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Intelligent logistics scheduling model and algorithm based on Internet of Things technology

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Internet of Things;
Intelligent logistics;
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Abstract With the continuous development of science and technology, the information age has arrived, and people have fully entered the information age. In this new era, Internet technology has achieved unprecedented development, and many innovative technologies have also been proposed. The competition in the logistics industry is becoming more and more fierce. Someone proposed the concept of intelligent logistics. This concept has been continuously expanded and the requirements have become higher and higher. Finally, an intelligent logistics management supported by the Internet of Things technology has emerged. technology. In our school's research, we mainly proposed an intelligent distribution model based on the Internet of Things. This model not only optimizes the distribution process, but also proposes an efficient distribution strategy when faced with a large amount of data. This technology mainly uses the information interaction technology in the Internet of Things, which can ensure that the average delivery speed is the fastest, the average transportation distance is the shortest, and the time consumed in the logistics transmission process is the shortest. In the decision-making process of this intelligent distribution model, we must first establish some intelligent distribution models controlled by multiple indicators. During the experiment, we built a logistics perception system and used heuristic algorithms to solve the packing problem. Answered. The mainstream solution algorithm we use genetic algorithm, a large number of experiments and data show that this algorithm is scientifically based, and it has also exerted its due effect in application. This article mainly analyzes the impact of the intelligent logistics system provided by the Internet of Things technology, and then looks forward to the future development trend of the system. We hope that through the analysis of the status quo, we can promote the further development of my country's Internet of Things technology, and also promote the further development and optimization of my country's intelligent logistics system technology.

1. Introduction

With the development of the times, economic exchanges between countries have become increasingly close. The world has entered the trend of economic integration. No matter

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which country consumers are, their concepts are constantly changing with the change of the times. In the past, the products on the market were mostly single and simple. With the increasing requirements of people's material life needs, the products on the market have gradually changed from a single simple model to more diversified. People can have more choices and can better meet people's needs. However, under such conditions, certain manufacturing companies must be able to produce a large number of low-cost, high-quality, and diversified products in a relatively short period of time. Only in this way can companies survive the market competition. At present, many manufacturing enterprises in my country have begun to transform their industrial models. The original production model of the enterprise was single in variety, and the production scale was also in small and medium batches. In order to better meet the needs of the market, these companies began to expand the types of products, change the production mode, and expand the scale of production. However, the increase in the variety of products will lead to more complex product processes, and various unpredictable conditions will occur in the production line, and sometimes the raw materials in the production workshop are difficult to be accurately controlled. Many traditional workshop logistics have decades of history and need to be combined with modern emerging logistics technologies to meet the requirements of the new era. The workshop should be intelligent and informatized, so that there are fewer and fewer problems in the production process. (see Figs. 1–10).

The rise of the Internet of Things technology is not long, and the development history is still relatively short. Although the development of this technology is not long, it has attracted everyone's attention since it appeared. Researchers in my country attach great importance to the development of the Internet of Things technology, and gradually apply the Internet of Things technology to a variety of enterprises, realizing digital modernization for various workshops, and providing technical support. In the previous production workshop, some information could not be obtained in time, which caused problems in cooperation between departments. Sometimes, because there is no reasonable algorithm to plan the delivery method, it may cause the delivery route to be wrong, the delivery distance will be greatly increased, and the delivery time may even be excessively extended. In some cases, due to the problem of the delivery vehicle, it may lead to errors in the delivered items, or even the accumulation of items in the warehouse, which will greatly affect the production efficiency of the company and also affect the company's own image. We use the Internet of Things technology as support to make the logistics distribution system in the workshop more intelligent and transparent, so that we can directly perform visual management during management, thereby greatly improving the efficiency of logistics distribution (see Tables 1 and 2).

2. Related work

With the continuous development of information technology, the information age has come, the network is flooded with people's surrounding environment, the emergence of the Internet of Things technology is also a matter of course. People's lives and the Internet are closely linked. From the literature [1] we can see the status quo of the development of Internet of Things technology at home and abroad. At the same time, in the literature [2], a system architecture of the Internet of Things belonging to China is also designed, and a new design method is proposed in combination with this architecture. Literature [3] mainly uses the SNMP protocol to achieve effective management of China's Internet of Things system. Literature [4] mainly proposes that in a universal environment, many computers will adjust in time to provide more appropriate services according to external conditions. But in a wide range of environments, we lack standardized technologies to enable computers to provide appropriate information services. Therefore, the research mainly conducted an in-depth discussion on the standard of pervasive computing, thus explaining the definition of a standard under development. Literature [5] mainly conducted a simple analysis of the current Internet

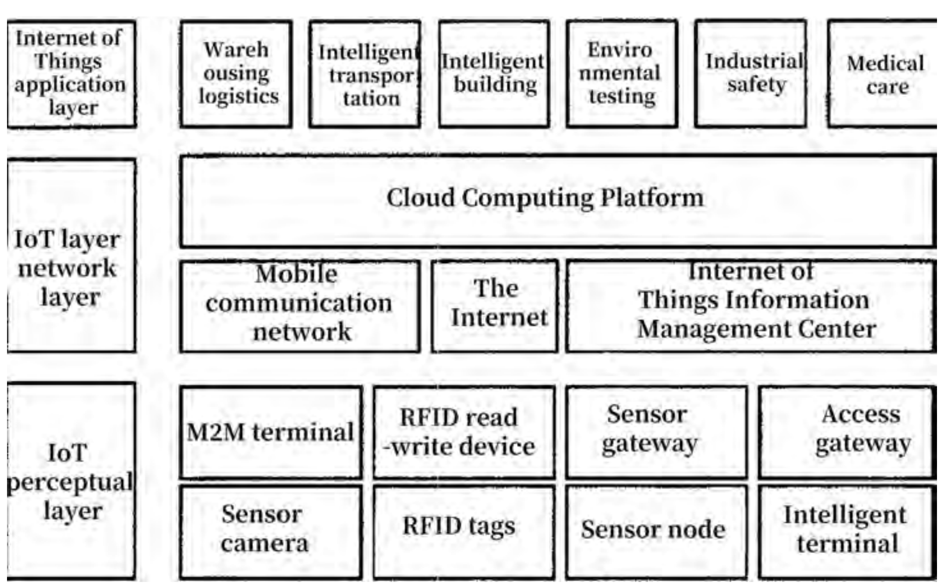

Fig. 1 IoT system architecture.

