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Research Article

Incremental Mining Method of Warehouse Operation Process in Production Enterprises Based on Swarm Intelligence

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In order to improve the scheduling ability of production enterprise warehouse operation, an incremental mining algorithm of production enterprise warehouse operation process based on swarm intelligence algorithm is proposed. The particle swarm optimization method is used to sample the environmental information of the warehouse operation area of the production enterprise, and the collected data of the warehouse operation area of the production enterprise are dynamically weighted, and the shortest path optimization control is carried out. Particle swarm optimization (PSO) is used to detect the shortest path for incremental mining and block search of warehouse operation process in production enterprises, and the pheromone feature quantity of incremental mining of warehouse operation process in production enterprises is extracted. Through the adaptive optimization process of incremental mining of warehouse operation process of production enterprises, incremental mining and shortest optimization control of warehouse operation process of production enterprises are realized. The simulation results show that the optimization ability of incremental mining of warehouse operation process of production enterprises using this method is better, which improves the response ability of warehouse operation of production enterprises and reduces the time cost of delivery.

1. Introduction

In recent years, with the rising of land cost, material cost, and labor cost in China, industrial automation and intelligence have become the development trend of enterprises. At the present stage, full market competition and rising costs make the profit margin of the food industry smaller and smaller, which forces enterprises to continuously reduce operating costs, seek profits from operations, and seek development in the direction of automation and intelligence. As the “third profit source” of warehousing enterprises, properly handling the efficiency of warehousing links will provide new profit growth points for enterprises and become the key power to promote the development of enterprises. It is necessary to study the incremental mining model of the warehouse operation process of production enterprises and combine the optimal design of the warehouse operation process of production enterprises to realize the warehouse operation process planning of production enterprises. However, in the long run, through incremental mining and planning design of warehouse operation process of production enterprises, the labor cost, storage cost, and management cost can be reduced, and the space utilization rate of warehouses can be improved. Effectively improving the efficiency of warehouse operation is conducive to building an advanced logistics system that meets the needs of enterprises and improving the production management level of enterprises, thus effectively helping enterprises to reduce the cost of warehouse management and logistics operation and further improve their operating efficiency [1]. In recent years, the state has issued a series of policies and plans to encourage enterprises to explore an automated warehousing system that is in line with their own development reality [2]. Relevant departments have also actively issued policies to encourage enterprises to promote the development of warehousing and logistics business, which provides a strong policy guarantee for enterprises [3]. With the continuous development of automation technology and information technology, the operation efficiency, labor productivity, and production benefit of the automated warehouse have been greatly improved by adopting advanced control means such as computers and high-efficiency output equipment and sorting equipment. An automated warehouse is generally composed of a goods access machine, storage mechanism, conveying equipment, sorting system, and control device. Comprehensive consideration of the industry characteristics, demand and investment cost of the business, automatic sorting system, and conveyor system are the most widely used automatic equipment for warehousing operation [4]. The flexibility, expansibility, and efficiency of warehouse management directly affect the overall competitiveness of the whole logistics and supply chain and then affect the timeliness and correctness of market distribution, replenishment, and old goods cleaning of production enterprises. Therefore, in the fierce market competition, the market share and sales performance of sportswear companies, the overall profitability of the company, and the ability of modern warehousing operation management play a decisive role. How to build a modern new warehouse operation management system, enhance the core competitiveness of enterprises, and reduce the overall cost of enterprises has become a problem that production enterprises must face and pay attention to in the development of the whole [5].

To solve the above problems, this paper proposes an incremental mining algorithm for the warehouse operation process based on a swarm intelligence algorithm. Swarm intelligence algorithm includes genetic algorithm, particle swarm optimization algorithm, and many other algorithms. Among them, the particle swarm optimization algorithm is simple and easy to implement, without many parameters to be adjusted. Therefore, this paper adopts the particle swarm optimization method to collect and optimize the environmental information sampling in the warehouse operation area of production enterprises. And the shortest path planning method is used to analyze the warehouse operation characteristics of production enterprises, and the global evolution game characteristic quantity of the warehouse operation process of production enterprises is analyzed. Particle swarm optimization (PSO) is used to carry out adaptive optimization in the incremental mining process of the warehouse operation process of production enterprises, and the incremental mining of the warehouse operation process of production enterprises is realized. Finally, the simulation test analysis is carried out, and the validity conclusion is obtained, which shows the superior performance of this method in improving the incremental mining planning ability of warehouse operation process of production enterprises.

