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LETTER TO THE EDITOR

Design of Intelligent Agricultural Regional Information Matching System Based on Block Chain

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In recent years, with the rapid development of Internet technology, agricultural production has been promoted, and digital agriculture, precision agriculture, intelligent agriculture and so on have been formed. The intelligence of information system is an important development trend of network construction. From the point of view of promoting agricultural informatization, this paper designs an intelligent agricultural regional information matching system based on block chain technology. The reliability and robustness of the system are guaranteed by using the characteristics of block chain, such as non-tampering and security encryption. Combined with the network of edge computing, computing and storage service resources, the acquisition, data processing and storage of large-scale intelligent agricultural area information are realized. Thus, an intelligent agricultural system is constructed, and a comprehensive, open and multifunctional agricultural science and technology information system under the network environment is gradually built. To achieve the purpose of effectively improving the production efficiency of agricultural products, it is of practical significance for the application of intelligent information technology in the field of agriculture and the exploration of network system from general information service to knowledge service. At the same time, it provides consumers with comprehensive information on the production of agricultural products.

block chain; intelligence; agricultural area; information matching; system

1 Introduction

Intelligent agricultural system mainly uses wireless sensor, communication network, database, automatic control and other technologies to establish an agricultural monitoring system for comprehensive real-time monitoring of agricultural production environment and remote control of agricultural automation equipment. However, in the system of intelligent agriculture, a large number of data are often stored in the database, how to ensure that the safe and private data are not leaked, and the data are not maliciously modified when tracking agricultural problems, which becomes an important problem (Zhang et al. 2017). On the other hand, with the rise of digital currency, block chain as the underlying technology of digital currency, has been paid more and more attention. Block chain is to record the transaction information of all currencies safely in the form of decentralized distributed ledger. Block chain has the characteristics of decentralization, unusurable data modification, high transparency and so on, which ensures that the stored data can be trusted and traced back and will not be tampered with.

Tianbao Guo, Yunfeng Wangpublished an article in the Ekoloji (Issue 107, 2019), entitled “Big Data Application Issues in the Agricultural Modernization of China”. This paper points out that the development of agricultural informatization is an important part of agricultural modernization in China. Big data analysis is an important means to analyze agricultural production and management information. Big data analysis can improve the accuracy of analysis and prediction. In terms of data collection and preservation, this approach is more flexible when considering the breadth of the problem.(Far;Rezaei-Moghaddam, 2018) It can not only solve the problem set in advance, but also solve the sudden problem. On the basis of the construction and development of modern agricultural technology system, it is of great significance to construct big data central system. Data and agricultural system construction, basic theory research, baseline data construction, intelligent model development and system platform must be considered. At the same time, we must strengthen the data consciousness, perfect the data legislation, and share the data publicly under the premise of ensuring the information security. However, big data in the field of agricultural production and management big data collection, there are still some obstacles. The development of this field depends on the advanced application of technology and the strengthening of information technology consciousness, as well as on the construction and perfection of the system level.

On the basis of the above research, from the point of view of promoting agricultural informatization, this paper uses block chain technology combined with edge computing network to calculate and store service resources to realize the acquisition, data processing and storage of large-scale intelligent agricultural regional information. Thus, an intelligent agricultural system is constructed, and a comprehensive, open and multifunctional agricultural science and technology information system under the network environment is gradually built. The results show that the application of intelligent information technology in agriculture and the exploration of network system from general information service to knowledge service are of practical significance.

2 Idea Description

At present, agriculture in China is in a historical period of transformation from traditional agriculture to modern agriculture. Although the developed countries have carried out agricultural informatization after the completion of industrialization and agricultural mechanization, we can not wait until all industrialization is realized before developing agricultural informatization, but can only adopt the mode of industrialization and informatization at the same time. Vigorously develop practical and easy-to-use agricultural information technology to promote the process of agricultural modernization (Lamontagnegodwin et al. 2018). Taking Hubei Province as an example, this paper constructs the design of intelligent agricultural regional information matching system according to the actual situation of Hubei Province.

2.1 System design

(1)The system is based on the Hubei science and technology information port and its 14 cities and states science and technology information network, and takes the provincial science and technology information port as the center to form the provincial high-speed backbone network system of the provincial city and state interconnection, and radiates to the county (district) and township.

(2)The standard protocol TCP IP of Internet is used to improve the openness and practicability of the network by using Web technology, component technology, server browser (S B) service mode, setting up information publishing, communication and query platform.

(3)Expand and improve the provincial and municipal network center database platform, on the basis of the existing, add agricultural information system special database server and supporting software; At the same time, it is necessary to properly add development platform and external equipment to improve the ability of information

processing, processing and input / output.

(4)Improve the network security management facilities at the provincial and municipal levels, adopt firewall products with excellent security performance, while supporting a large number of users to access concurrently, reduce and resist the infringement from the outside world.

(5)Through the five networks interconnection platform of the provincial capital and docking with other networks in the province, the extensive resource sharing can be realized (Zhu et al. 2018).

2.2 Hardware design of intelligent agricultural regional information matching system

In this paper, an intelligent agricultural regional information matching system is designed based on block chain technology, the hardware of the system is composed of physical layer, block chain layer and data application layer. The physical layer is responsible for collecting and uploading the crop data, the block chain layer is responsible for storing and encrypting the data to ensure that it is not tampered with, and the data application layer is mainly used to store and query the text data.

