the disadvantages of long distribution distance, many vehicles, high distribution cost, etc., which is not conducive to e-commerce logistics distribution. At the same time, traditional algorithms cannot effectively calculate the delivery time of the delivery vehicle, the customer's delivery time, and the delivery distance. Therefore, it will cause uncertain factors in the delivery route and cannot effectively optimize the e-commerce logistics delivery route. Therefore, this paper proposes an improved genetic algorithm to determine the position I of each vehicle in the e-commerce logistics distribution process. With the rapid development of e-commerce industry, the time required for logistics distribution is gradually shortened, the distribution volume is gradually increased, and the types of distribution goods are more and more [16]. Therefore, the commodity demand information of distribution vehicle station i is improved genetic algorithm. When each service vehicle in the actual distribution process cannot guarantee that it can carry out excess distribution after completing the task, therefore, for each vehicle, there are k service stations, and the excess stations after completing the K stations are unknown. Therefore, when the service vehicle completes the K stations, its total carrying capacity of goods will not exceed Q. Therefore, when planning the distribution route, we must ensure that the total carrying capacity of the service vehicles does not exceed Q after completing K stations [17]. The constraint condition of pos {A} is as follows: the improved genetic algorithm of commodity demand is set to K station D'_k, the remaining commodity load of vehicles after completing K station is set to R, and the excess work of service vehicles after completing K station is set to pos {A}:

$$K+Q/\text{pos }\{\text{A}\}*\{R..D_k^{'}\}=\alpha \tag{4}$$

Using an improved genetic algorithm to determine the transportation time of each vehicle can effectively improve the calculation accuracy and reduce the calculation error, so it is suitable for e-commerce distribution path planning. In the actual process of logistics and distribution, since the transportation time of each vehicle is different, its driving speed is also different [18]. The transportation time of vehicles will be affected by traffic jam, detour and other factors, so the transportation time of vehicles cannot be determined, that is, the transportation time of goods is an improved genetic algorithm. When determining the transportation time, it can only be determined by fuzzy language. For example, "the driving time from car B to car C is about half an hour", which is expressed by t_{ij} in the mathematical model. It is an improved genetic algorithm to determine the transportation time of each car. Delivery booking time refers to the time when the station receives the goods and the time when the customer picks up the goods in the process of delivery [19]. In the actual distribution process, the goods receiving time of each station is different, so the traditional station goods receiving time cannot be expressed by time window [20]. Therefore, the reservation time of receiving goods is set to the improved genetic algorithm. In order to accurately reflect the time of receiving goods, the fuzzy reservation information window is used. The time of receiving goods is set to t and the reservation time is set to t_i. The satisfaction degree of customers to the delivery of goods is expressed by the reservation time function of the improved genetic algorithm, that is, μ_i (t_i). In this function, t_{mini} is the earliest assignment time of vehicle in station i, t_{maxi} is the latest assignment time of vehicle in station I, t_{ni} is the most satisfactory assignment time of vehicle in station I, and the highest satisfaction is 1. At t_{ni}, the service vehicles arrive at the station and deliver goods. Before t_{mini} and after t_{maxi}, the customer satisfaction reaches the highest value of 1, while before t_{mini}, the customer satisfaction is 0. After the optimization design of the distribution path, the establishment environment of the fuzzy logistics distribution path is determined, the key points of the distribution path planning and the improved genetic algorithm are defined, and the design of the distribution path planning model is completed [21]. For the cargo demand of each vehicle station i, if the improved Ga parameter is set to D_i, the calculation formula of Di is as follows:

$$D_i = Ga\text{-}\mu_\text{i}\left(\text{t}_\text{i}\right)/\alpha(t_{\max i}-t_{\text{mini}}), i\in\mathbf{N} \tag{5}$$

N in this equation represents a set of total stations. The general improved genetic algorithm parameter of freight transportation time from station i to station j is set as $t_{ij.}$

$$t_{ij}=\left(t_{1ij},t_{2ij},t_{3ij}\right)\quad i\in\mathbf{N}, j\in\mathbf{N} \tag{6}$$