2. Particle Swarm Optimization Theory

Particle swarm optimization is a kind of swarm intelligence algorithm, which is designed by simulating the predation behavior of birds. Assuming that there is only one piece of food in the area, the task of the flock is to find this food source, that is, the optimal solution in the general optimization problem. During the whole searching process, birds let other birds know their position by passing their own information to each other. Through such cooperation, they can judge whether they have found the optimal solution or not, and at the same time, they can pass the information of the optimal solution to the whole flock. Finally, the whole flock can gather around the food source; that is, the optimal solution is found, and the problem converges. Particle swarm optimization simulates birds in a flock of birds by designing a massless particle. Particles have only two attributes: speed and position, with speed representing the speed of movement and position representing the direction of movement. Each particle searches for the optimal solution separately in the search space and records it as the current individual extremum, sharing the individual extremum with other particles in the whole particle swarm, and finding the optimal individual extremum as the current global optimal solution of the whole particle swarm. All particles in the particle swarm adjust their speed and position according to the current individual extremum found by themselves and the current global optimal solution shared by the whole particle swarm.

The idea of particle swarm optimization is relatively simple, which mainly includes 1. initializing particle swarm; 2. evaluating particles, that is, calculating the fitness value; 3. finding the individual extreme value; 4. finding the global optimal solution; 5. modifying the speed and position of particles. The specific operation process is shown in Figure 1.

3. 3D Information Sampling and Optimization Control of Incremental Mining of Production Warehouse Operation Process

3.1. Production Enterprise Warehouse Operation Process Incremental Mining of Three-Dimensional Information Sampling. In order to realize the incremental mining of production enterprise warehouse operation process based on swarm intelligence algorithm, the optimization control of incremental mining of production enterprise warehouse operation process is carried out, and the road network model of production enterprise warehouse operation is established [6–8]. A 5-tuple is used to represent the road network of incremental mining of production enterprise warehouse operation process, an edge in the directed graph, as shown in the following formula:

$$\text{Edge} = \{\text{StartID}, \text{EndID}, c_a, x_a, t_a\}, \tag{1}$$

where c_a represents the road characteristics of incremental mining of warehouse operation process in production enterprises, x_a represents the dynamic characteristics of vehicle operation in the process of incremental mining of production enterprise warehouse operation process, *Edge* represents the directed edge of production enterprise warehouse operation in a, StartID represents the ID of dynamic distribution of roads in incremental mining of

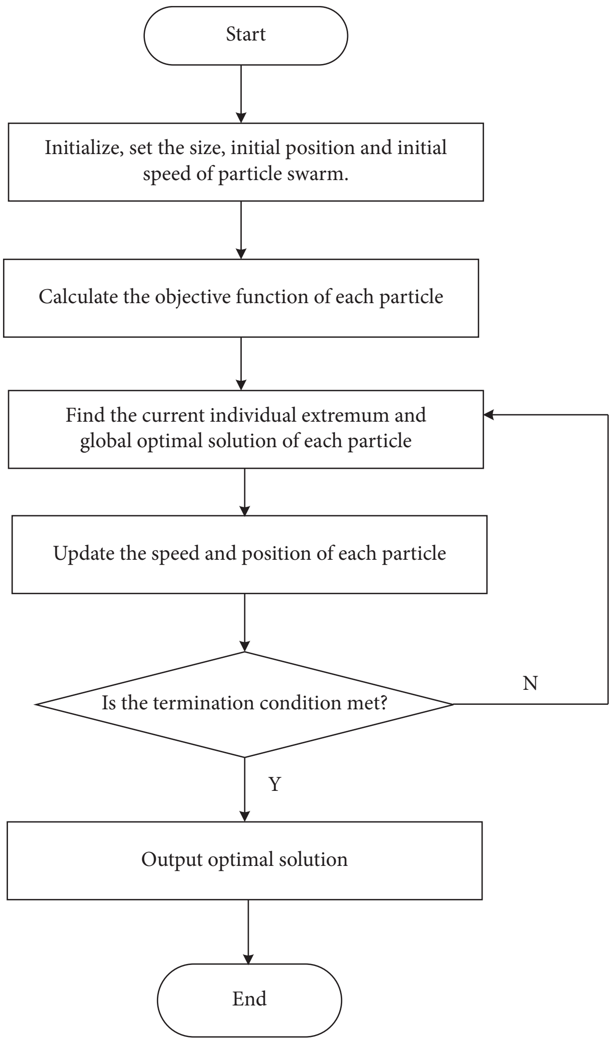

Figure 1: Particle swarm optimization process.

