



# Research on Dynamic Multi Intelligence Algorithm and Its Application in Logistics Distribution System in Post Epidemic Era

Haopin Luo<sup>(✉)</sup>

Wuhan Business University, Hubei 430056, China  
luohaopin@hotmail.com

**Abstract.** In logistics distribution systems, dynamic multi-agent algorithms can monitor and adjust the delivery process in real time, and optimize delivery paths, vehicle scheduling, and other issues based on real-time information, improving the timeliness and accuracy of logistics distribution.

In terms of specific applications, using dynamic multi-agent algorithms to optimize express delivery needs to consider multiple factors, such as the number of deliveries, delivery address, weather, traffic flow, and so on. By comprehensively considering these factors, we can build a fitness function of dynamic multi intelligence algorithm, optimize the distribution scheme, and make real-time adjustments according to real-time data to achieve the optimal distribution effect.

In the post pandemic era, logistics distribution systems face more severe challenges. The application of dynamic multi-agent algorithms can improve the efficiency and quality of logistics distribution, promote the digital and intelligent development of the express delivery industry, and also provide better support and guarantee for the development of the social economy. Therefore, the application of dynamic multi-agent algorithms has important significance and broad application prospects in the field of express delivery. This article aims to develop an effective method for designing and implementing dynamic multi-agent algorithms, which can serve as a tool to improve the performance of logistics distribution systems in the post pandemic era.

**Keywords:** Post epidemic era · Logistics distribution · Dynamic multi intelligence algorithm

## 1 Introduction

With the arrival of the post pandemic era, the challenges and opportunities faced by logistics distribution systems have changed. In order to better respond to this change, it is necessary to adopt more intelligent and efficient delivery systems to improve the efficiency and accuracy of express delivery. Dynamic multi-agent algorithm is an emerging algorithm that can dynamically adjust the algorithm according to the changes in the problem to be optimized, in order to achieve better results and generalization ability. In 2020, the COVID-19 will sweep the world. The epidemic not only poses a great

threat to the lives of people in all countries, but also seriously affects the global supply chain and industrial chain. In the face of the epidemic, while actively fighting against the epidemic, China has maintained the smooth flow of logistics with the help of the technology and strength of smart logistics. During this period, intelligent logistics distribution showed obvious advantages. Therefore, this paper analyzes the current situation and shortcomings of intelligent logistics distribution in the post epidemic era, and puts forward development suggestions. Especially in the aspect of intelligent distribution, it shows obvious advantages over traditional distribution [1]. During the epidemic, the express enterprises in Wuhan, Hubei, used UAVs to put medical and epidemic prevention materials in Wuhan Jinyintan Hospital;

## 2 Related Work

### 2.1 Urban Logistics Distribution

On the issue of how to establish an efficient distribution system that can reduce the impact of distribution activities on all aspects of the city, Ogden and other scholars in Japan for the first time took a great interest in distribution activities between cities, and described them in detail, called “urban logistics distribution”; Then, Japanese scholars devoted themselves to the research of this distribution and the expansion of this concept, and established a special association in Tokyo, Japan, in the late 1990s. Since then, it has become a research hotspot of domestic and foreign scholars. To solve this problem, experts and scholars first classified them according to relevant measures, policies and other standards.

Different scholars from different perspectives on this issue, such as Munuzuri and others from the perspective of policy makers, believe that the negative impact caused by urban logistics should be taken from the following aspects: (1) infrastructure and equipment, such as distribution center, transfer center, highway and railway transportation; (2) The management and use of the park land area, such as the land lease and use right of the logistics park in the city; (3) Moreover, the access threshold, such as time window, traffic restrictions, etc.; (4) The traffic management is a problem of cooperation between various departments. Russ and Comil24 think that the following aspects should be taken into consideration: first, infrastructure, mainly the construction of point line distribution network; The second is the use of information technology terminals; The third is equipment; The fourth is the government’s supervision of the transportation network.

Relevant scholars have also studied the degree of impact on the construction of urban freight logistics network. For example, Quak has classified it according to various policies and measures, The implementation subjects of the two types of measures are respectively government and organization. Scholars at home and abroad mainly focus on the basic theoretical knowledge and relevant policies issued by the state on the logistics distribution between cities. The author has selected 8 types of measures that are theoretically feasible and implemented them in many European countries, and evaluated the implementation effect.

## 2.2 Development Status of Intelligent Distribution at Home and Abroad

At present, in terms of the attempt and development of intelligent distribution, Amazon and Google are the main players abroad, while Alibaba, JD, Shunfeng, Suning and other enterprises are the representatives in China.

In 2013, Amazon put forward the unmanned delivery plan. Three years later, the Prime Air, an express drone developed by Amazon, delivered the first order; In 2014, Google first released the project of UAV for delivery. In addition, many enterprises began to try intelligent distribution. The development of intelligent distribution in China is very fast, following closely with that in other countries.

In 2012, Shunfeng first proposed the UAV distribution plan. JD's intelligent distribution project is to bind the UAV and the unmanned warehouse together, and use the unmanned warehouse as a transit station for UAV distribution, so as to realize the normal distribution and operation of UAVs everywhere.

It can be seen from this that intelligent distribution has been developing continuously, and it is precisely during the epidemic that the popularity of intelligent distribution really heats up. A batch of intelligent robots quickly took up their posts and shuttled around the hospital wards to deliver food and medicine for medical staff and patients, which was efficient and safe, as shown in Fig. 1.



Fig. 1. JD Intelligent Distribution

In addition to JD Logistics, intelligent distribution, some technology manufacturing companies have also joined in, such as Qinglang intelligent distribution robots, Purdue technology hospital robots, and Xingshen intelligent unmanned delivery vehicles have been put into production.