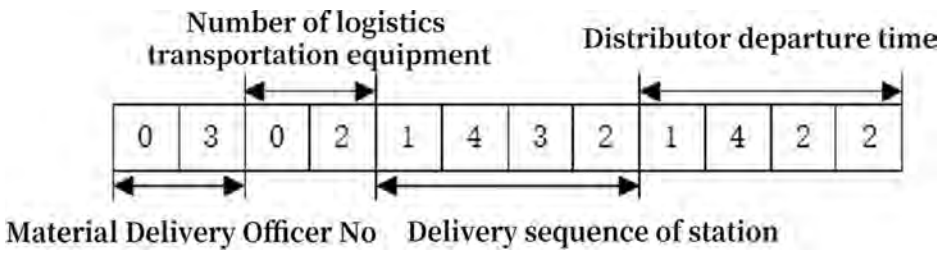

Fig. 2 A possible chromosome.

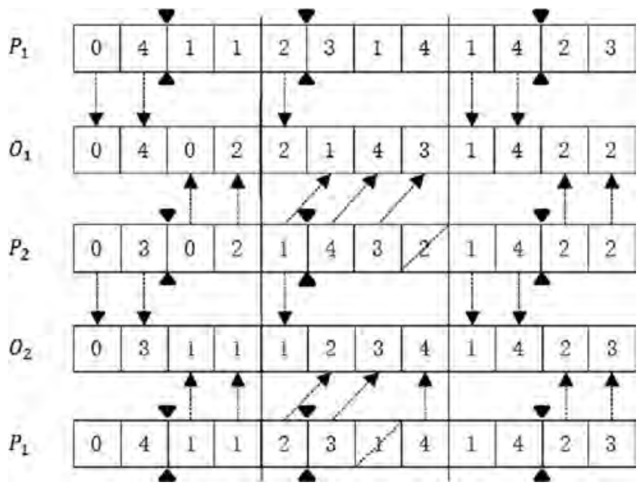

Fig. 3 Schematic diagram of chromosome crossover operation.

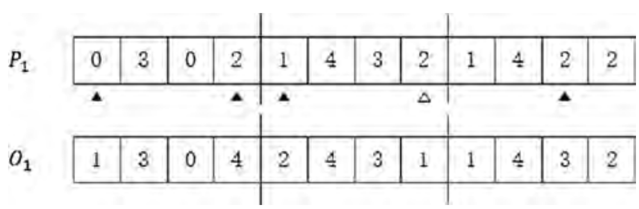

Fig. 4 Schematic diagram of chromosome mutation operation.

of Things system, and conducted an in-depth discussion on the problems existing in the definition of the scale system. At the same time, this article also reads relevant literature on the Internet of Things, understands the next-generation development of the Internet of Things technology, and also sorts out the relationship between the Internet of Things technology and wireless sensor networks. Literature [6] mainly designed a new system model by classifying IoT service types and nodes, which is based on IoT nodes. The literature [7] mainly conducted an in-depth understanding and analysis of the concepts and characteristics of the Internet of Things, and at the same time gave a certain introduction to the connection between the Internet of Things and sensor networks. Literature [8] mainly proposed the architecture of the ubiquitous sensor network, and thus put forward the research suggestions on the architecture of the Internet of Things. At the same time, this article also summarized the main technologies involved in the Internet of Things technology, and then summarized its development status and put forward relevant suggestions. Literature [9] mainly proposes a security architecture for the Internet of Things in view of the existing wireless sensor network security research. The article also introduces in detail the realized IoT security verification system, which optimizes the path of logistics transportation vehicles, which is a very critical point in the logistics distribution process. The optimized route can ensure the minimum travel distance and the shortest travel time, which can also reduce the cost of the logistics company as much as possible. Literature [10] mainly planned the routing problem of delivery vehicles in some workshops, and mainly used genetic algorithm to optimize the routing of vehicles. Literature [11] introduces a real-time vehicle distribution system, which is applied to actual production, which can realize real-time planning of vehicle distribution routes. Literature [12] mainly classified the problem of vehicle path optimization from different aspects. For example, the problem of vehicle entry with capacity constraints and the path planning problem with the shortest time, as well as the path problem of multiple use of vehicles and dynamic planning of the path problem. Literature [13] mainly proposes a solution path, and the algorithms of dynamic programming can be divided into precise algorithms and heuristic algorithms. Generally, we use heuristic algorithms to implement dynamic planning of paths, and we can keep trying in a limited time to get the most reasonable answer. When solving NP-type problems, the efficiency of heuristic algorithms is very high, such as the genetic algorithm used in this article, the traditional simulated annealing algorithm and the now more popular neural network algorithm are all heuristic algorithms. Literature [14] mainly uses the improved genetic algorithm to optimize the driving route of the vehicle, and avoids the premature end of the genetic algorithm through multiple inversions. Literature [15] mainly applied hybrid genetic algorithm to the optimization problem of vehicle path with time window. Experiments show that this hybrid genetic algorithm can prevent the results from falling into the local optimal solution, and can greatly improve the delivery efficiency of vehicles. Literature [16] mainly optimizes the vehicle path under multiple fuzzy conditions. First, the optimization of the vehicle was modeled, and some uncertain factors in the production process should also be considered in the process of modeling. According to the established model, a hybrid intelligent algorithm is proposed. This algorithm improves the convergence speed of the algorithm through double selection and double mutation, and has demonstrated its effectiveness in practice. Literature [17] uses traditional genetic algorithm to optimize the vehicle path. Literature [18] uses the traditional simulated annealing algorithm to optimize the vehicle path. Literature [19] uses the traditional artificial neural network algorithm to optimize the vehicle path.