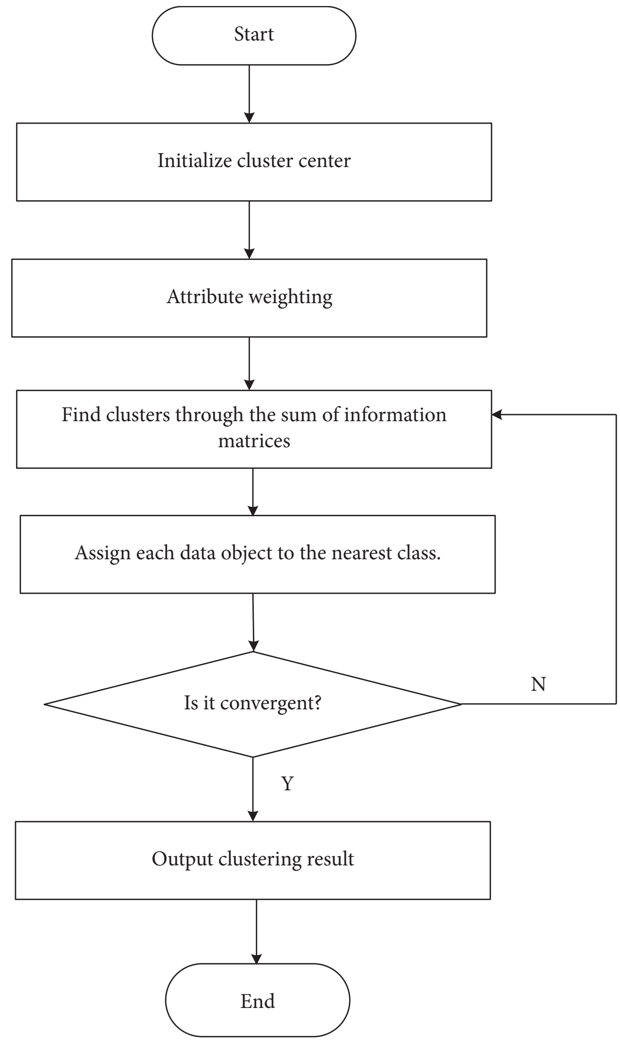

Figure 2: Clustering process of warehouse operation information.

production enterprise warehouse operation process, and EndID represents the ID of the directed end node. According to the road network model of incremental mining of production enterprise's warehouse operation process, the road environment information is sampled, and the information clustering of production enterprise's warehouse operation is completed according to the communication range and the relative distance relationship of the sensor nodes. The specific operation process is shown in Figure 2.

The shortest path of the production enterprise's warehouse operation is concentrated, and the number of nodes of the production enterprise's warehouse operation is represented [9]. The set of edges is shown in the following formula:

$$E = \{e_1, e_2, e_3 \ldots e_M\}, \tag{2}$$

where $e_1, e_2, e_3 \ldots e_M$ represents the node mode of production enterprise warehouse operation. According to the node distribution, different production enterprise warehouse operation scheduling channels are constructed, and the incremental mining model of the production enterprise warehouse operation process is established [10–12]. The spatial planning function of production enterprise warehouse operation is shown in the following formula:

$$t_a = t_a^0 \left[1 + J\left(\frac{x_a}{(c_a - x_a)} \right) \right], \tag{3}$$

where J is the load of the warehouse operation channel of production enterprises, t_a^0 is the modified adaptive coefficient, and c_a is the congestion coefficient of the warehouse operation of production enterprises. The least-square programming method is adopted to optimize the warehouse operation and path of production enterprises, so as to improve the incremental mining ability of the warehouse operation process of production enterprises [13].

3.2. Optimization Algorithm for Warehouse Operation of Production Enterprises. Establish a grid block planning and detection model of path space area in the warehouse operation area of production enterprises, adopt particle swarm optimization (PSO) shortest path optimization detection method to carry out incremental mining and block search of the warehouse operation process of production enterprises, and carry out information fusion of incremental mining of warehouse operation process of production enterprises [14–16]. The load of incremental mining of warehouse operation process of production enterprises is shown in the following formula:

$$[\nabla F(x)]_j = \frac{\partial F(x)}{\partial x_j} = 2\sum_{i=1}^{N} v_i(x)\frac{\partial v_i(x)}{\partial x_j}. \tag{4}$$

