Design and implementation of domain economy intelligent management system based on big data analysis

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ABSTRACT

The subsystems in a complex system are not independent of each other, but interrelated, and because they are in different micro-level and macro-level, this makes the complex system hierarchical. In the process of rapid economic development, the integration of economics and management is deepening. Applying the statistical analysis method of big data to regional economic management can find out the rules of management and operation, improve the efficiency of management and promote the healthy development of regional economy. This article discusses the application of big data analysis method in the field of regional economic management, and puts forward an intelligent decision management model of regional economy based on AFSA (artificial fish swarm algorithm) driven by big data. The simulation results show that the stability of the model system is high, and it can still keep about 90% stability when there are many transaction sets. The results show that the method is feasible and available, and it has good performance. There are a large number of levels in the regional economic system, and their hierarchical structures are different. In order to realize the overall optimization of the system, we must actively coordinate the mutual interest relationship between elements and levels.

Keywords: Complex system, Regional economy, Big data, Intelligent management

1. INTRODUCTION

With the rapid development of society, decision-making problems are becoming more and more complicated. The limitations of human cognitive problems and the uncertainty of the objective world itself make decision-making information often need to be expressed in the form of fuzzy numbers when actually dealing with problems [1]. How to quickly find information from a huge amount of data, turn information into operational knowledge, and put knowledge into application has become the basic skill of knowledge and technology innovation, grasping business opportunities, enhancing competitiveness and regional economic decision-making [2]. There are a large number of levels in the regional economic system, and their hierarchical structures are different. Some levels have industrial structure, while others have regional structure [3]. The statistical analysis method of big data relies on information technology, which plays a guiding role in regional economic management. Its scientific and accurate calculation method effectively improves the work efficiency, and achieves the effect of economic management on the basis of promoting the stable development of regional economy [4]. Becase the complex system is a multi-level and multi-factor system, in order to realize the overall optimization of the system, it is necessary to actively coordinate the mutual benefits among the factors and levels.

Usually, a complex system contains several subsystems, and it also has the characteristics of large space-time span and high dimension. The subsystems in a complex system are not independent of each other, but interrelated, and because they are at different micro-level and macro-level, this makes the complex system hierarchical [5]. For managers in a region, faced with the constant changes and updates of all kinds of information, there are more and more decision-making factors to consider, and the relationships among various factors are becoming more and more complex, which affects the management decision-makers to make correct and scientific decisions [6]. As a representative complex system, compared with the general system, the regional economic system shows complexity in behavior, relationship and structure, in addition to some common characteristics, such as environmental adaptability, correlation, integrity and purpose [7]. Economic decision-making must have scientific decision-making procedures to avoid decision-making mistakes [8]. In this article, driven by big data, an intelligent decision management system of regional economy based on AFSA is proposed.

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2. DESIGN AND IMPLEMENTATION OF INTELLIGENT MANAGEMENT SYSTEM FOR REGIONAL ECONOMY