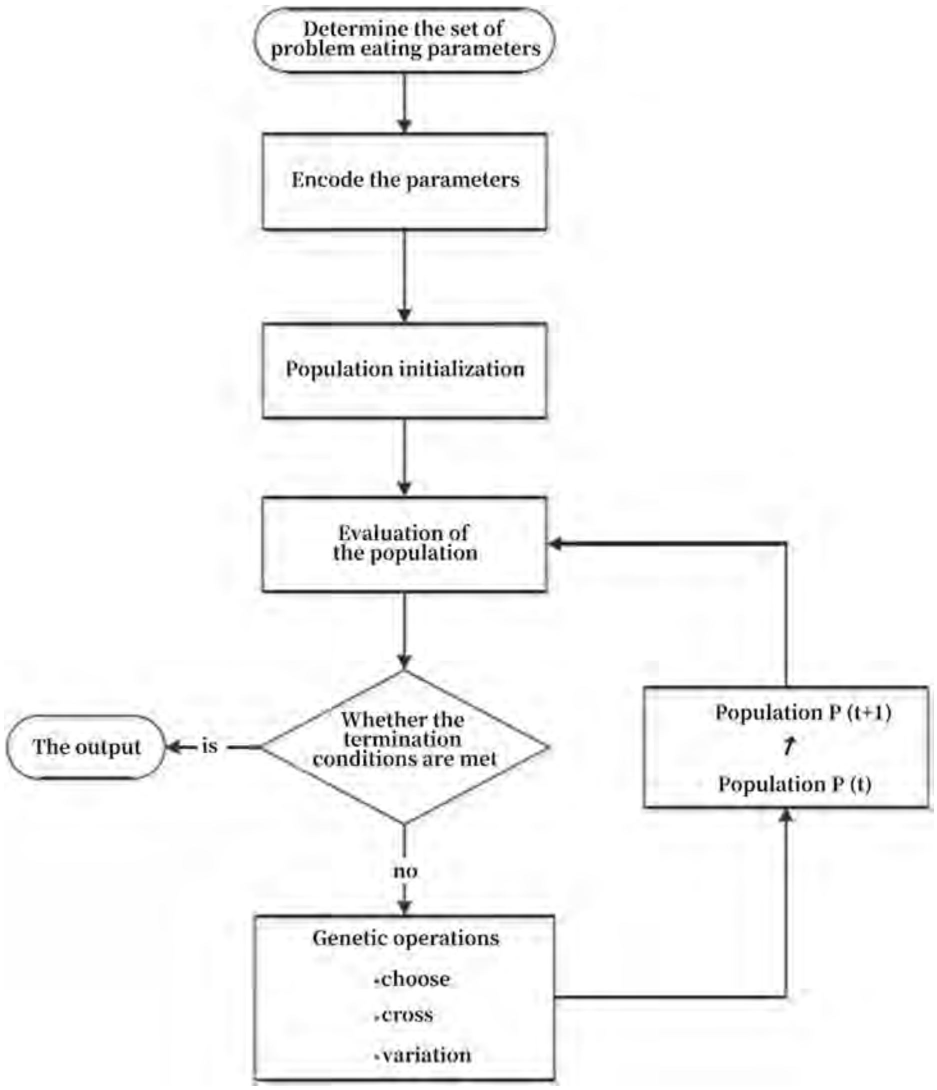

Fig. 5 Genetic algorithm road map.

3. Intelligent logistics scheduling model construction and algorithm optimization based on Internet of Things technology

3.1. Application of Internet of Things technology

3.1.1. Internet of Things architecture

The development of the Internet of Things technology marks the start of the third wave of the world's information industry. The Internet of Things enables all objects in the world to be connected together through a network. The Internet of Things technology mainly spreads information through the use of various devices such as infrared sensors and laser scanners, and connects all things on the earth to the Internet, so that information can be exchanged [20]. In the Internet of Things system, each object can realize automatic positioning and identification management. At the same time, we must also ensure that our information security mechanism must monitor every object in the Internet of Things in real time, and be able to locate it. Once a fault occurs, it can be resolved and alarmed in time. At the same time, if there is a security problem in the system, it should be managed, dispatched and remotely controlled by a dedicated manager [21]. Security personnel must remotely maintain the Internet of Things system anytime and anywhere and regularly perform online upgrades. At the same time, in the IoT system, we must also focus on energy saving and high efficiency.