In the above formula, $F(x)$ represents the ambiguity function of incremental mining of the production enterprise warehouse operation process, and $v_i(x)$ is the spatial distribution function of the shortest path of the production enterprise warehouse operation process [17, 18]. Using similarity information optimization method, incremental mining of production enterprise warehouse operation process is carried out to improve the incremental mining ability of production enterprise warehouse operation process, and the physical information fusion parameters of incremental mining of production enterprise warehouse operation process are obtained as shown in the following formula:

$$\begin{aligned}\left[\nabla^2 F(x)\right]_{kj} &= 2\sum_{i=1}^{N}\left[\frac{\partial v_i(x)}{\partial x_k}\cdot\frac{\partial v_i(x)}{\partial x_j} + v_i(x)\frac{\partial^2 v_i(x)}{\partial x_k \partial x_j}\right] \\ &= 2J^T(x)J(x) + 2S(x),\end{aligned} \tag{5}$$

where $J(x)$ is the parameter distribution set of production enterprise warehouse operation process, $S(x)$ is the tracking error of production enterprise warehouse operation process data group, and x_k and x_j are the characteristic quantities of production enterprise warehouse operation model. Using the fuzzy information clustering method, the incremental mining of the production enterprise warehouse operation process is carried out [19, 20], and the path control model is obtained as shown in the following formula:

$$l(v_v) = l(av) + l(cv) + l(bv), \tag{6}$$

where A, B, and C are sorting speed and efficiency parameters, respectively. By counting the production efficiency parameters of the i-th scheme, a comprehensive evaluation is made on the layout scheme of the warehouse operation network of production enterprises, and the scheduling evaluation function in the investment cost distribution nodes v_a, v_b, and v_c is expressed as shown in the following formulas:

$$l(v_a) = l(ba) + l(ca), \tag{7}$$

$$l(v_b) = l(ab) + l(cb), \tag{8}$$

$$l(v_c) = l(ac) + l(bc), \tag{9}$$

where $l(ac)$, $l(bc)$, $l(ab)$, $l(cb)$ are the inertia parameters of the warehouse operation of production enterprises in the. Under the influence of many uncertain factors, the particle swarm optimization detection method of shortest path is used for incremental mining of warehouse operation process of production enterprises to improve the block search ability.

4. Incremental Mining of Warehouse Operation Process of Production Enterprises

Based on the three-dimensional information sampling and optimization control of incremental mining of the warehouse operation process of the above-mentioned production enterprises, the particle swarm optimization method is used to schedule the warehouse operation process of production enterprises, incrementally mine information, and extract pheromone features. By giving the spatial planning matrix of the shortest path of warehouse operation in the production enterprise, the error measurement of path planning is obtained. Fuzzy control error realizes incremental mining of warehouse operation process in production enterprises.

4.1. Particle Swarm Optimization Algorithm for Incremental Mining of Production Warehouse Operation Process. Particle swarm optimization (PSO) shortest path optimization detection method is adopted to conduct parallel scheduling in the incremental mining process of production enterprise's warehouse operation process, and pheromone feature quantity of incremental mining of production enterprise's warehouse operation process is extracted.

The particle swarm state parameter of incremental mining of production enterprise's warehouse operation process is $X_i(t) = (x_{i1}(t), x_{i2}(t), \ldots, x_{iD}(t))$. In the path distribution coordinate system, Hama optimization distribution for incremental mining of production enterprise warehouse operation process is as follows: parallel optimization control algorithm, and the shortest distribution distance T_0, U_0, V_0 is obtained.

According to the parallel control model of the shortest path of warehouse operation in production enterprises, the individual pheromone of the ant colony is T_6^1, and the fuzzy fusion parameter is $p^1 = (p_x^1, p_y^1, p_z^1)^T$. The fuzzy parameter is T_1, U_1, V_1, and the shortest path is taken as the optimization objective function, so that the fuzzy information of warehouse operation of production enterprises is T_6^1, and the fuzzy parameters of intelligent planning of the shortest path of warehouse operation of production enterprises are shown in the following formula:

$$\begin{aligned}\Delta x &= \left(p_x^1 - p_x^0\right)/n \quad \Delta T = (T_1 - T_0)/n \\ \Delta y &= \left(p_y^1 - p_y^0\right)/n\,; \ \Delta U = (U_1 - U_0)/n. \\ \Delta z &= \left(p_z^1 - p_z^0\right)/n \quad \Delta V = (V_1 - V_0)/n\end{aligned} \tag{10}$$

Selecting different index weights, the particle swarm optimization parameter $x_i, y_i, z_i,\ T_i, U_i, V_i\ (i = 1, 2, \ldots, 6)$, which is used to optimize the shortest path of warehouse operation in production enterprises, is obtained. According to the fuzzy control method, particle swarm optimization is carried out, and the particle swarm control equation of warehouse operation of production enterprises is shown in the following formula:

$$ {}^{i-1}T_i = \begin{bmatrix} c\theta_i & -s\theta_i & 0 & a_{i-1} \\ s\theta_i c\alpha_{i-1} & c\theta_i c\alpha_{i-1} & -s\alpha_{i-1} & -d_i s\alpha_{i-1} \\ s\theta_i s\alpha_{i-1} & c\theta_i s\alpha_{i-1} & c\alpha_{i-1} & d_i c\alpha_{i-1} \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad (11) $$

