



Artificial Intelligence Integration Method for Agricultural Product Supply Chain Quality Data Based on Block Chain

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Abstract. Traditional supply chain quality data integration methods costed a lot in integrating product quality, but the integration accuracy was very low and the effect is poor. In order to solved this problem, a supply chain of agricultural products was set up based on the artificial intelligence integration method of block chain using quality data. The framework of agricultural product supply chain was designed. The supply chain included four steps of production, processing, trade and consumption. Based on the frame, the workflow of the supply chain of agricultural products was expounded. The feasibility of the construction of agricultural product supply chain was verified by the experiment. The experimental results showed that the design of intelligent integration method can effectively reduce cost and improve the accuracy of integration.

Keywords: Block chain · Agricultural product supply chain · Supply chain quality · Intelligent integration method · Artificial intelligence

1 Introduction

With the development of the international trend of food economy and trade, agricultural products have become the focus of research in the global food safety field. The quality and safety inspection system of agricultural products is extremely complex and is the key to establishing a reasonable, stable and sustainable global agricultural product supply chain, which can promote the sustainable and stable development of agriculture [1]. With the popularization and application of data encryption currency such as Bitcoin, the blockchain has gradually emerged. Blockchain technology has become the first new technology. In recent years, the application research of blockchain technology has experienced an explosive growth. It is widely regarded as another subversive innovation in the computing paradigm following personal computers and mobile social networks, and is expected to reshape the activities of human society [2].

Reference [3] proposes an improved oversampling unbalanced data integration classification algorithm, using the AdaBoost algorithm to deal with the advantages of unbalanced data, using the decision tree as the basic classifier, using the oversampling

method to synthesize samples at each iteration, balancing The training information, the final classification model, and the improved oversampling unbalanced data integration classification algorithm can significantly improve the classification accuracy, and thus improve the performance of the classifier. Reference [4] explores the way in which production fragmentation affects the unsalable sales of agricultural products through the mediation of supply chain integration and the regulation of information network capabilities under the theoretical framework of “resources-capacity-circulation”. The higher the information network capability, the stronger the intermediary role of supply chain integration, and the role of regulated mediation.

The time dimension of the above integrated method data is limited. This paper proposes an artificial intelligence integration method based on blockchain for agricultural product supply chain quality data. The design quality system integration framework uses blockchain technology to asymmetrically encrypt data to ensure data security and increase the time dimension of the data to make it traceable.

2 Design of Agricultural Product Supply Chain Quality System Integration Framework

The process of obtaining the quality data integration of agricultural product supply chain is more complicated, and the calculation formula is as follows:

$$m = \frac{xy + 3y}{2x} \quad (1)$$

In formula (1), x , y and m represent the supply material, labor cost and product quality respectively. After obtaining the product quality, formula (1) is substituted into formula (2) to calculate the product quality level.

$$T = \frac{xy - 2y}{m} \quad (2)$$

After obtaining the product quality level, the product integration of the supply chain is calculated:

$$\kappa = \frac{T}{m} \quad (3)$$

Through the above calculation process, the integration of agricultural product supply chain quality data is completed.

Figure 1 shows the agricultural product supply chain basic structure. As it shows, the agricultural product supply chain includes the production, processing, trading and consumption of products. Since the agricultural product supply chain is a complete chain, the management of agricultural product safety should be started from the source [5].

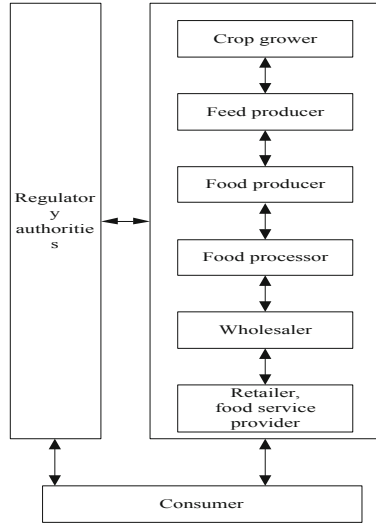


Fig. 1. Agricultural product supply chain basic structure

The quality chain of the agricultural product supply chain must ensure that all agricultural-related industry groups can participate, and the quality safety should be the first in the process of participation [6]. The agricultural product supply chain includes a number of elements, such as: crop growers, food manufacturers at all levels, and food distributors at all levels, ensuring supply chain quality by integrating resources such as logistics, information flow and capital [7].