In the architecture of the Internet of Things, the top layer is the perception layer of the Internet of Things. The perception layer is also the basic component of the Internet of Things system to perceive the outside world. This layer is mainly a network composed of a large number of sensor nodes. The perception layer can realize the dynamic perception of the external world [22]. The network layer of the Internet of Things mainly provides infrastructure services for the Internet of Things system. The network layer is mainly established on the basis of the existing mobile communication network, and is connected to the Internet through various access devices and output devices. The existence of the network layer enables the Internet of Things system to be connected and integrated with the Internet system, and it can also resolve various information. The application layer of the Internet of Things is mainly to solve some ubiquitous problems, mainly to combine

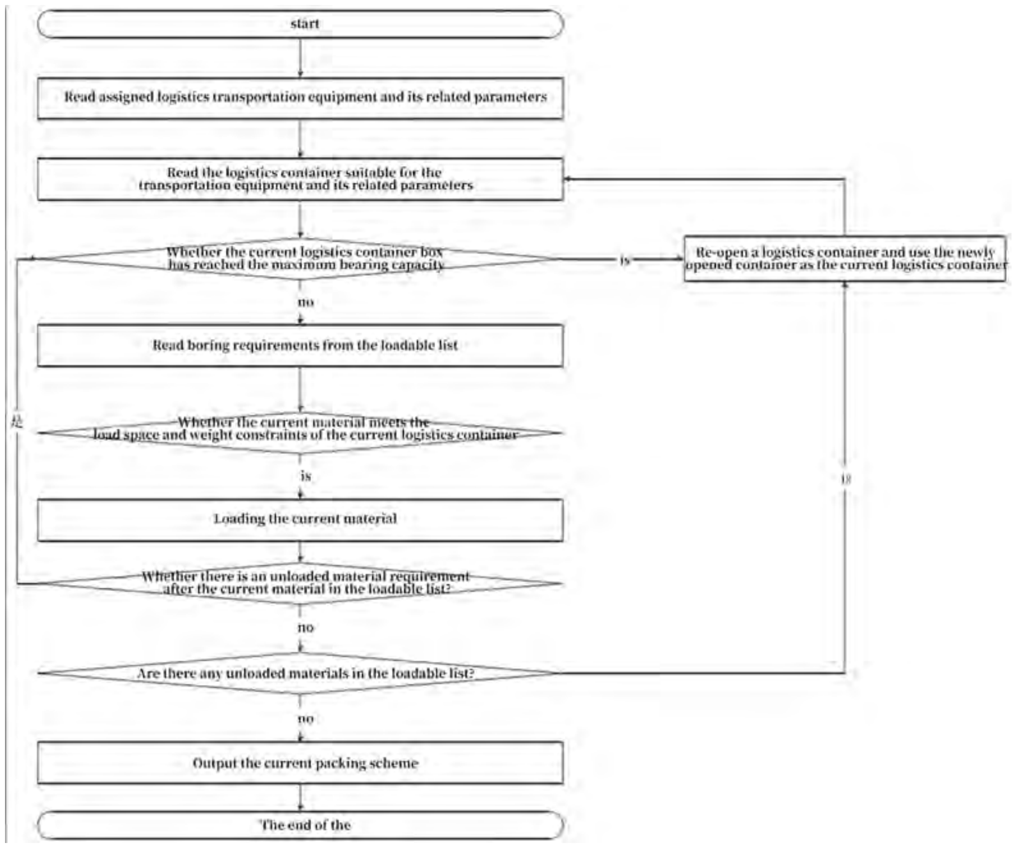

Fig. 6 Boxing module algorithm flow chart.

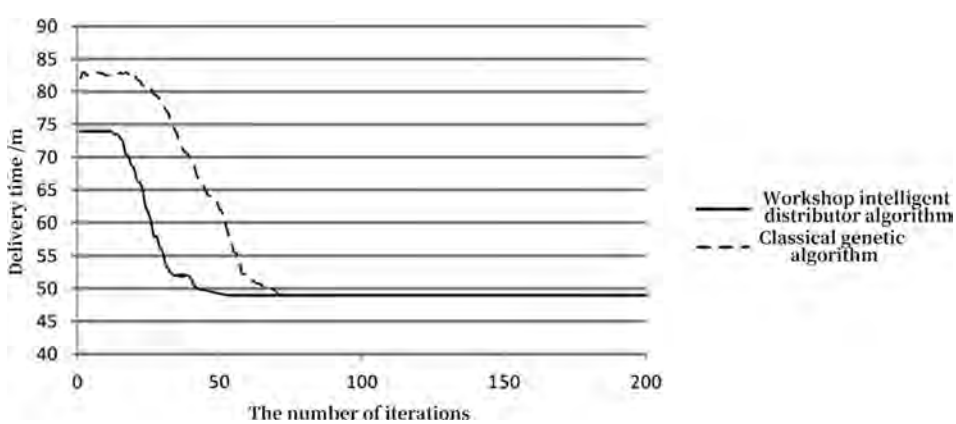

Fig. 7 Comparison of optimal packing and distribution time between workshop intelligent distributor algorithm and classical genetic algorithm.

some technologies of the Internet of Things with related technologies, to achieve the integration of information technology in different industries, and to provide solutions for various problems that arise.

3.1.2. Internet of Things technology based on RFID system

The Internet of Things technology integrates a variety of brand-new information technologies. It is not like the traditional Internet in the past that only realizes the transmission of information, but connects all objects on the earth with the network, and truly realizes the The connection between. With the increasing popularity of the Internet, the application of information technology has become more and more extensive [23]. We connect all objects in the world to the Internet, which can make people's lives more and more intelligent and convenient, and will further affect the country's economy and future industrial development. At present, the Internet of Things technology is also constantly developing and breaking through, and is gradually developing in two aspects: comprehensive perception and intelligent applications. The RFID system is relatively mature and has been applied to many industries, such as the pharmaceutical industry and agricul-