where S represents the positioning error of the shortest path optimization of production enterprise warehouse operation, c represents the optimization parameters of incremental mining of production enterprise warehouse operation process, the particle star index coefficient is $P_0, P_1, P_2, \cdots, P_n$, and the spatial change matrix of incremental mining of production enterprise warehouse operation process is ${}_0^6T_0$, ${}_0^6T_1, \cdots, {}_0^6T_n$, and the optimized parallel ant colony optimization function is shown in the following formula:

$$ {}_0^6T = {}_0^1T_1^2T_2^3T_3^4T_4^5T_5^6T, \quad (12) $$

where ${}_0^1T_1^2T_2^3T_3^4T_4^5T_5^6T$, respectively, represents the optimization dynamic parameters of incremental mining of warehouse operation process of production enterprises and finds out the optimization parameters of incremental mining of warehouse operation process of production enterprises. Combined with the fuzzy optimization method, intelligent planning and design of the shortest path of warehouse operation of production enterprises is carried out.

4.2. Production Enterprise Warehouse Operation Process Incremental Mining. The particle swarm optimization (PSO) algorithm is used to mine the warehouse operation process increment of production enterprises. Given the spatial planning matrix of the shortest path of warehouse operation of production enterprises, the error measurement parameters of path planning are as shown in the following formula:

$$ l = \frac{1}{N_0} \int_{T_i}^{T_f} \int_{T_i}^{T_f} \tilde{x}(t)\tilde{h}(t,u)\tilde{x}(u)\mathrm{d}u\mathrm{d}t, \quad (13) $$

where N_0 is the incremental parameter of warehouse operation, $\tilde{x}(t)$ is the optimization correlation state coefficient, $\tilde{h}(t,u)$ is entropy, and $\tilde{x}(u)$ is mutual information. By adopting the adaptive optimization method, the incremental mining of warehouse operation process is carried out, and a fuzzy control model of incremental mining of warehouse operation process composed of decision variables is obtained, which is expressed as shown in the following formula:

$$ \begin{aligned} & \min F(x) = \left(f_1(x), f_2(x), \ldots, f_m(x)\right)^T, \\ \text{s.t.} \quad & g_i \le 0, \quad i = 1,2,\ldots,q, \\ & h_j = 0, \quad j = 1,2,\ldots,p, \end{aligned} \quad (14) $$

where $f_1(x), f_2(x), \ldots, f_m(x)$ represents the target state function of incremental mining of the production enterprise's warehouse operation process, and q and p, respectively, represent the distribution weight of the production enterprise's warehouse operation process. The shortest path optimization of the production enterprise's warehouse operation is carried out by using the least square programming method, and the similarity information of incremental mining of the production enterprise's warehouse operation process is obtained as shown in the following formula:

$$ \eta = \frac{a}{a+b+c} \cdot \frac{E[M_A] + E[M_B]}{E[V_A] + E[V_B]}, \quad (15) $$

where M_A and M_B are the load of extracting and storing all kinds of complex goods, and V_A and V_B are the rate of incremental mining of warehouse operation process of production enterprises. The measurement model of incremental mining of warehouse operation process of production enterprises is constructed, and the measurement equation is as shown in the following formula:

$$ E[M_A] = E[V_A] = \sum_{i=0}^{\infty} i(1-p)^i p = \frac{1-p}{p}, \quad (16) $$

where p is the group optimization coefficient of incremental mining of production enterprise warehouse operation process, and the shortest optimization function of the shortest path of production enterprise warehouse operation is established, which is expressed as shown in the following formula:

$$ \begin{cases} A = \dfrac{\partial^2}{\partial f^2}[D_s(f,\mu)]_{\substack{f_{0k} \\ \mu_{0k}}}, \\ B = \dfrac{\partial^2}{\partial \mu^2}[D_s(f,\mu)]_{\substack{f_{0k} \\ \mu_{0k}}}, \\ C = \dfrac{\partial^2}{\partial f\, \partial \mu}[D_s(f,\mu)]_{\substack{f_{0k} \\ \mu_{0k}}}. \end{cases} \quad (17) $$

In the above formula, τ is the location information in the process of incremental mining of warehouse operation process of production enterprises, f is the frequency characteristic quantity of the shortest path distribution of warehouse operation of production enterprises, t is the time parameter, and $D_s(f,\mu)$ is the output state objective function of incremental mining. To sum up, the particle swarm optimization algorithm is adopted to carry out adaptive optimization in the process of incremental mining of warehouse operation process of production enterprises, and the optimal design of incremental mining of warehouse operation process of production enterprises is realized.