2.1   Application of big data in intelligent management of regional economy

When it is in the corresponding time, the previous software can't handle the data reasonably. Instead, it takes a reasonable way to optimize the process and enhance the decision-making power, which belongs to a diversified and massive information resource. The statistical analysis method of big data relies on information technology, which plays a guiding role in economic management. In the process of rapid economic development, the integration of economics and management is also deepening. By applying the statistical analysis method of big data to regional economic management, we can find out the management operation rules, improve the management efficiency and promote the healthy development of regional economy [9]. As far as big data technology is concerned, it is not only to master a lot of data information, but also to process the data professionally. Big data statistical analysis can realize all-round collation and analysis of market information data, which provides high-quality technical and theoretical support for the formulation of regional long-term development strategy. The decision-making of economic units and enterprise units should grasp the frontier information of market development in the first time, and submit valuable information to decision makers through big data analysis to improve the speed of information transmission. Compared with traditional data analysis methods, big data analysis technology is more diversified, which can not only analyze basic data, but also integrate regional structural or unstructured information. The characteristics of big data and data mining structure are shown in Figure 1.
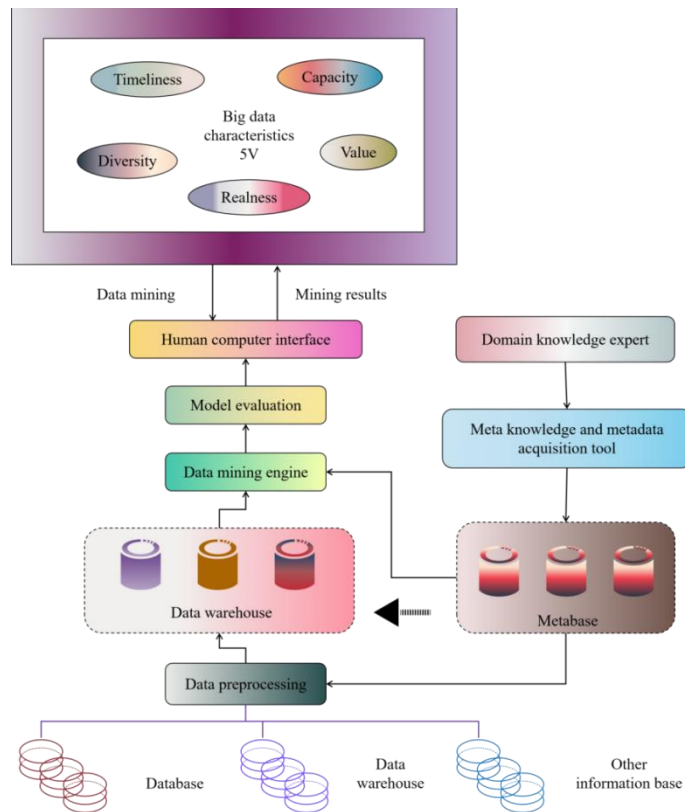

Figrure 1. Big data characteristics and data mining structure

From the perspective of economic management, in the daily operation and management process, enterprises must make adjustments to various business products and enterprise development plans in accordance with relevant policies and regulations. Based on the big data analysis method, coordinating the internal resources of enterprises can realize the rational allocation of resources, maximize the utilization rate of resources, and then reduce the cost of enterprises. In addition, the development of regional economy depends on managers' decisions and whether they can respond effectively to risks. The risk judgment by statistical analysis of big data is efficient and accurate, which can avoid the waste of resources and improve the efficiency of employees' work. With the continuous development of economy, the whole region should also be constantly adjusted and changed. The old management mode has ceased to exist, and it has been replaced

by a brand-new management mode that conforms to the development of the new period [10]. After using the statistical analysis method of enterprise big data, it provides a strong backing for the formulation and management of enterprise management decisions, and steadily improves the level of regional economic management. Looking at the past data analysis, it is found that the economic development has certain rules to follow, but it is restricted by various factors, which affects the statistical function and finally leads to the prediction results deviating from reality [11]. By using the big data analysis method, we can combine massive information and infer the macro-laws of current economic development with the aid of computer, which plays a supporting role in economic management. There are many levels in the regional economic system, and their hierarchical structures are different. Some levels have industrial structure, while others have zoning structure. Because the complex system is a multi-level and multi-factor system, in order to realize the overall optimization of the system, it is necessary to actively coordinate the mutual benefits among the factors and levels. Based on this, this article discusses and analyzes the design and implementation of regional economic intelligent management system based on big data analysis method.

2.2 Construction of intelligent management system for regional economy

Regional economy is an economic system formed in a certain region, which covers all sectors of the regional national economy. In the process of operation, it is organically linked with the production, exchange, distribution and consumption of the society, with natural resources and the environment, and with the outer margins and regions. The coordination of economic and environmental system is a state and the most important feature of the dynamic development of the system. Although the system is very complex, the objectivity of its operation and the regularity of its internal structure urge us to get rid of the static thinking mode, cross-sectional analysis method and single qualitative analysis, but to describe and analyze its complex interrelations in a dynamic and quantitative way, so as to find out some internal laws of the coordinated development of the system and the basic criteria for measuring the coordination of the system.