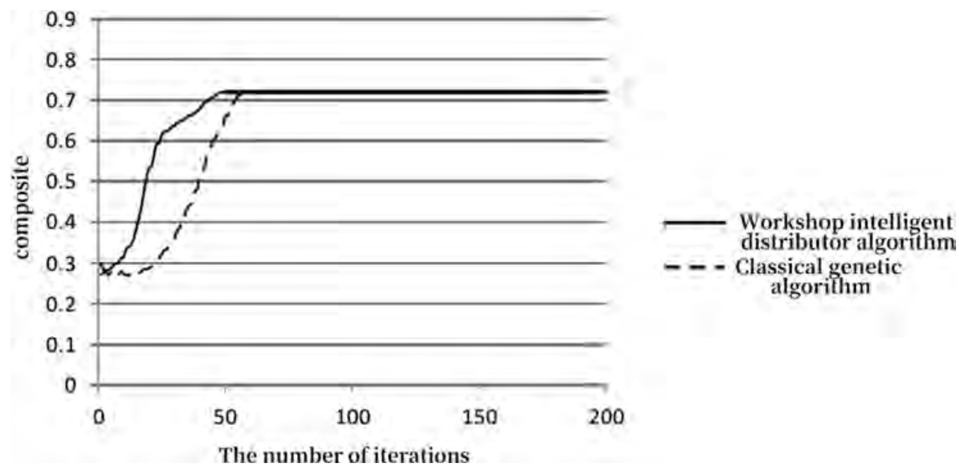

Fig. 8 Comparison of optimal packing index between workshop intelligent dispenser algorithm and classical genetic algorithm.

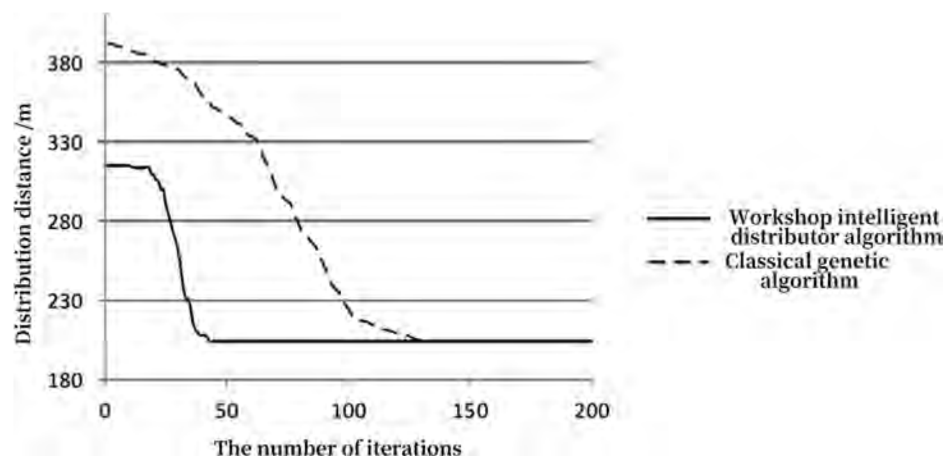

Fig. 9 Comparison of optimal distribution distance between workshop intelligent distributor algorithm and classical genetic algorithm.

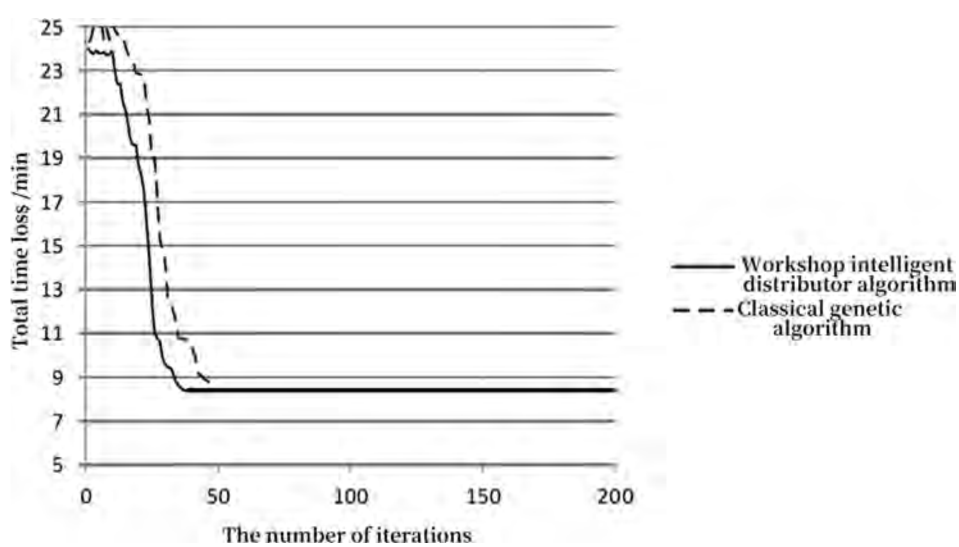

Fig. 10 Comparison of total time loss optimization between workshop intelligent dispenser algorithm and classic genetic algorithm.

tural products. In the industrial field, RFID can realize real-time tracking and investigation of the working conditions of production equipment, while also being able to efficiently manage some assets [24]. Using this technology, we can determine the number of different products on the production line. The RFID system can adapt to the environment and exert its opti-

Table 1 Frequency information of RFID reader.

Frequency band	Range (MHZ)	Main application frequency (MHZ)	Working principle
Low frequency	0.03–0.3	0.124, 0.133	Work through inductive coupling
High frequency	3–30	13.55	The voltage on the antenna can be changed by changing the on–off condition of the load resistance on the inductor
UHF	300–3000	860–960	The radio frequency signal between the reader and the electronic tag will be reflected when it hits the target, and then the target information will be fed back to the background

Table 2 Application characteristics of RFID equipment in various frequency bands.

