of the warehouse center can better improve the logistics distribution efficiency, reduce costs and improve benefits. This paper empirically analyzes the case of the grocery shopping platform, expounds the background and current situation of warehouse site selection research, analyzes the characteristics of the site selection of fresh agricultural products warehouse, follows the principles and the influencing factors that need attention, and draws the warehouse selection of fresh agricultural products. The practical significance of the site research; using genetic algorithm and k-value clustering analysis to test and optimize the data obtained by the dual-product single-target location model through MATLAB form, the basis of the principle and method of site selection in the original warehouse The results of the research calculations are compared with the results of the optimal distance scheme corresponding to the warehouse location scheme obtained through the test optimization. Finally, combined with the operational advantages of the grocery shopping platform and the research of the warehouse site selection The results of the optimization plan are summarized and summarized for the research on the site selection of the warehouse platform.

1. Introduction

With the development of e-commerce platform, competition is intensifying, reducing cost output and maintaining asset preservation, which is the main way for e-commerce platform to develop stably. The relevant platforms based on fresh agricultural products management need to study the management mode and warehouse location design to enhance their competitiveness. The demand for fresh agricultural products in the market is increasing year by year, and the service level related to fresh agricultural products has been generally concerned by the social groups. Reasonably solve the problem of warehouse location of fresh agricultural products, and to a certain extent, can effectively improve its logistics. The overall operational efficiency of the link reduces the waste of social resources and reduces the total logistics cost that the society needs to invest.

The purpose of researching the site selection of the warehouse location center is to realize the enterprise logistics under the (regional development) adaptability, (overall) coordination, (cost input and income) economy, (long-term development) strategic principle. Under the condition of the least comprehensive cost input, the realization of the best service level and the greatest comprehensive development potential. The distribution cost of fresh agricultural products is affected by factors such as delivery time, transportation and distribution tools (transport mode), distribution types and quantities, product-specific perish ability, packaging density, distribution distance and traffic conditions.

2. Genetic Algorithm for Warehouse Location Research Optimization Problem

In the process of researching and calculating the warehouse location of fresh agricultural products in selected cases, a new algorithm combining k-means clustering analysis and genetic algorithm (mainly in the form of MATLAB) is needed to derive the dual-product single-objective

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model selected and constructed.

K-means clustering analysis: randomly select several objects as the initial clustering center, calculate the distance of each object to each seed clustering center, and then assign the seed clustering center to the nearest initial clustering center object according to the distance.

Genetic algorithm: An intelligent random global search and optimization method based on natural selection theory and population genetics theory; it mainly involves writing the chromosome coding of cluster clusters in data form, and testing and optimizing the results obtained by the algorithm model.

K-means clustering genetic algorithm: genetic algorithm based on natural evolution mechanism combined with K-means clustering, can solve and solve the problem of warehouse location by searching the objective function or its vicinity; wherein k-means clustering analysis randomly selects several objects As the initial clustering center, the distance from each object to each seed cluster center is calculated, and then the seed cluster center is assigned to the nearest initial cluster center object according to the distance.

3. K-means clustering genetic algorithm coding principle and use steps

As a new genetic algorithm combining k-means clustering analysis and genetic algorithm, its coding principle and usage steps are relatively easy to understand.

3.1 Coding principle combining k-means clustering with genetic algorithm

The seed clustering clusters in the corresponding cluster clusters are assigned to the cluster center to which they belong, and the sequence numbers of the cluster centers corresponding to each seed cluster center are arranged in order to form a set of digital data, which may be called a chromosome code or a chromosome data sequence. .

For example, two cluster centers are recorded as 1, 2, and six seed cluster centers are respectively recorded as 1, 2, 3, 4, 5, and 6. Among them, the odd-numbered seed clustering center is in the clustering cluster of 1 and the even-numbered seed clustering center is in the clustering cluster of 2, then the chromosome encoding can be recorded as:

1 2 1 2 1 2

3.2 New genetic algorithm using k clustering combined with genetic algorithm

The customer is recorded as C class by geographical location, L_r represents the r customer category, and is recorded as 1<=r<=c (k cluster); evaluation of alternative warehouse location center i (i belongs to I, to L_r, L_r is the customer category, 1<=r<=c), for any customer L_r, select the better Ir warehouse location center to form the customer category L_r's preferred warehouse location center set Br selects one warehouse location center from each of Br (1<=r<=c). If c warehouse location centers are independent, Then it can be an alternative location scheme and get all the location schemes according to the same principle; for an alternative location scheme $\{(b1,b2,...,b_r)\}$, $\forall r$,$b_r \in b_r\}$, using an improved genetic algorithm to determine the optimal assignment scheme under the current scheme.