In the equation, t_{1ij} represents the upper bound of the improved genetic algorithm for commodity transportation time from station i to station j, t_{2ij} represents the lower bound of the improved genetic algorithm for commodity transportation time from station i to station j, t_{3ij} represents the lower bound of the improved genetic algorithm for commodity transportation time from station I to station j, and t_{nij} represents that the commodity transportation time from station i to station j is 1. Finally, the total number of times of the improved genetic algorithm is t_{ri} and the calculation formula of t_{ri} is as follows:

$$t_{ri}=\left(t_{1ri},t_{2ri},t_{3ri}\right)\quad i\in\mathbf{N} \tag{7}$$

In the equation, t_{1ri} represents the upper bound of the number of improved genetic algorithms in the delivery reservation time window of station i, t_{2ri} represents the lower bound of the number of improved genetic algorithms in the delivery reservation time window of station i, and t_{3ri} represents the membership point when the number of improved genetic algorithms in the delivery reservation time window of station i is 1. The improved genetic algorithm adds the concept of learning, and uses learning factors to perform genetic calculations on the time window. Several better solutions can be searched for in the whole world to select a suitable optimal value. Suppose that an e-commerce logistics distribution company has a distribution center, and all the distribution vehicles are sent from the distribution center [22]. There are n customers in the company who need to deliver goods, that is, there are n stations. The distribution vehicles are sent from the distribution center first, and then drive to each station in turn to deliver goods. When the number of distribution stations specified by the company is completed, they return to the distribution center. The maximum commodity carrying capacity of each delivery vehicle is Q, and the number of general improved genetic algorithm for commodity demand at station i is D_i (i = 1,2,3, … n). The number of general improved genetic algorithm for the distance of goods transportation from station i to station j is m_{ij} (j=1,2,3, … n, i=1,2,3, … n). Now a mathematical model will be established to calculate the most efficient and least cost service vehicle logistics distribution path. From the equation, we can know that the improved genetic algorithm parameter of commodity demand of station i is s, and its membership value function calculation equation is as follows:

$$\begin{cases} \mu D_i(x)=0, \quad xd_{1i} \text{ or } xd_{3i} \\ \left(x-d_{1i}\right)/\left(d_{2i}-d_{1i}\right), d_{1i}xd_{2i} \\ \left(d_{3i}-x\right)/\left(d_{3i}-d_{2i}\right), d_{2i}xd_{3i} \end{cases} \tag{8}$$

When a vehicle has been transported to the k-th station, the total amount of goods carried by the vehicle is:

$$D^{'}k=\sum_{i=1}^{k} D_i \tag{9}$$

The remaining carrying capacity of the vehicle is calculated as follows:

$$Dk=\sum_{i=1}^{k} D_i Q_i D_i \tag{10}$$

Based on the above algorithm, after establishing the improved genetic algorithm logistics distribution path planning model according to the calculation results, the hybrid search algorithm is used to calculate the model to ensure that the calculated distribution path is the best path.

C. Realization of e-commerce logistics distribution path planning

The emergence of e-commerce logistics is based on the current economic development, and this trend has been gradually strengthened. Logistics is a kind of logistics form, and its root is the logistics activities between the first party supply and the second party demand. It should be pointed out that it does not participate in the production and inventory possession of the first party products, nor does it sell or consume the second party products. It is a kind of independent of both parties, with standardization, and constraints in the form of contract to provide services for customers for professional logistics agent service enterprises. With the acceleration of globalization, the first party and the second party have been unable to meet the needs of the society. At the same time, in order to participate in market competition, enterprises often outsource the logistics business that does not belong to their own core in order to enhance their core competitiveness, strengthen their own management and reduce their own cost consumption. Therefore, logistics also arises at the historic moment. As shown in Figure 2.

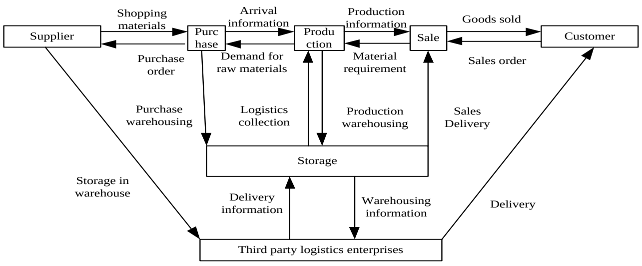

Fig. 2. E-commerce logistics distribution space grid structure

One of the functions of distribution is to create so-called value in space, which is basically consistent with transportation. However, there are also differences between the two. Distribution is the further extension of transportation, and the value it creates in the extension can be summarized as the following aspects. The applicability and flexibility of distribution itself is reflected in the cooperation with other logistics links. The formation of this coordination mechanism is helpful to meet the needs of small batch, high frequency and strong service transportation in cities, which is a kind of customized service. When there is no distribution center in the city, the supplier can choose to deliver the goods directly to the customer. It adopts a direct distribution mode, which is called cross transportation, as shown in Figure 3.