Frequency band	Features	Application scenario
Low frequency	(1) The cost of electronic tags is not high; (2) The amount of data stored in the label is relatively small; (3) The reading distance is relatively short (4) Various shapes; (5) The antenna directivity is relatively weak.	Can be applied in scenes such as animal husbandry and identity recognition
High frequency	(1) In this frequency band, the cost of electronic tags and readers is relatively high; (2) The amount of information stored in the label is relatively large; (3) Longer readable distance; (4) It can identify some high-speed moving objects; (5) The shape of the reader is card-shaped; (6) The directivity of the antenna is relatively strong; (7) It is recognized globally;	Can be used in access control, large amounts of data transmission, etc.
UHF	(1) The reading distance can be very far; (2) The transmission speed is very fast;	It can be used in scenarios such as air parcel, supply chain, container, production line automation, etc.

mal performance under different conditions. Different industrial fields have different requirements for the frequency and performance of this technology.

When choosing a reader, we mainly choose the reader by judging the frequency of the reader. The frequency of the reader is mainly based on the frequency of the wireless signal transmitted by it, and it mainly includes three ranges. The main information of the frequency of the reader is shown in the table above.

We have summarized the characteristics of the three stages of reader frequency, and the results are shown in the table above. In order to maximize the performance of the reader, we need to select a suitable antenna for pairing. When choosing an antenna, we should not only consider the impedance and other parameters of the antenna, but also the radiation capability of the antenna. Generally speaking, the stronger the radiation capability of the antenna, the higher the possibility of its own value-added. The polarization of the antenna determines the quality of the antenna's signal [25]. If the polarization mode of the antenna is the same as the electromagnetic wave polarization mode, then the electromagnetic wave signal it can receive is effective. The impedance of the antenna mainly determines the quality of communication. When the impedance of the antenna and the impedance of the electronic tag are the same, the power of the antenna can reach the highest and the communication quality can be the best. Otherwise, the communication quality will be seriously affected. The performance of the antenna is also affected by the influence of the external environment and the shape of the article. The environment like metal can affect the propagation of electromagnetic signals.

3.2. Intelligent logistics scheduling model construction and algorithm optimization

3.2.1. Model construction

In the production process, due to the different abilities of the staff, their work efficiency and time spent are also different, and the benefits produced are also different. Therefore, when assigning personnel, we should consider the work efficiency of personnel and assign tasks according to certain standards, so that the time spent on completing the total tasks is minimized [26]. This can ensure the highest efficiency. This is a classic problem in operations research, that is, the distribution problem. When the distribution amount is good, this distribution method has extremely high application value and good development prospects. In the process of logistics transportation in an enterprise, many logistics equipment are often required, and the delivery speed of different logistics equipment is also different. We must use this method to assign and allocate logistics equipment [27]. If there are a total of N logistics delivery personnel, and the number of logistics equipment is M, we can use the average delivery speed to express the work ability of an employee. Then we can calculate that when an employee is working with a certain logistics equipment, his work ability can be expressed as:

$$V_{ij} = \lambda V_i + (1 - \lambda) V_i \quad (1)$$

$$V_{ij} = a_i + b_j \quad (2)$$

Under the condition of ensuring the shortest total time, model it:

$$minT = \sum_{i=1}^{n} \sum\nolimits_{j=1}^{m} \sum_{ts=1}^{TS} \frac{S_{ts}}{v_{ij}x_{il}} \tag{3}$$

$$\sum_{i=1}^{n} x_{i'ts} = 1 \tag{4}$$

$$\sum_{ts=1}^{TS} x_{i'ts} \le b_i \tag{5}$$

Further optimize the model:

$$minT = \sum_{i=1}^{n} \sum\nolimits_{j=1}^{m} \sum_{ts=1}^{TS} \frac{S_{ts}}{v_{ij}x_{i'ts}} \tag{6}$$

$$\sum_{i=1}^{n} x_{i's} = 1 \tag{7}$$

$$1 \le \sum_{ts=1}^{TS} x_{i'ts} \le b_i \tag{8}$$

If the number of personnel is larger than the volume of goods, optimize the model:

$$minT = \sum_{i=1}^{n} \sum\nolimits_{j=1}^{m} \sum_{ts=1}^{TS} \frac{S_{ts}}{v_{ij}x_{i's}} \tag{9}$$

$$\sum_{i=1}^{n} x_{i'ls} = 1 \tag{10}$$

$$0 \le \sum_{ts=1}^{TS} x_{i'ts} \le 1 \tag{11}$$

When packing boxes, we need to pay attention to the utilization of the boxes, the weight that the boxes can carry and the stability of the boxes. When measuring the size of a box, we generally consider its space utilization. We use a weight loading function to determine the weight of the box to analyze whether the box will be damaged. We use the center position function to represent the stability of the box. If the center of gravity month of the box is, the lower the center of gravity, the more stable the whole. The expression function of space utilization is as follows:

$$CR = \frac{\sum_{l=1}^{N} l_l w_l h_l num_l}{LWH} \times 100\% \tag{12}$$

The weight loading rate function is as follows:

$$WR = \begin{cases} \sum_{l=1}^{N} g_l num_l / G \times 100\% \\ 0 \end{cases} \tag{13}$$

The center of gravity position function is as follows:

$$CG = \frac{\left[1.5L - \left(\sum_{l=1}^{N} g_l \times num_l \times BMP\right) / \sum_{l=1}^{N} g_l \times num_l\right]}{L} \times 100\% \tag{14}$$

After weighting, the objective function becomes:

$$F = k_1 CR + k_1 WR + k_1 CG \tag{15}$$

Considering the shortest path length, the mathematical model can be optimized as:

$$Z = \min \sum_{k'=1}^{K} \sum_{k'=0}^{K} \sum_{w=1}^{K} d_{kk'} x_{kk'w} \tag{16}$$

$$\sum_{w=1}^{K} m_k y_{kw} \le G_W (w = 1, 2, \cdots, W) \tag{17}$$

$$\sum_{w=1}^{K} y_{kw} \le 1 (k = 1, 2, \cdots, K) \tag{18}$$

$$\sum_{w=1}^{K} y_{kw} = W \tag{19}$$

$$\sum_{w=1}^{W} \sum_{k=1}^{K} x_{k0w} = W \tag{20}$$

At the same time, the delivery of materials cannot be too fast or too slow, and there must be a time range.

