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Reform and Innovation of Government Public Service Algorithm Model in the Era of Big Data

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Abstract. With the continuous development of information technology, data is being generated and accumulated at an unprecedented speed. Big data policies have gradually extended from the overall plan to major industries and various sub-fields. The development of the industry has risen to the national strategic level. In order to provide big data Development provides a good environment. The government has issued relevant policies and regulations at the national level to conduct top-level design and system deployment of the national big data development strategy. The purpose of this article is to organically integrate public management with the advanced information technology of big data algorithms through interdisciplinary, and provide theoretical basis and technical support for the innovation of government public services in my country. To solve the difficulties and challenges encountered by government public service algorithms in the big data environment and the limitation of the problem scale of government public service algorithms under traditional platforms, the MapReduce model is used to transplant government public service algorithms to the Hadoop platform for research. The government public service model algorithm is MapReduce, and the algorithm of the government public service model under the Hadoop platform is analyzed experimentally from the solution quality and problem scale of the algorithm. The experiment shows that after transplanting the government public service model algorithm to the cloud computing platform, the price of the optimal solution for the public service is calculated to be 1,756,633,690 yuan/1,000 square meters.

Keywords: Big Data Algorithm, Government Public Service, Change and Innovation

1. Introduction
With the continuous development of computer technology and network technology, the new term "big data" has emerged [1-2]. It is currently a hot topic in academia and industry [3-4]. Although the prototype of related theories has been produced for a long time, for my country, the proposal and overall development of big data, especially in the application of government departments, are relatively young [5-6]. At present, my country has entered the era of big data, and information technology is also subtly affecting various industries in society [7-8].

In the research on the reform and innovation of government public service models in the era of big
data, many scholars have studied them and achieved good results. For example, Tae-Min S believes that in the process of purchasing public services, the Chinese government does not have a unified standard on the boundary of public service purchases. Even in provinces and cities where the government purchases public services earlier, they still feel vague about the boundary of public service purchases. Qing [9]. Jin Z believes that although government functions can be used as an important basis for dividing the scope of the purchase of public services, the imperfection of existing relevant laws and excessive emphasis on the government’s input and output during the period of participation in relevant public services limit its role and ultimately lead to the accuracy of boundary definition is weak [10].

In this paper, the government public service model algorithm is transplanted to the cloud computing platform for research, in order to solve the limitation of the government public service model algorithm brought by the big data environment. In this paper, the standard government public service model algorithm is MapReduce, and the algorithm of the standard government public service model under the Hadoop platform is analyzed experimentally from the solution quality and the problem scale of the algorithm.

2. Reform and Innovation of Government Public Service Models in the Era of Big Data

2.1. Structural Design of Government Public Service Model

In order to shape the form of government in the direction of modernization, it is also very important to use and understand the context of information technology and big data. The reshaping of government forms mainly include:

(1) The organizational structure of the Chinese government is a unity of "bureaucratic system + democratic centralism". The "bureaucratic system" refers to the division of various regions of the government into one piece, and on this basis different government departments are divided One piece is cut into one piece, thus forming a fusion organization system. The comprehensive popularization of big data applications has shaken the government's information monopoly position, deepening the horizontal connection between the government and social groups and the public, and the vertical monopoly structure is gradually "loose".

(2) Traditional horizontal governments have less communication and separate governance. The rules and procedures of establishing independent departments are only responsible for the higher-level government. This kind of fragmented governance lacks interaction and coordination, and there are often the drawbacks of multiple political outreach and even multiple departments involved in completing the tasks.

2.2. The Foundation of the Analysis Formula Model for the Reform of the Government Public Service Model

(1) Euclidean distance

$$S_i = \sum_{j=1}^{n} S(D_{ij})$$

In this experiment:

$$D_{ij} = \frac{1}{d_{ij}}$$

(2) The fitness value $f(i)$ of public services is adjusted to $f_s(i)$ according to formula (3):
Calculate the adjusted fitness value of each area in the public area, and choose according to its adjusted fitness value in the selection stage.

(2) Public service mode parameter setting
Consult the relevant literature, this article sets the regional crossover probability to 0.7 and the price change probability to 0.1. This parameter setting can take into account the optimization ability and convergence of the algorithm.

2.3. Map Reduce of Optimized Government Public Service Model Algorithm
The map phase completes the fitness value evaluation work, and the reduce phase completes the government public service model operator operation. Based on the big data environment and the MapReduce model, a series of optimization studies have been carried out on the government public service model algorithm.

(1) The main tasks of the map phase
1) Calculate the distance $d_{ij}$ between areas;
2) Calculate the similarity $D_{ij}$ between regions;
3) Calculate the sharing degree $S_i$ of the area in the sub-area;

(2) The main working steps of the Reduce phase
1) Roulette selection operation based on adjusting fitness value and optimal saving strategy;
2) Adaptively adjust the regional crossover probability and the probability of price changes;
3) Optimize cross operation.