4 Empirical Analysis--Taking Dingdong Grocery Shopping E-commerce Platform as an Example

4.1 Introduction of Grocery shopping e-commerce platform

Dingdong grocery shopping platform is a self-operated fresh platform, with its own fresh agricultural product inventory warehouse, operating products for vegetables, fruits, seafood, rice, grain and oil, etc., presented in the form of a life service app platform and provided to its customer groups. The corresponding distribution service mainly implements online and offline integrated marketing operations. The platform revolves around the 25-45-year-old young group's three-day life scene with fresh food as the entry point. The main line explores the community o2o format. Currently, there are more than 200 pre-stored fresh product inventory warehouses in Shanghai,

covering the business scope.

4.2 Dingdong grocery shopping platform warehouse location optimization

In the research and calculation process of the selection case Dingdong grocery platform warehouse location, a new algorithm combining k-means clustering analysis and genetic algorithm (mainly in the form of MATLAB) is needed to derive the dual-product single-objective model selected and constructed. And inspection.

Step 1: Learn that the actual warehouse location center of the grocery shopping platform is its own self-operated inventory center (warehouse) or partner cold storage. The customer (consumer) order is generally selected in the case of two or more warehouse location centers, and the warehouse location center (ie, the inventory center or partner) that can meet the delivery within one hour of the customer address is preferred. The cold storage) is distributed, that is, the location problem can be calculated by converting to the warehouse location-distribution model, and the shorter the distance and time, the better.

Step 2: Under the business background model of the proposed grocery shopping platform, it is planned to select 12 customers and 3 warehouse location center data around the operation of its fresh agricultural product platform (three warehouse location center data are The most preferred site plan selected by the platform; the distribution of the two products is mainly, but the two fresh agricultural products must be bundled with a warehouse location center to form a warehouse selection in the selected area. Address model.

Through research and calculation, it is concluded that the decision-making center of the system decision-makers pre-established three possible best fresh agricultural products is reasonable in reality, and the customer allocation plan of the optimal warehouse location that can meet the customer's maximum goal of time satisfaction is satisfied. If the location selection scheme is unreasonable, the coordinates of the preferred location of the warehouse location center and the distance after the location optimization are required to prove the reason better than the original scheme.(The method used in the original warehouse location is the general algorithm with the shortest distance between two points, and can also be regarded as the initial data of the center of gravity method.)

The company's headquarters of the grocery shopping platform is (0,0), and the selected warehouse location center and customer coordinates are established. The detailed customer coordinates are shown in Table 1, and the warehouse location center coordinates are shown in Table 2.

Table 1 Customer Coordinate Table

NO.	1	2	3	4	5	6	7	8	9	10	11	12
Abscissa	5.0	6.0	7.0	2.2	3.0	4.0	5.0	6.0	7.0	3.0	1.4	5.6
Y-axis	6.0	6.3	4.7	6.2	6.0	4.8	5.0	6.2	4.0	4.1	5.6	4.8

Table 2 Warehouse Location Center Coordinate Table

NO.	1	2	3
Abscissa	2.2	2.8	3.9
Y-axis	5.2	6.8	5.8

Operation analysis process: Since the location selection method of the warehouse location center of the grocery shopping platform is the initial data of the center of gravity method, that is, the calculation method with the shortest distance between two points, it can be called a general algorithm.

Finally, the shortest distance summary from each customer to the warehouse location center is summarized and the warehouse location center and its corresponding customer division result are obtained. In summary, in the three warehouse location centers, three warehouse location centers, l1, l2, and l3, can be selected. The optimal solution of the cluster center is:

Warehouse Location Center 1 (l1): Customer 10, Customer 11 (hereinafter referred to as serial

number)

Warehouse Location Center 2 (l2): 2, 4, 5

Warehouse Location Center 3 (l3): 1, 3, 6, 7, 8, 9, 12

That is, under the general method:

Total distance

=1.118+0.7+3.289+0.849+0.825+1.005+1.36+2.138+3.585+1.031+0.894

+1.792=18.045

Process 2: Use the dual-product single-objective model (the shortest time, that is, the shortest distance is the constraint condition, that is, select the dual-product single-target-time function model in the dual-objective model, and the two products are bound out of the library), and use the k-means and the genetic algorithm. The combination method uses MATLAB software to cluster and verify the optimal warehouse location center location scheme selected by the grocery shopping platform. It is necessary to verify whether the optimal three warehouse location optimization schemes of the grocery shopping platform have practical rationality.

According to the cluster analysis chart, the three warehouse location schemes considered to be the best in the grocery shopping platform are actually not the most reasonable three solutions in reality. Among them, the coordinates of the cluster center are (2.72, 5.34), (7.0, 4.35), (5.52, 5.66).