3.2.2. Algorithm optimization

After we build the model, we use genetic algorithm to optimize the model, but genetic algorithm cannot affect the specific parameters in the model. We must transcode the parameters and then turn them into chromosomes with genetic structure. Only when chromosomes are coded can the application of genetic algorithms be affected. When choosing the coding method, we mainly used multi-part coding, dividing the gene into 4 parts. The chromosome model is shown in the figure below.

The fitness function is expressed as:

$$F(x^k) = \frac{1}{\sum_{i=1}^{4} W_i y_i}, k = 1, 2, 3, \cdots \tag{21}$$

Using the roulette algorithm to calculate the fitness value of the chromosome is:

$$eval(U_k) = F(x^k) = min \sum\nolimits_{i=1}^{4} W_i y_i, k = 1, 2, 3, \cdots \tag{22}$$

The total fitness of the group can be calculated as:

$$F = \sum_{k=1}^{pop\_size} eval(U_k) \tag{23}$$

The probability of a single chromosome being selected is:

$$p_k = \frac{eval(U_k)}{F} \tag{24}$$

The cumulative probability can be calculated as:

$$Q_k = \sum_{j=1}^{k} p_j \tag{25}$$

$$p_j = \sum_{l=0}^{L} p \tag{26}$$

The process of chromosome crossing operation is shown in the figure below.

The parental chromosomes can be divided into three parts. The first part is used to indicate the number of the staff and the corresponding logistics equipment number, the second part is used to indicate the delivery order, and the third part is the delivery time. We use population diversity to prevent the algorithm from falling into the local optimal solution prematurely. At the same time, we manually add a mutation operation to make the offspring produce completely new individuals.

As shown in the figure above, the parental chromosomes can be divided into three parts. The first part is used to indicate the number of the staff and the corresponding logistics equipment number, the second part is used to indicate the delivery order, and the third part indicates Delivery Time.

When calculating, first of all, we need to specify the size of the population by determining the fitness function, and at the same time we set the probability of crossover and the probability of mutation [28]. Then, we encode it according to the rules of multi-part encoding. We need to take a reasonable value for the initial population, and then calculate the fitness function of each individual in the population. Perform crossover and mutation according to the corresponding rules, so that new individuals are produced in the population. The algorithm is used to judge the population to determine whether it has reached the maximum number of evolution. If it is not satisfied, then continue to cross and mutate. If the maximum number of evolutions required by the algorithm has been met, then the result is output. Finally, decode the chromosome and output the complete solution. The main process is as follows.

When packing, we should decide the packing order according to the logistics delivery method and distribution route. The packing order should be opposite to the delivery order, so that it is more convenient to unload the goods. We need to box the items to be delivered in turn. After the boxing is completed, we also need to judge the capacity and volume quality of the box in the algorithm. In the actual application process, because the quality and shape of the boxed object itself may affect the boxing result, we cannot determine whether the article can be packed into the box only by judging the quality. We need to reopen new containers to load such goods.

The flow of the algorithm is shown in the figure above. First of all, we need to find the current logistics number, then determine the maximum load-bearing capacity of the loading equipment, and determine the size of the loaded container and other parameters. Then, judge whether the container has reached the maximum load-bearing capacity at this time. If the container has not reached the maximum load-bearing load, then we will gradually unload the objects from the list [29]. If the container has reached the maximum load, we need to reopen a brand new container and load it. We also need to determine whether the currently loaded items meet the existing load-bearing space, and also determine the shape of the object itself. If the container can still be loaded, then we continue to load using the maximum flush loading algorithm. If it can no longer be loaded, we output the current packing plan.

3.2.3. Algorithm verification

We verify the algorithm in actual applications. The demand information of each station is shown in Table 3, and the distance information between stations is shown in Table 4. We use two algorithms for delivery. The parameter information of the two algorithms is shown in Table 5.

The convergence trend of the two algorithms is shown in the figure below.

As can be seen from the above figure, the use of the workshop intelligent dispenser algorithm is faster than the classical genetic algorithm. After changing the parameters, the convergence trend of the two algorithms is shown in the figure below.

Table 3 Station information table.

Station number	Demand/unit	Material demand time/min
1	3.7	(33,37,39)
2	5.1	(5,7.5,10)
3	2.6	(26,26,30)
4	2.7	(18,20,20)
5	4.5	(15,18,21)
6	4.4	(30,34,36)
7	5.8	(9,10,12)
8	2.9	(22,25,26)
9	4.6	(30,33,35)

From the above figure, the intelligent dispatcher algorithm of the workshop is not much better than the traditional genetic algorithm.

After adjusting the weights, the convergence trend of the two algorithms is shown in the figure below.

As can be seen from the above figure, the workshop intelligent dispenser algorithm converges faster and has higher efficiency than the classical genetic algorithm. After adjusting the weights, the convergence trend of the two algorithms is shown in the figure below.

It can be seen from the above chart that the workshop intelligent dispenser algorithm is much better than the classical genetic algorithm in many aspects.