In the regional economic system, the resource allocation, production layout, spatial structure and industrial structure all show its hierarchy. The culture of the system. Due to the differences or differences in geographical location, natural conditions, ecological environment and socio-economic foundation, regional economies with different characteristics have been formed in the process of economic development, showing obvious regionalism. The regional economic optimization model based on AFSA is shown in Figure 2.
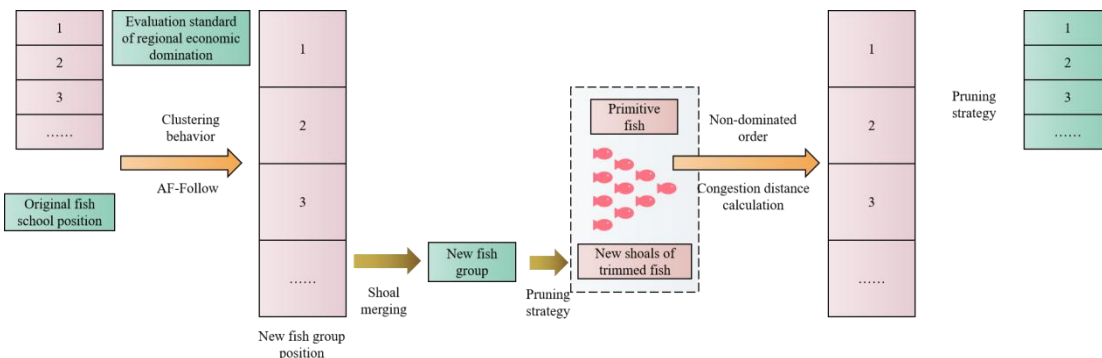

Figure 2. Regional economic optimization model

Income, output value and expenditure are the most commonly used target indicators in the regional economic system. Through the analysis and research of the existing data, this article selects the output value as the decision-making goal to promote the rapid development of regional economy. For a region, to realize the maximum gross output value of its economic region, the key is to find the optimal situation. An economic zone is usually composed of several independent regions, which constitutes the so-called event set, which can be recorded as:

$$A_1 = \{a_1, a_2, a_3 \ldots, a_m\} \tag{1}$$

Where A_1 refers to the event set of the first layer. The situation is as follows:

$$S_1 = \{(a_1, b_1), (a_1, b_2), (a_1, b_3) \ldots, (a_m, b_1), (a_m, b_2), (a_m, b_3)\}$$
$$= \{s_{1,1}, s_{1,2}, s_{1,3}, \ldots, s_{m,1}, s_{m,2}, s_{m,3}\} \tag{2}$$

Its corresponding situation matrix is:

$$S_1 = \begin{pmatrix} S_{11} & S_{12} & S_{13} \\ S_{21} & S_{22} & S_{23} \\ \cdots & \cdots & \cdots \\ S_{m1} & S_{m2} & S_{m3} \end{pmatrix}$$

(3)

Where S_1 refers to the situation matrix of the first layer. If the following conditions are met:

$$\xi^k\left(x^{\min}\right) = \min\left\{\xi^k\left(x^j\right): j \in I^i\right\} < \xi^k\left(x^i\right)$$

(4)

Then x^i moves to $x^{\min}$; Otherwise, try group behavior. Group behavior is characterized by moving to the center of x^i 's "visual attention range", which is defined as:

$$\bar{x} = \frac{1}{np^i} \sum_{j \in I^i} x^j$$

(5)

The decision model established in this article is as follows:

$$\max Z_1 = \sum_{i=1}^m \sum_{j=1}^3 X_{ij} r_{ij}$$

(6)

$$\text{s.t.} \begin{cases} \sum_{j=1}^3 X_{ij} = 3 \\ 1 \le \sum_{i=1}^{13} X_{ij} \le 11 \end{cases}$$

(7)

Type, when $X_{ij} = 0$, refers to the situation S_{ij} is not accepted and adopted; When $X_{ij} = 1$, it means that the situation S_{ij} is accepted and adopted.

Regional economy is an economic system formed in a certain region, which covers all sectors of the regional national economy. In the process of operation, it is organically linked with the production, exchange, distribution and consumption of the society, with natural resources and the environment, and with the outer margins and regions. The main characteristics of economy: besides the basic characteristics of integrity, openness, dynamics and complexity, the economic system also has the following characteristics: systematic comprehensiveness. It is mainly manifested in the comprehensiveness of regional economic development resources utilization, production layout, environment, combination and allocation of economic elements, and economic management.