5. Simulation and Result Analysis

In order to test the application performance of this method in incremental mining of production enterprise warehouse operation process, a simulation experiment is conducted. The experiment is based on the Matlab simulation platform.

5.1. Experimental Setup. Three machines are used to build the Hadoop cluster environment. The operating system of each node is Ubuntu12.04. The configuration of each machine is shown in Table 1.

In the environment of Table 1, the number of spatial distribution nodes of production enterprise warehouse operation is set as 80, the shortest response time is 14 s, and the index weight is $\lambda = (2322, 0.645, 4.643, 154.144, 4.355, 7.277)$. The map size of the production enterprise warehouse operation area is 1400×1400 pixels, and the spatial node distribution of the production enterprise warehouse operation process path is shown in Table 2.

Table 1: Experimental environment.

Standard	To configure
CPU	Intel i5 3.2 GHz
OS	Ubuntu12.04 64 bit
Disk	500 GB
IDE	Eclipse
Hadoop	Hadoop1.0.2

Table 2: Spatial node distribution of warehouse operation process path in production enterprises.

Warehouse operation node	X	Y
1	349.378512	441.342975
2	345.247107	310.585124
3	340.452893	56.895041
4	343.365289	151.780165
5	346.028099	313.273554
6	336.011570	302.182645
7	339.979339	134.050413
8	347.376860	118.854545
9	339.444628	54.920661
10	353.229752	287.767769

5.2. Examples of Warehouse Operation of Production Enterprises. In the scheduling of the warehouse operation process of production enterprises, first of all, we will sort out the details of the SKUs of goods that need to be shipped in large quantities or have a large inventory in the next quarter or month, so that WMS system can allocate a fixed Home Location before the order is generated, and take a part of inventory from VNA to replenish it to the Home Location. Set the minimum safety stock for the Home Location. Once the remaining stock of the zero-picking location is less than the safety stock quantity, the WMS system triggers VNA's picking task and the zero-picking location's replenishment task. After VNA completes the corresponding picking task, the zero picking personnel will replenish the inventory. In this way, once the order comes, the zero picking inventory demand can be mostly picked directly from the prereplenished inventory.

Second, when the WMS system allocates the location of Home Location, set the system allocation rule, so that the products of the same type and the same material are distributed in consecutive adjacent positions, so that customer orders can better realize that the products of the same material or SKU are in the same zero-picking carton. Because the system has precalculated the contents of the zero-picking carton during the production and shipment plan, it can be understood that most of the goods in the same zero-picking carton can be picked at adjacent locations, thus shortening the road effort of picking, and the more the quantity of picking per unit time, thus improving the picking production efficiency.

Third, because we have set up safety stock for the zero-picking locations, most of the demand for zero-picking quantity can be picked directly from these locations. However, there will still be some cases where the stock on the preallocated zero-picking locations is not enough. This is why we should not blindly replenish the goods at these zero-picking locations, because the actual location size is fixed, and there is not enough storage space for excessive replenishment. In this case, when the quantity of demand for some goods in actual order is greater than the inventory in the zero-picking position, we ask WMS to assign a Free Seat and ensure that the products replenished to the zero-picking position can be completely picked in the current picking task, so that once the zero-picking position is empty, this position can be used by another goods, thus improving the utilization rate of the position.

5.3. Analysis of Experimental Results. According to the experimental setup in section 5.1 and the example in section 5.2, the method in this paper is used to mine the operation process information. First, the working environment coordinates of the warehouse operation of the production enterprise are obtained, as shown in Figure 3.

In the environment shown in Figure 3, the warehouse operation of production enterprises is carried out, and the optimization path is obtained as shown in Figure 4.

According to the optimization path of warehouse operation of production enterprises shown in Figure 4, the optimization planning of warehouse operation of production enterprises is carried out. According to the walking mode of picking goods from the retail area, there are mainly three ways, namely, after the pickup truck is built, first go to Free Seat to pick goods, then go to Home Location to pick goods, and finally, send them to the packaging station for packaging; Or after building the car, go directly to Free Seat to pick the goods, and then send them to the packaging station for packaging; Or after building the car, go directly to Home Location to pick the goods and finally send them to the packaging station for packaging. The optimized planning model is shown in Figure 5.