Within the various quality chain organizations, product design, production, marketing, services and other elements work together to ensure product quality, the interlaced internal structure of the organization is constructed with internal mass structure. When perfecting the internal structure of the product, it is necessary to always consider the product quality, taking quality as the core goal, and ensuring that the quality data meets the production requirements [8].

3 Artificial Intelligence Integration Process Design of Agricultural Product Supply Chain Quality Data

The artificial intelligence integration method is highly flexible, and the fault tolerance and computing power are also unmatched by traditional methods, so it has been widely concerned by the research community. The integration approach mimics human nature and seeks some advice before making a decision. This method evaluation can be divided into multiple independent pattern classifiers, and the data is integrated after they are integrated. The performance of this method is better than the performance of any single classifier [9, 10].

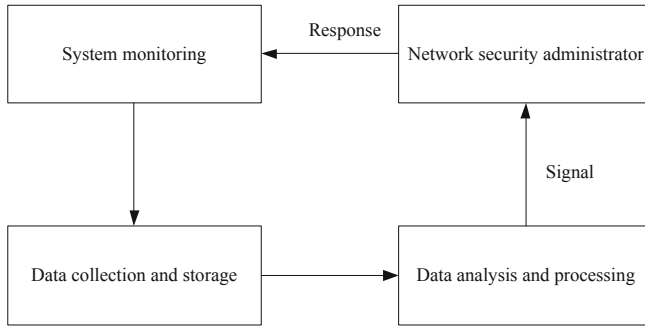


Fig. 2. Artificial intelligence integrated system module

As shown in Fig. 2, the artificial intelligence integrated system process involves data collection, data processing, selection, analysis, and result classification. The system can be divided into four modules: data acquisition and storage, data analysis and processing, network security administrator and system monitoring. Based on these modules, the system can be divided into different types. The system can measure the system performance according to the threshold, order and probability [11]. The artificial intelligence-based integrated classifier can improve the performance of the classifier.

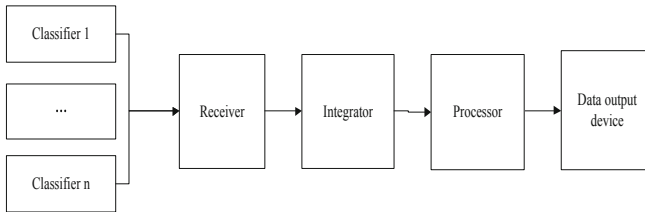


Fig. 3. Hardware design of artificial intelligence integrated system for agricultural product supply chain quality data

As shown in Fig. 3, the data is collected by a plurality of classifiers, and the data collected by each classifier is received and preprocessed by the receiver. Then the data is integrated through the integrator, the integrated data information is processed by the processor, the information we need is obtained, and finally the data information is output and fed back to the user [12].

As shown in Fig. 4, firstly, the data collected by the classifier is standardized, the data is input, and then the data is detected and classified, the data is converted into a signal, and the standard data is judged according to the signal, and the matched data is subjected to secondary detection and classification, obtaining test results.

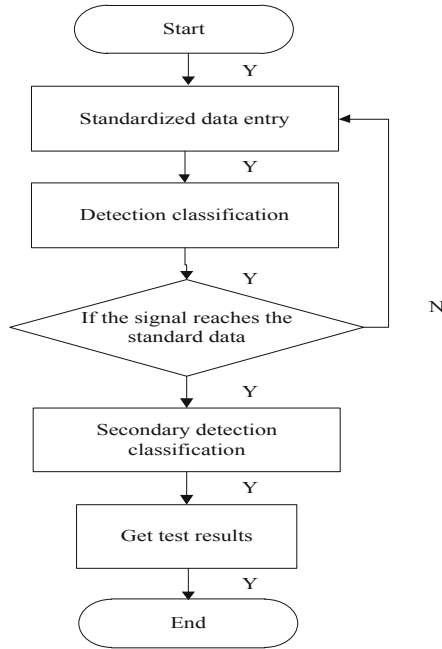


Fig. 4. Software design of artificial intelligence integrated system for agricultural product supply chain quality data

4 Experiments

In order to test the actual working effect of the artificial intelligence integration method designed in this paper, a comparative experiment is designed.