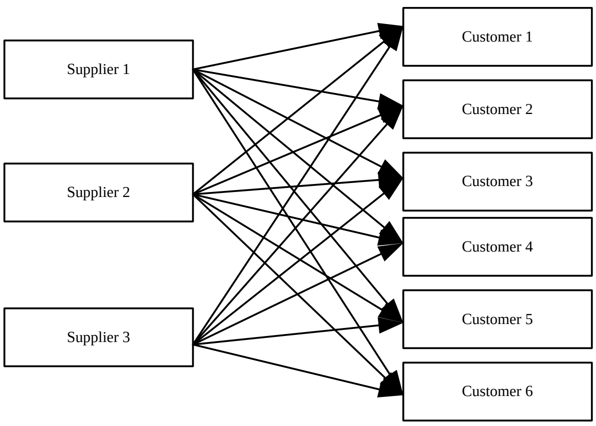

Fig. 3. Optimization of transportation mode

The main disadvantage of this distribution method is that enterprises participate in the distribution, the distribution line is too long, which will cause low efficiency and increase the loss of transportation costs. The first mock exam is to set up a distribution center and distribute the distribution center to the same mode.

The relief of logistics distribution pressure based on the above method has a good effect on eliminating cross transportation, planning urban distribution network, ensuring supply, shortening transportation distance and reducing cost. It improves the economic benefit of city terminal logistics. When participating in the distribution, the logistics system itself can carry out joint distribution with other enterprises or departments, so as to reduce the shortage of the distribution link, and also help to improve the economic benefits of the distribution end. Distribution in the concentration of their own inventory at the same time, can ensure that the appropriate level of service, so that the total inventory level to reduce, but also reduce the cost of storage. On the other hand, in the process of just in time distribution, enterprises can rely on the just in time distribution of the distribution center to ensure their own inventory level. At the same time, they can keep a single amount of storage, so that enterprises can achieve zero inventory or low inventory, so as to reduce the possession of funds and improve their own capital operation. To win good logistics service and realize customer satisfaction is the direction of enterprises. After reaching a consensus with customers, the distribution enterprises provide professional services and multi-functional logistics services for the appointment of customers, so as to reduce the workload of customers and save unnecessary expenses. Therefore, the improved genetic algorithm has high-precision data calculation capabilities and can effectively optimize transportation methods. The grid structure of e-commerce logistics distribution space can improve transportation efficiency and customer service level, which can be suitable for e-commerce distribution route planning.

III. Analysis of Experimental Results

Select an e-commerce product sales head office, which needs to deliver goods to 7 branches every day. The total carrying capacity of each product is Q=8 t. there is a distribution center w in the store, and all distribution vehicles are delivered by W is sent to each branch. The demand and scheduled delivery time of electronic goods are counted by 7 branches. The distance between 7 stations, the travel time of distribution vehicles between branches, and the cost of transportation are calculated. The letters A, B, C, D, E, F and G denote 7 workshops, in which w is the distribution center of the workshop and W is the location distribution among the 7 workshops.

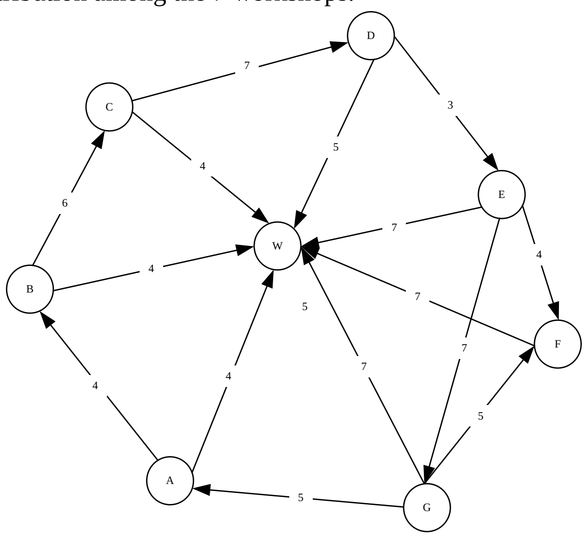

Fig. 4. E-commerce logistics distribution path selection mode

In the Figure 4, the numbers on the line indicate the actual distance between the store distribution center W and each distribution station, and the distance between each station. The setting of the path distance can effectively meet the customer's time demand for the goods. Within the range of 2 T and 8 T, each piece of goods is on the best delivery route. According to the logistics distribution path selection mode, the path with the shortest total distance, less time-consuming and lower cost can be selected, which effectively improves the effect of e-commerce logistics distribution. According to the data in the figure, the shortest distribution distance between the store distribution center W and the seven stations is calculated. The detailed data is shown in the Tables 1-3.