3. RESULT ANALYSIS AND DISCUSSION

Because of the concentration of natural environment and human activities, the environmental system field has the characteristics of centralized distribution and differential distribution. For example, human activities are mainly concentrated on the land, so the concentration of the destruction of the environmental system on the land is much more obvious than that on the ocean. This different geographical distribution makes the study of regional environmental system very important. Actually, each region has its own unique environmental system, so we should pay attention to the characteristics of the region while grasping it as a whole. In the regional economic system, the resource allocation, production layout, spatial structure and industrial structure all show its hierarchy. Due to the differences or differences in geographical location, natural conditions, ecological environment and socio-economic foundation, regional economies with different characteristics have been formed in the process of economic development, showing obvious regionalism.

Any environmental system has the ability to self-adjust to the best or better state. The self-adjustment of the system is a natural process, but due to the slow and long-period nature of the natural process, this self-adjustment ability of each system is limited. Stability and variability of the system. The environment is in the natural process and the interaction of human social behavior. Due to the changes of various elements, the system is bound to be in the process of constant change, which is random but measurable to a certain extent. With the intensification of market competition and the

development of information society demand, it becomes more and more important to extract all kinds of required information from a large amount of data. This demand not only requires online services, but also involves a large amount of data for decision-making. Decision support system has a large number of non-standardized, non-standardized or incomplete data. In order to optimize the performance of analysis and processing, it is necessary to denormalize the data structure. Figure 3 shows the precision comparison of several algorithms.
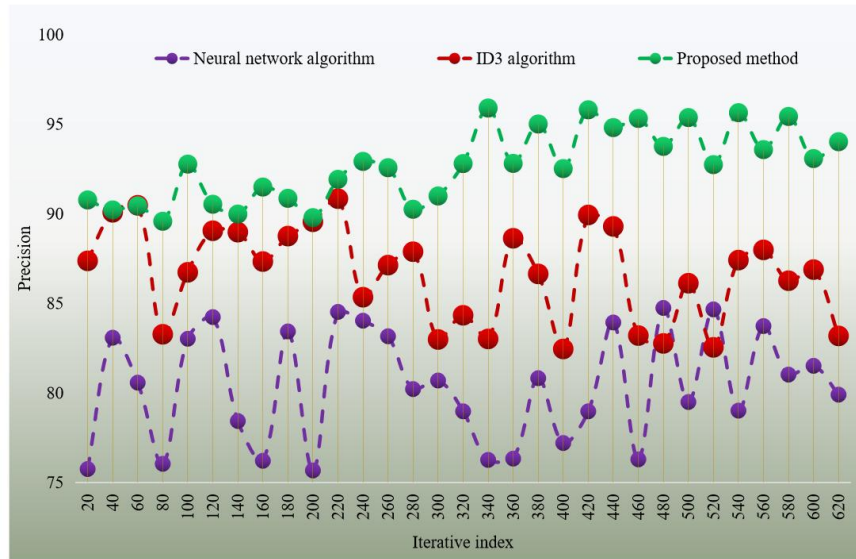

Figure 3. Accuracy comparison results of several algorithms

In order to get a comprehensive overall evaluation of the evaluated thing, it is necessary to synthesize the indicators reflecting all aspects of the matter. In the synthesis, due to the imbalance of the development of the physical objects themselves, some indicators should play a larger role in the synthesis level, while others should be smaller. Information fusion technology is to use the information of multiple data sources to comprehensively handle a certain transaction or goal. Figure 4 shows the running time comparison of the system.
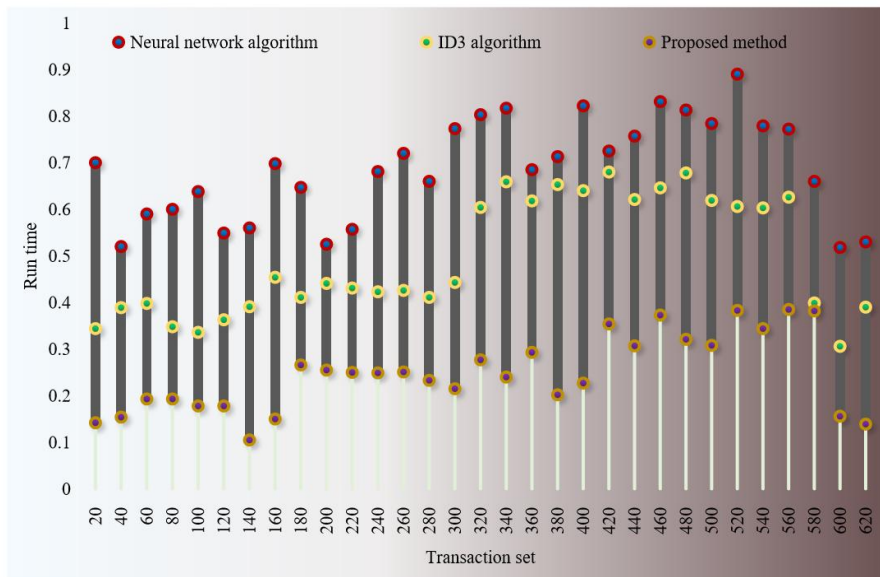