(1) physical layer

The physical layer is a data acquisition layer, a local area network is formed by self-organization of various wireless sensor nodes and a camera, various data acquisition is realized, the edge gateway is responsible for analyzing and processing the collected data. The edge gateway encapsulates the data in a JSON format and uploads it to the data application layer in a publish mode.

(2)data service layer

The data service layer is a data storage layer, which consists of two parts: block chain and edge computing, which are used to store data and provide computing power for devices that do not have computing power. The data transmitted by the physical layer is temporarily stored in the edge node as backup. At the same time, the edge gateway provides the computing power needed to reach consensus in IPFS and blockchain, and reduces the delay. The data stored in the block chain is stored in the block chain in JSON format, in the form of a transaction in the block chain. In the block chain system, an external attacker cannot obtain any file data because the system simply stores the content hash value of the file in it. At the same time, the data can be stored directly in the block chain, which can ensure the integrity of the stored data.

(3) data application layer

The data application layer is composed of IPFS and cloud server, which is used for the storage and query of files. The files are uploaded from the physical layer to the cloud server cache through the edge gateway, and the IPFS file storage mechanism is used. The files cache on the cloud server are transferred to the nodes of the network for storage through point-to-point transmission, and the location of the nodes where the files are stored is stored in the distributed hash table. At the same time, the content hash value is obtained according to the stored file, which is used to address and verify the stored file, and finally the obtained content hash value is passed to the edge computing gateway through the cloud server as transaction information (George and Andreas 2018).

2.3 Software implementation flow of intelligent agricultural regional information matching system

Based on the above system hardware design, the system software implementation flow is designed, and the software implementation flow is shown in fig. 1.

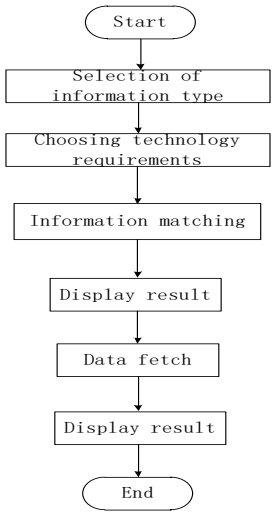

Fig. 1 flow chart of system software implementation

The user can match the relevant information that matches the information entered by the user by entering the relevant information text. If the user does not select the directory of the technical field in which the information is located, the user will get the relevant technical information in all fields (Yang and Sun 2017). After the user selects the technical field, the user will get all the technical information that matches the user input text information in the technical field.

3 Results

In order to verify the effectiveness of the intelligent agricultural regional information matching system based on block chain, the experiment is carried out to verify the effectiveness of the intelligent agricultural regional information matching system proposed in this paper. The simulation environment is Intel Core2.30GHz, 4GB memory, and the operating system is Ubuntu10.04,. The experimental data come from Matlab software. In order to verify the accuracy of information matching in this paper, the error of information matching in this paper is tested, and the results are shown in Table 1.

Table 1 Information matching error of this system

	wind speed（m/s）			temperature （℃）		
number of experiments	actual value	matching value	matching error	actual value	matching value	matching error
1	36.5	36.4	0.3	28.6	28.6	0
2	32.6	32.7	0.3	27.5	27.5	0
3	32.7	32.7	0	22.3	22.2	0.45
4	30.5	30.4	0.32	23.7	23.6	0.42
5	37.5	37.3	0.53	25.5	25.4	0.39
6	36.2	36.1	0.27	26.9	26.9	0
7	37.5	37.5	0	23.4	23.4	0
8	35.3	35.3	0	24.5	24.2	0

The data in Table 1 show that in the process of matching agricultural regional information, the matching error is less than 0.6 m / s, and the three matching data are consistent with the actual value. The above data show that the error of information matching in this paper is small, the reliability is strong, and the user can provide accurate

data basis.

4 Discussion

Block chain, as a key technology of digital currency, securely records all currency transaction information in a decentralized distributed ledger. A linked list data structure constructed by a hash pointer, which is a pointer to the hash value of the data storage location and its location data, which can not only determine the location of the data store. In each block chain, each block contains block head and block content, in which block head contains version number, parent block hash value, Merkel tree root, timestamp, random number and target threshold, and block content contains transaction number and transaction set. The structure of block chain makes it have some important characteristics, such as decentralized, untampered, open and transparent, secure encryption and so on. In this paper, the block chain technology is applied to the design of intelligent agricultural regional information matching system. Record transactions can be managed without personnel participation, thereby reducing operating costs and improving the efficiency of shared services.

5 Conclusion

In this paper, an intelligent agricultural regional information matching system based on block chain is designed. The data is stored by using the characteristics of decentralization and untampering of the block chain system to ensure the reliability of the data, and the data storage is not secure and easy to be tampered with. Traceability of agricultural products and other difficult problems, at the same time, can speed up the processing and transmission of data, reduce delay, save costs, reduce equipment complexity and management. It provides a new idea for the application of blockchain and has a wide range of application value in the fields of intelligent agriculture and data storage.

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