The adjusted cluster center (inventory center location scheme) coordinates are displayed as:

Cluster Center 1: (2.72, 5.34)

Cluster Center 2: (5.52, 5.66)

Cluster Center 3: (7.0, 4.35)

Table 3 Cluster Center Table

Cluster center		
	x	y
1	2.72	5.34
2	5.52	5.66
3	7.00	4.35

Its counterparts as cluster centers (cluster clusters) are:

Cluster Center 1:4, 5, 6, 10, 11

Cluster Center 2: 1, 2, 7, 8, 12

Cluster Center 3:3, 9

The distances required to calculate the adjusted three inventory center location schemes are presented in the following table:

Table 4 Cluster Center to Customer Distance Table

Cluster center to customer distance table												
NO.	1	2	3	4	5	6	7	8	9	10	11	12
1	\	\	\	1.005	0.717	1.389	\	\	\	1.271	1.345	\
2	0.621	0.800	\	\	\	\	0.840	0.722	\	\	\	0.864
3	\	\	0.350	\	\	\	\	\	0.350	\	\	\

Using the MATLAB (k-means) algorithm, according to the dual-target single product model, the total distance required for the cluster analysis adjusted scheme is:

Use the formula to make the final judgment:

$$y^*_j = \frac{1}{N_j}\sum_{z\in L} Z_i$$

Get the judgment:

$$y_j^* \neq y_j$$

The warehouse location plan after cluster analysis is output.

Original total distance
=1.118+0.7+3.289+0.849+0.825+1.005+1.36+2.138+3.585+1.031+0.894+1.792
=18.045
Adjusted total distance
=0.621+0.8+0.35+1.005+0.717+1.389+0.84+0.722+0.35+1.271+1.345+0.864
=10.274

$$y_j^* = \frac{1}{N_j} \sum_{Z \in L_j} Z_i$$

Adjusted total distance 10.274 <original total distance From 18.045

That is, the cluster-adjusted inventory selection center scheme is more suitable than the original site selection.(Because the value of the MATLAB software of the circular fraction and the value of the three digits after the decimal point are rounded off, the hand value and the computer value produce a slight deviation.)

The total distance of the MATLAB software operation under each iteration scheme is:

Replicate 1, 1 iterations, total sum of distances = 11.0374.
Replicate 2, 2 iterations, total sum of distances = 10.2542.
Replicate 3, 1 iterations, total sum of distances = 12.5408.
Replicate 4, 1 iterations, total sum of distances = 15.08.
Replicate 5, 1 iterations, total sum of distances = 11.839.
Replicate 6, 2 iterations, total sum of distances = 11.0374.
Replicate 7, 1 iterations, total sum of distances = 11.2308.
Replicate 8, 1 iterations, total sum of distances = 11.0374.
Replicate 9, 1 iterations, total sum of distances = 10.2542.
Replicate 10, 1 iterations, total sum of distances = 10.125.

That is, Best total sum of distances = 10.125, and the shortest distance of the optimal solution is 10.125.

Summary: In the absence of other variables, the shortest distance and the shortest time are the shortest. The optimized and adjusted warehouse location center location scheme is relatively reasonable. The corresponding total distance and warehouse location scheme, customer classification and chromosome coding are as follows.

The new warehouse location coordinates are:

Site selection center 1 (2.72, 5.34), site selection center 2 (7.0, 4.35), site selection center 3 (5.52, 5.66)

Total distance = 10.274 (Equation 4-11)
New warehouse location center 1:4, 5, 6, 10, 11
New warehouse location center 2: 1, 2, 7, 8, 12
New warehouse location center 3:3, 9
The chromosomal sequence data after MATLAB cluster analysis is: 2 2 3 1 1 1 2 2 3 1 1 2

5. Conclusion

The location of the fresh produce warehouse of the e-commerce platform is a very complicated issue. Especially in cities with high economic land with high economic development, the fresh e-commerce platform wants to have stable operation and development for a long time, and it needs certain business advantages and reasonable warehouse location. In the site selection study of the warehouse, it is necessary to consider many factors, such as time factor, cost factor, customer satisfaction and so on.

Through the warehouse selection center and customer location of the grocery shopping platform, the warehouse location research optimization analysis is carried out, and the shortest distance (distance and time mutual conversion) research calculation analysis is carried out based on the pre-established optimal warehouse location plan. The total distance obtained by the general algorithm of the selection of the site selection center selected by the initial selection center is compared with the selection center selected by the MATLAB using the k-means clustering genetic

algorithm for optimization and optimization. The total distance comparison shows that the adjusted site selection scheme is relatively more reasonable. According to the case study calculation results and the analysis of the actual operation and disadvantages (unreasonable points) of the grocery shopping platform, the conclusion is drawn: the grocery shopping platform is under the O2O mode with its unique online (platform) line. (Entity convenience stores, etc.) support each other, opening up a unique and obviously advantageous business mode in the context of the chaos of the fresh agricultural products logistics market and the backwardness of transportation facilities and equipment. Although there are still unreasonable things at present, as long as they are solved according to their unreasonable points in practice, and on this basis, the site selection scheme of the warehouse location center is continuously adjusted and optimized, and the use can be continued. Currently has an advantageous business approach.

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