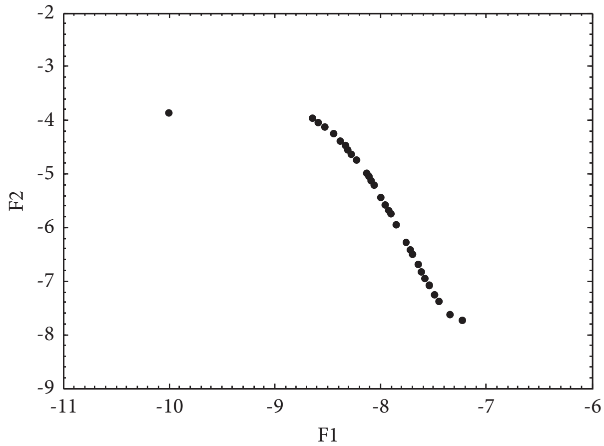

FIGURE 3: Working environment coordinates of warehouse operation of production enterprises.

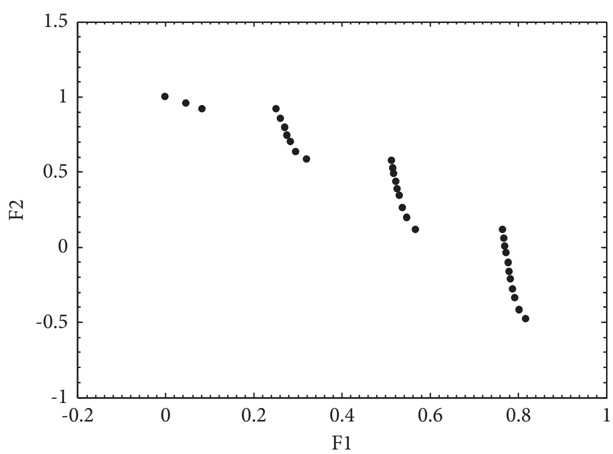

FIGURE 4: Optimization path of warehouse operation of production enterprises.

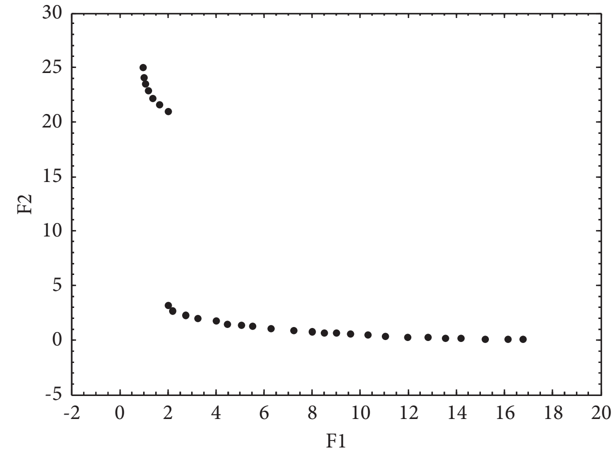

FIGURE 5: Results of optimal planning for warehouse operation of production enterprises.

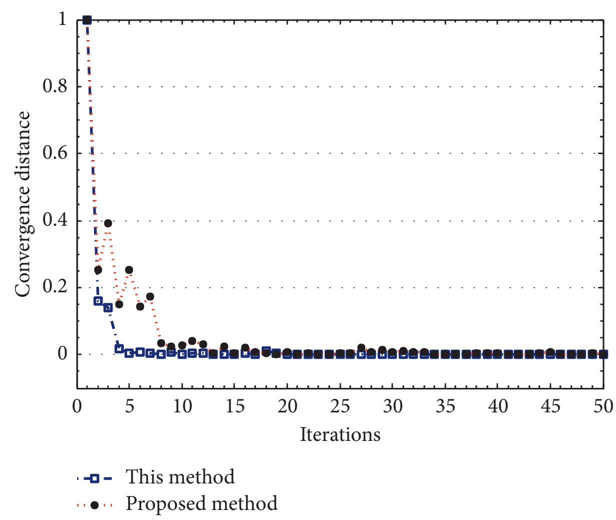

FIGURE 6: Comparison of convergence of warehouse operation of production enterprises of test function 1.

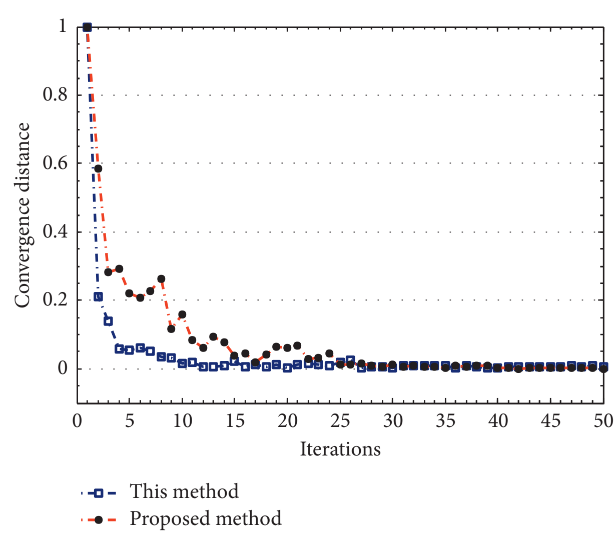

FIGURE 7: Test function 2: comparison figure of convergence of warehouse operation correction in production enterprises.