### 3 Multi Agent System and Distributed Computing

In today's information technology environment, many applications can be simulated as Multi Agent Systems (MAS), in which humans and autonomous entities cooperate dynamically to achieve the set basic goals. The organization of multi-agent system should adapt to its environment and the tasks of existing personnel to meet its performance requirements, so it may be necessary to optimize the management of multi-agent system organization during design and operation.

They usually include them as a constraint in their efforts to solve problems.

Distributed systems can be defined as networks of independent components that communicate and coordinate their behavior only by passing messages. The motivation of using distributed systems is that distributed data computing can reduce the cost of data processing and improve the robustness of the system through data replication. If used properly, distributed computing can get results faster than a single computer. A multi-agent system is a distributed intelligent system, typically composed of multiple individuals with autonomous and interactive abilities. Each individual has their own knowledge, skills, beliefs, and other characteristics, and can make autonomous decisions and actions based on different environments and tasks. When solving complex decision-making problems, multi-agent systems can work together and achieve goals through the interaction and collaboration between individuals. The characteristics of multi-agent systems include autonomy, collaboration, distribution, and heterogeneity. Autonomy refers to the ability of agents to make autonomous decisions and actions based on their own knowledge and experience; Collaboration refers to the ability of agents to interact and collaborate to achieve goals together; Distribution refers to the distribution of agents in different locations or computing nodes; Heterogeneity refers to the differences in knowledge and abilities between agents. In distributed computing, multi-agent systems can complete large-scale computing tasks through shared information and collaborative actions. Each proxy node can send and receive data to each other, share computational pressure through cooperation and division of labor, and improve computational efficiency and accuracy.

The working process of a multi-agent system includes steps such as knowledge acquisition, information sharing, collaborative decision-making, and action execution. Each agent node continuously updates its knowledge base by actively collecting and learning information; By sending and receiving information to other proxy nodes, sharing information, negotiating solutions, and jointly completing decisions and actions; Ultimately, the task objectives are achieved by executing actions.

Multi agent system is a distributed intelligent system with characteristics such as autonomy, collaboration, distribution, and heterogeneity. In distributed computing, multi-agent systems can complete large-scale computing tasks through shared information and collaborative actions, and have broad application prospects. In the future, multi-agent systems will play an increasingly important role in various fields of application.

### 4 Dynamic Multi Intelligence Algorithm and Its Application in Logistics Distribution System in the Post Epidemic Era

In logistics distribution systems, dynamic multi-agent algorithms can monitor and adjust the distribution process in real-time, thereby achieving optimization of logistics distribution. Specific applications include the following:

- (1) Order processing and scheduling: Using dynamic multi-agent algorithms for real-time processing and scheduling of orders, it is possible to grasp real-time information about goods, arrange suitable vehicles and routes, minimize delivery time, and improve delivery timeliness and accuracy.
- (2) Vehicle scheduling and path planning: Using dynamic multi-agent algorithms to select the optimal vehicle scheduling and route planning solution can achieve various optimization goals such as shortest distance and shortest time, thereby improving the efficiency and accuracy of logistics distribution.
- (3) Instant information exchange and adjustment: By using dynamic multi-agent algorithms, it is possible to monitor changes and abnormal situations in the logistics distribution process in real time, adjust distribution plans, handle abnormal situations, and ensure the accuracy and timeliness of logistics distribution to the greatest extent possible.

If the load value is greater than the maximum value, add virtual machine operations, and create a new virtual machine on the physical host with the lowest load; Otherwise,

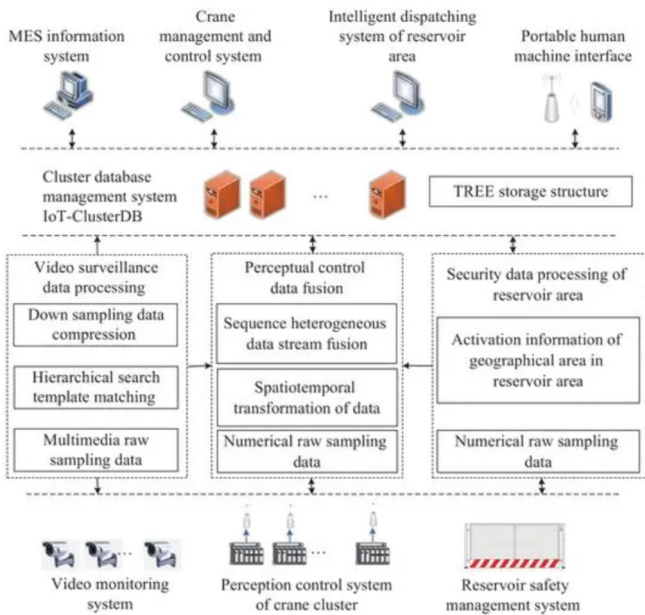


Fig. 2. Intelligent algorithm logistics distribution system

if it is lower than, it will issue reduced virtual machine operations and delete too many virtual machines on the highest load virtual machine. as shown in Fig. 2.

## 5 Conclusion

This paper mainly applies the idea of dynamic routing and forwarding in the Internet to the logistics distribution system. Through the theoretical research of dynamic routing algorithm and logistics distribution, combined with the analysis of GPS traffic situation, the problem of logistics distribution path is finally solved. This algorithm is aimed at the complex logistics distribution system. The GPS traffic analysis system collects real-time GPS information, cleans and processes big data, updates each table and corresponding weight value, and each transit station updates its own routing table according to the latest weight value information. Through real-time GPS information update, it can ensure that the items in the routing table are the latest routes. After logistics distribution vehicles arrive at each node, they only need to look up the routing table for forwarding, so as to ensure the shortest time requirement.

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