Table 1. Data of e-commerce demand and scheduled delivery time

Station	Demand for electronic goods $D_i(t)$	Booking delivery time t_{ri}(min)
A	(0.5,0.6,1.5)	(20,30,35)
B	(0.8,0.9,1.8)	(20,30,40)
C	(0,0.2,1)	(30,35,40)
D	(0.1,0.4,1.1)	(35,40,45)
E	(0.5,0.6,1.5)	(40,45,50)
F	(1,1.4,2)	(40,45,50)
G	(1,1.2,2)	(50,55,60)

According to Table 1, it can be seen that the demand for e-commerce products at the seven sites is consistent with the appointment delivery time. The F site has a higher demand and a shorter appointment delivery time, so it can be used in the subsequent logistics and transportation process. Continue to optimize the transportation path of F site in order to improve the overall customer satisfaction.

Table 2. Distance between delivery routes and travel time of delivery vehicles between stations

Station	Distance between stations l_i (km)	Vehicle travel time t_{ij} (min)
A	4	22.07
B	6	32.33
C	7	30.11
D	3	18.29
E	4	19.13
F	5	18.88
G	5	18.88

According to Table 2, the mileage of each station is different, and the delivery time is also different. Shorter distance between stations will also result in longer vehicle travel time. This is due to the difference in the customer's scheduled delivery time, resulting in a difference in the delivery time of the delivery vehicle. Therefore, the follow-up e-commerce logistics distribution path can consider customer factors and improve the path planning.

Table 3. The shortest distribution distance table between the distribution center and the route

	W							
A	4	A						
B	4	4	B					
C	5	9	6	C				
D	7	14	11	6	D			
E	6	11	14	8	3	E		
F	7	9	12	11	6	4	F	
G	7	5	8	14	9	7	5	G

According to Table 3, the optimized delivery distances of the seven sites are of reference. The person in charge of each store can arrange delivery vehicles for comprehensive delivery according to the optimized delivery route, which improves delivery efficiency and reduces delivery costs. The path planning results between the path planning methods in literature [3] and literature [4] and the method in this paper are compared, as shown in Table 4.

Table 4. Path planning results

	Literat	Literatur	The

		ure [3] method	e [4] method	algorithm in this paper
Distribuion mileage (km)		66	54	39
Vehicle arrangement	2 T vehicle	1	2	1
	4 T vehicle	2	1	1

According to Table 4, the optimal distribution path designed by the algorithm of this paper is 39 kilometers, while the paths of literature [3] and literature [4] are 66 kilometers and 54 kilometers. This is because this article considers the ambiguity of the calculation parameters, so it has a strong ability to plan routes. At the same time, the number of vehicles that need to be allocated during transportation is also one, which can effectively save costs. Therefore, the method in this paper is more suitable for e-commerce distribution route planning, which can effectively control the time and actual distance in the distribution process, so as to improve the distribution effect and shorten the distribution time.

IV. Conclusion

Logistics distribution has a far-reaching impact on the healthy and sustainable development of e-commerce industry. Whether the distribution route is reasonable or not has a direct impact on the speed of distribution, the cost of distribution, the quality of distribution and the operational efficiency of enterprises. In terms of logistics distribution path optimization, new technologies such as cloud computing and big data can provide powerful computing services and decision support for reasonable distribution path of enterprises. Whether it is the shortest route or the shortest time distribution route planning, the optimal solution can be obtained through high-performance computing support, and the logistics transportation distribution path planning model can be constructed through the improved genetic algorithm parameters to better realize the e-commerce logistics distribution path planning. Through the method of this article, enterprises can obtain the optimal distribution plan of logistics transportation in the shortest time to ensure that consumers get convenient and efficient logistics services. At the same time, e-commerce enterprises can use advanced Internet of Things technology to obtain efficient operations. The optimization of logistics distribution path is an inevitable requirement of low-carbon economy and green development. Therefore, the method in this paper can play a huge supporting role in the development of e-commerce industry under new business conditions, and can effectively serve and support the efficient and high-efficiency operation of the national economic system. However, due to limited time and research conditions, the scope of the experiment is not broad enough, and the results still have limitations. For example, this study only selected one store distribution center as the experimental object, and the data lacks universality. Therefore, the subsequent experiment selection can be more In-depth, multi-dimensional object selection, in order to consolidate the experimental research results, and strengthen the effect of e-commerce logistics distribution.

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