Analysis of the above simulation results shows that the optimization ability of incremental mining of production enterprise warehouse operation process is better, and the response ability of production enterprise warehouse operation is improved. The simulation results of path deviation correction of warehouse operation process in testing enterprises are shown in Figures 6–8.

According to the analysis in Figure 8, for the three sets of test function sets, using multiple information fusion of main feature information and iterative recovery matching method, the probability of local search to improve the search to the global optimal solution is increased, so as to achieve dynamic real-time correction of access paths. The improved crossover operator reduces meaningless operations, makes effective use of fine-grained cloud data features, and improves the incremental mining ability of the warehouse operation process of production enterprises.

In order to verify the time efficiency of this algorithm in incremental mining of warehouse operation process of production enterprises, the time required for mining this

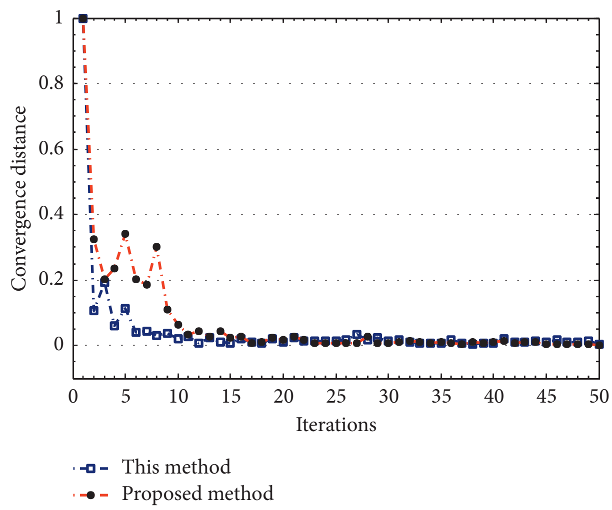

Figure 8: Test function 3: comparison diagram of convergence of warehouse operation correction in production enterprises.

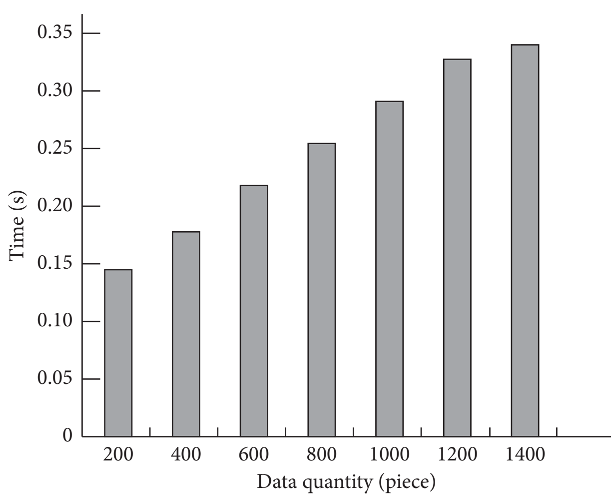

Figure 9: Mining time of this algorithm under the number of warehouse operation data of different production enterprises.

algorithm under different numbers of warehouse operation data of production enterprises is studied, and the results are shown in Figure 9.

According to the analysis of Figure 9, with the increase in the amount of warehouse operation data of production enterprises, the time-consuming of algorithm deduplication mining is on the rise. When the amount of data reaches 1400, the mining time-consuming is only 0.33 s. The experimental results show that the algorithm in this paper has a high efficiency of incremental mining of warehouse operation process of production enterprises.

6. Conclusions

This paper presents an incremental mining algorithm of the warehouse operation process based on the swarm intelligence algorithm. The particle swarm optimization method is used to sample the environmental information of the warehouse operation area of the production enterprise. Through dynamic weighting and shortest path optimization control, incremental mining and partition block search of warehouse operation process in production enterprises are realized. Particle swarm optimization algorithm is used to carry out adaptive optimization in the process of incremental mining of warehouse operation process of production enterprises, so as to realize incremental mining of warehouse operation process of production enterprises. The warehouse operation process of a production enterprise is taken as an example to verify. The analysis shows that the optimization ability of incremental mining of production enterprise warehouse operation process using this method is good, which improves the response ability of production enterprise warehouse operation. When the amount of data reaches 1400, the mining time is only 0.33 s, and the execution time is small.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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