4. Intelligent logistics scheduling strategy based on Internet of Things technology

4.1. The impact of IoT technology on smart logistics

4.1.1. Information synchronization and sharing

The use of Internet of Things technology to manage smart logistics is to enable better synchronization and sharing of information. In the process of managing intelligent logistics, we use the network to track some logistics resources in real time. Once a problem occurs in a certain link in the supply chain, we can find and solve it in time. At the same time, the use of the network can also realize the real-time sharing of information and ensure the accuracy of information [30]. No matter what the problem is, we can find and solve the problem accurately and timely. Using Internet technology we can achieve the synchronization of information, which can greatly promote the development of the logistics industry, and can also promote market changes. At the same time, with the support of this technology, companies can have a rough grasp of market demand and will not easily cause inventory accumulation.

4.1.2. Optimize the management process

In the process of intelligent logistics management, we also need to optimize the logistics supply chain accordingly, and transform the logistics from the production mode, so as to optimize the links of logistics production and improve the efficiency of logistics. In the process of management, we can optimize the management process by optimizing the model. The use of

Table 4 Distance between stations and driving schedule.

Driving time											
Travel distance	Station	0	1	2	3	4	5	6	7	8	9
	0		10	5	9	11	5	11	7	10	10
	1	23.33		6	5	7	8	6	8	11	10
	2	27.10	24.02		9	7	9	13	7	11	11
	3	12.31	16.44	15		6	6	11	6	6	9
	4	26.50	36.63	18.5	21.07		8	10	11	9	10
	5	11.34	33.27	30.12	20	21.65		10	10	12	9
	6	7.04	29.26	32.37	18.64	28.7	9.62		10	10	9
	7	7.83	26.80	34.4	19.51	33.55	14.73	6.02		5	6
	8	21.92	25.29	43.5	28.99	47.83	31.41	22.40	17.20		10
	9	20.00	7.96	29.8	18.35	39.76	31.74	25.80	21.90	17.45	

Table 5 Basic parameter table.

Population size pop_size	Terminating algebra T	Crossover probability Pc	Mutation probability Pm
100	200	0.8	0.02

the Internet of Things technology can better avoid human errors. Once problems occur, they can be solved in time, and many losses can be avoided. At the same time, after optimizing the management process, we can greatly improve the work efficiency and quality of the logistics industry, and better manage the logistics links. The real-time information is also higher and the accuracy is better.

4.1.3. Visualizing the supply chain

The use of Internet of Things technology can realize the visualization of the process of managing the supply chain. We can use visualization technology to observe the logistics information in real time. During the actual operation, we can mark the products and view them through the marked points. In this way, managers can better manage resources and make the management process more transparent and open.

4.2. Smart logistics risk management and control strategies

In addition to optimizing the management process, we also need to control the risks that may appear in the logistics system and make timely response strategies. We should grasp the sudden disasters that may appear in the logistics network in time, control them from the source of danger, and prevent them from the process of dangerous spread. Once the risk breaks out, we should have a timely response policy to prevent the rapid spread of the risk.

4.2.1. Improve material security in areas with high disaster risk

There are some areas with high risk of disasters that the logistics guarantee mechanism is not perfect. We should attach great importance to these areas, improve their logistics guarantee mechanism, and establish a reliable material storage system. China is the third largest country in the world with a very vast land area. There are natural disasters in many areas of China. Because some border areas are located in the volcanic earthquake zone, they are very prone to volcanic earthquakes. In some areas, the soil is not strong enough to cause mudslides and other disasters. All these areas should establish a material guarantee system and carry out material reserves in a timely manner. At the same time, in order to ensure that the stored materials can be used when needed, we should also control the risks from the source to ensure that the emergency system can be effectively implemented.

4.2.2. Establish an efficient emergency communication system

As many areas of China are prone to sudden disasters, we should not only store materials in a timely manner and establish a good material security system, but also establish an efficient emergency communication system. In areas with a high incidence of such disasters, the material storage points in these areas must have a certain ability to deal with risks, as well as efficient emergency rescue capabilities. This can ensure effective prevention of the spread of risks, and can also reduce the extent of risk damage. From the simulation results of the experiment, it can be seen that if the reliability of the demand point is relatively high, the resistance to risk will also be relatively high, which is also very obvious. The reliability of the materials we store in disaster-prone areas and the reliability of the external communication emergency system determine the reliability of our system. Therefore, it is very meaningful for us to establish an efficient emergency communication system.

4.2.3. Build a rapid rescue response mechanism

When disasters occur in some disaster-prone areas, our logistics may face various risks. Once the logistics has risks, it will quickly spread. Therefore, in addition to timely material storage, we also need to build a rapid rescue response mechanism. By simulating the rescue time, we explored the impact of the rescue speed of emergency supplies on risk. The simulation results show that the faster the rescue of materials, the lower the risk of spread. Therefore, in the event of a disaster, we must first build an emergency relief platform so that emergency relief materials can be delivered to the designated address. Reduce the deployment of useless materials, which can increase the speed of rescue, control the spread of risks, and reduce national losses.

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5. Conclusion

The history of my country's Internet technology development is relatively short, and it is still in its infancy. There are still many shortcomings in this technology, and it needs to be further improved. With the continuous development of science and technology, the Internet of Things technology is also constantly innovating, and all countries in the world attach great importance to this technology. This technology has been applied to intelligent logistics management, which has promoted the continuous development of the logistics industry. Such technology will continue to develop and mature, and intelligent management can also be realized in other fields. Using the Internet of Things technology as the basis to improve the level of intelligent logistics management can not only establish a good corporate image, but also enhance the competitiveness of the company, and it can also make the company more professional.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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