Figure 4. Comparison results of running time of the system

As a relatively complete organic system, the regional economy is closely related to each other, which is embodied in the organic combination and stable development of economy, education, science and technology and culture in the region. Figure 5 shows the stability of the system.
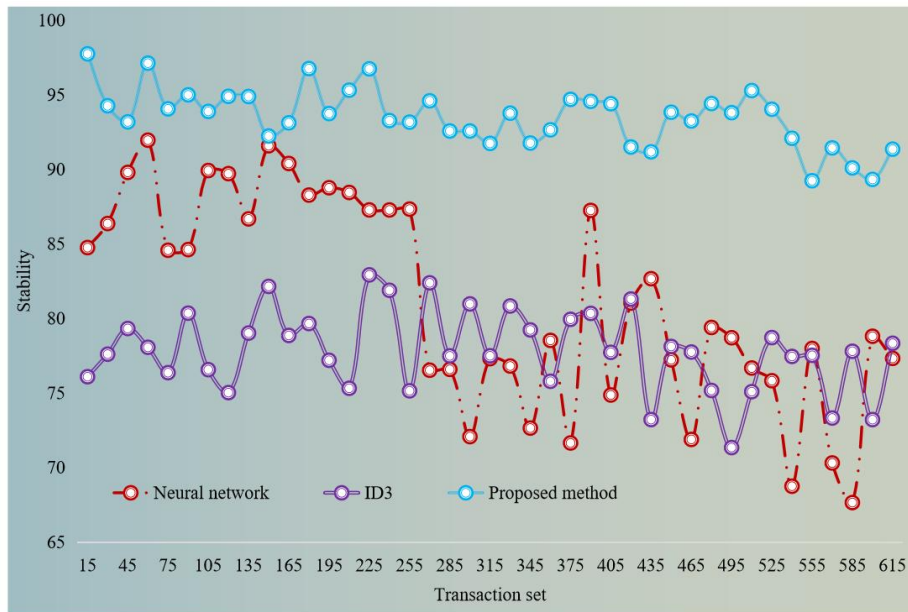

Figure 5. Stability results of the system

The simulation results show that the intelligent decision-making management model of regional economy based on AFSA has high stability, and it can still maintain about 90% stability when there are many transaction sets. The experimental results in this section show the feasibility and availability of the method proposed in this article, and it has good performance. Scientific application of statistical analysis methods of big data is helpful to promote the development of regional economy, and the development of regional economy can not be separated from the support of big data information. Using big data analysis can not only help enterprises to prevent risks, but also reduce costs and control the market development trend. Based on the results of big data analysis, rational planning of financial management can maintain the vitality of regional economic development.

4. CONCLUSIONS

With the advent of the information age, various industries are facing certain challenges while developing. Big data is an indispensable information dissemination foundation in the information age and plays an irreplaceable role in various fields. In the new era, China has gradually stepped up the modernization of economic construction, and clearly understood the role of big data technology. Scientifically using the statistical analysis method of big data can not only improve the core cohesion of enterprises, mobilize the enthusiasm of staff, point out the direction for the development of enterprises, but also realize the leap-forward development of regional economy. Using big data analysis to carry out regional economic management is the theoretical induction of overall planning of regional management. This article discusses the application of big data analysis method in the field of regional economic management, and puts forward an intelligent decision management model of regional economy based on AFSA driven by big data. The final simulation results show that the stability of the model system is high, and it can still maintain about 90% stability when there are many transaction sets. The experimental results show that the method proposed in this article is feasible and available, and it has good performance. Therefore, it is extremely important to deeply study the application of big data in economic management. Will be further explored in the follow-up.

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