4.1 Experimental Parameters

The experimental parameters are described below in Table 1:

Table 1. Experimental parameters

Project	Data
Power type	High efficiency and energy saving power supply
Processing instruction	Cache instruction
Hard disk	160 GB
Video card	ATI Mobility Radeon discrete graphics
Detection signal form	TUV radio frequency signal
Caching method	Three level caching
Data display form	DSP processing signal
Memory capacity	4 GB
Radiation level	B
Operation and maintenance voltage	220 V
Power	≥ 200 W

4.2 Experiment Process

The experiment is performed according to the parameters set above, comparing the traditional agricultural product supply chain system with the agricultural product supply chain system studied in this paper, respectively recording the cost, system work efficiency and system accuracy experiment of the agricultural product supply chain system, the working results of two agricultural product supply chain systems are analyzed according to the three experimental results.

4.3 Experimental Results and Analysis

The experimental results obtained are shown below:

(1) Operation cost

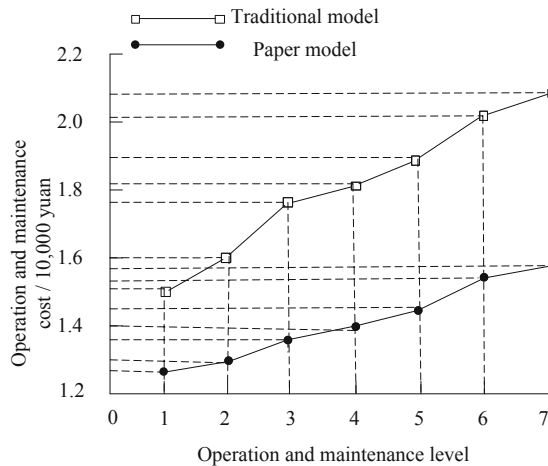


Fig. 5. Experimental results of operation cost

From Fig. 5, when the operation and maintenance level is 1, the operation and maintenance cost of the traditional system is 14,900 yuan, and the operation and maintenance cost of the system in this paper is 12,700 yuan; when the operation and maintenance level is 3, the operation and maintenance cost of the traditional system is 17,600 yuan, and the operation and maintenance cost of the system in this paper is 13,500 yuan; when the operation and maintenance level is 5, the operation and maintenance cost of the traditional system is 18,700 yuan, and the operation and maintenance cost of the system in this paper is 14,300 yuan; when the operation and maintenance level is 7, the operation and maintenance cost of the traditional system is 20,900 yuan, and the operation and maintenance cost of the system in this paper is 15,600 yuan;

(2) System efficiency

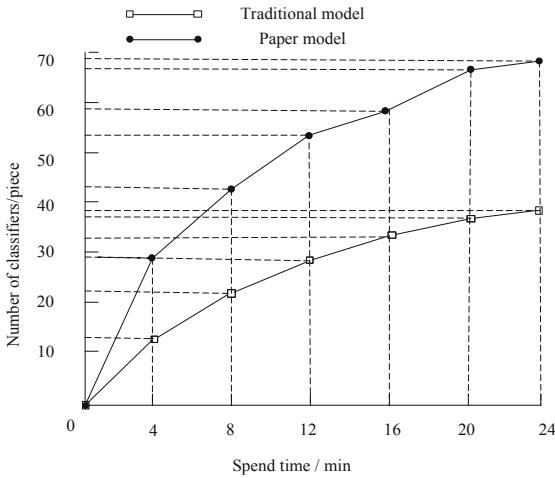


Fig. 6. Experimental results of system efficiency

It can be seen from Fig. 6 that when the time is 8 min, the system in this paper can receive 40 classifiers to collect data, and the traditional system can receive 20 classifiers to collect data; when the time is 16 min, the system in this paper can receive 60 classifiers to collect data, and the traditional system can receive 30 classifiers to collect data; when the time is 24 min, the system in this paper can receive 70 classifiers to collect data, and the traditional system can receive 40 classifiers to collect data.

(3) System accuracy experiment

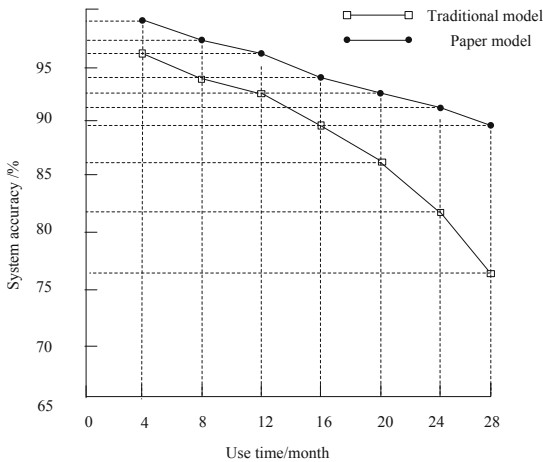


Fig. 7. System accuracy experiment

As can be seen from Fig. 7, when the system usage time is 4 months, the traditional system accuracy is 96%, and the system accuracy of this paper is 99%; when the system usage time is 12 months, the traditional system accuracy is 93%, and the system accuracy of this paper is 96%; when the system usage time is 20 months, the traditional system accuracy is 86%, and the system accuracy of this paper is 93%; when the system usage time is 28 months, the traditional system accuracy is 76%, and the system accuracy of this paper is 89.5%;

According to the above experimental results, the following experimental conclusions are obtained: The traditional agricultural product supply chain and the agricultural product supply chain based on the blockchain can improve the working efficiency of the whole system by adopting the artificial intelligence integration method, but the work cost of the agricultural product supply chain operation in this paper is much smaller than the traditional agricultural product supply chain with higher precision.

In summary, the agricultural product supply chain constructed in this paper has low cost, short time-consuming and high efficiency, which can effectively reduce the labor intensity and has a good development potential.

5 Conclusions

The core advantage of the blockchain is decentralization, which enables peer-to-peer transactions, collaboration, and coordination among different distributed systems by using timestamps, data encryption, economic incentives, distributed consensus, etc., thereby reducing costs and improving efficiency. This system adds time dimensions to the data, making it traceable, and the blockchain technology encrypts the data with asymmetric cryptography to ensure data security.

Although the agricultural product supply chain studied in this paper has a series of advantages and lacks a certain practical operation foundation, there may be some potential problems in the future use, which needs further research and discussion.

References

1. Ruimin, Z., Zhang, W.: Risk and control of financial science and Technology Innovation – based on large data, artificial intelligence, block chain research. *China Manag. Inf.* **13**(19), 33–36 (2017)
2. Fang, H., Tong, S., Du, J., et al.: Design and research of intelligent learning robot based on block chain technology - intelligent learning robot. *Distance Educ. Mag. Large-Scale Learn. Serv. Syst.* **35**(4), 42–48 (2017)
3. Zhang, F., Wang, L., Chai, Y.: An improved unbalanced data integration classification algorithm for oversampling. *Minicomput. Syst.* **39**(10), 36–42 (2018)
4. Qin, L., Tian, Y., Jiao, H.: The influence of production fragmentation on supply chain integration and unsalable agricultural products-an adjusted intermediary model. *Jiangsu Agric. Sci.* **46**(09), 335–340 (2018)
5. Chaoyang, Xu, P., Lou, J., et al.: Chemical recommendation model. *J. Northeast. Norm. Univ. (Natural Science)*, **49**(2), 84–88(2017)

6. Xie, W.: GMIC global financial innovation summit: when big data, artificial intelligence, block chain technologies encounter finance. *China Econ. Wkly.* **12**(18), 50–51 (2016)
7. Zhao, B., Xu, S., Huang, Z.: Simulation of robot path intelligent search method under intensive obstacle environment simulation. *Comput. Simul.* **34**(2), 393–396 (2017)
8. Fresh, J.: The important direction of the future transformation and development of China's financial industry: "block chain +". *Southern finance* **12**(12), 87–91 (2016)
9. Xing, G.: Artificial intelligence, financial digital new side. *China Financ. Comput.* **12**(5), 15–18 (2017)
10. Yuxiang, H.: FiMAX "endorsement" block chain new standard. *Chin. Financ.* **21**(2), 75–76 (2018)
11. Li, F.: Electrocardiogram point diagram - new vision for large data analysis. *Pract. Electrocardiol. J.* **27**(1), 7–8 (2018)
12. Xia, D., Wang, Y., Zhao, X., et al.: Incremental interactive data integration method for intelligent people's livelihood. *Comput. Res. Dev.* **54**(3), 586–596 (2017)