3. Experimental Research on Reform and Innovation of Government Public Service Models in the Era of Big Data

3.1. Experimental Background
With the continuous development of information technology, data is being generated and accumulated at an unprecedented speed, and the scale of problems encountered in practical applications and scientific research is also getting larger and larger. In order to solve the problem of government public service model algorithms in the big data environment the difficulties and challenges of the government public service model algorithm and the limitation of the problem scale in the traditional platform. This chapter uses the MapReduce model to transplant the government public service model algorithm to the Hadoop platform for research.

3.2. Experimental Method
According to the characteristics of the data flow in MapReduce, the minimum heap technology is used in the selection operation, and the simple government public service model algorithm is implemented based on the MapReduce distributed parallel computing framework. The experimental results show that the parallel government public service model algorithm based on this framework is Practical ways to solve data-intensive problems. In the experiment, the initial area is randomly generated and loaded into the Hadoop file system. The Map phase completes the area fitness calculation, and the Reduce phase completes the selection, crossover, and price changes government public service model operator operations and records the best area.

3.3. Experimental Data Collection
The experimental data source of this article is to refer to the research data disclosed in the previous literature, enter the big data system library, automatically generate data groups with the same
characteristics through machine learning technology, randomly generate different sample groups, load the research Hadoop system, and then use Mapreduce Systematic experimental research.

4. Analysis of the Experimental Research on the Reform and Innovation of Government Public Service Models in the Era of Big Data

4.1. The Relationship between the Average Price, Minimum Price and Improvement Frequency of Public Services in the Government Public Service Model Algorithm under the Big Data Algorithm

This article fully considers the characteristics of stricter constraints and high difficulty in generating effective areas in the big data environment, and proposes a new initial public service coverage area generation method, which is expressed as follows:

Assuming that the size of the initial public service coverage area needs to be generated is N, first, a guided random probability generation method is used to generate n areas, where N is a multiple of n. Then copy these n areas, and the number of areas is N. In the end, the initial public service coverage area with the number of areas N is obtained. In this way, taking into account the characteristics of large-scale problems while meeting the diversity of the initial public service coverage area, the efficiency of the algorithm can be improved.

The improved experimental results are shown in Table 1.

Table 1. Government public service model algorithm

| Improved frequency | Lowest price (million) | Average price of public service (million) |
|--------------------|------------------------|------------------------------------------|
| 0                  | 2059                   | 2875                                     |
| 20                 | 1769                   | 1960                                     |
| 40                 | 1687                   | 1874                                     |
| 60                 | 1650                   | 1887                                     |
| 80                 | 1650                   | 1879                                     |

Figure 1. Government public service model algorithm

As shown in Figure 1, the optimal solution found by the standard government public service model algorithm under the cloud computing platform depends to a large extent on the initial area, and the government public service model operator operation makes little contribution to the algorithm evolution. The government public service model algorithm MapReduce is transplanted to the cloud computing platform, the scale of processing problems becomes larger, and it can better adapt to the big data environment. In the above-mentioned standard government public service model algorithm research based on the Hadoop platform, after 50 experiments, the optimal solution price is 1,756,633,690 yuan/1000 square meters, which is higher than the 167,828,341 yuan/1,000 obtained by optimizing the government public service model algorithm under the traditional platform m², that is,
the fitness value of the optimal solution to optimize the government public service model algorithm under the traditional platform in this experiment is higher than the government public service model algorithm under the cloud computing platform.

4.2. The Relationship between the Regional Scale and Running Time of the Government Public Service Model Algorithm under the Hadoop Platform

In the experiment, the crossover probability is set to 0.7, the mutation probability is 0.1, the size of the public service coverage area is 228, and the evolution termination condition is set to when the minimum price change in the public service coverage area is within 0.001 in 50 consecutive experiments, the evolution is terminated. By transplanting the government public service model algorithm to the cloud computing platform, the scale, speed and efficiency of the problem that can be handled are improved, and the transplantation is feasible. The specific conditions of the experiment are shown in Table 2.

| Area size (㎡) | Average convergence time of algorithm (s) | Minimum convergence time of algorithm (s) |
|---------------|------------------------------------------|------------------------------------------|
| 5000          | 0.378                                    | 0.064                                    |
| 10000         | 0.609                                    | 0.554                                    |
| 15000         | 1.709                                    | 1.411                                    |
| 20000         | 7.976                                    | 4.915                                    |

Figure 2. Regional scale and running time of government public service model algorithm

As shown in Figure 2, when the area is small, the algorithm processing time under the traditional platform is basically the same as that under the cloud computing platform. At this time, due to the small area, the problem scale is smaller, the actual running time of the algorithm is smaller, and the communication time is larger proportion. As the area increases, the running time gradually increases, and the proportion of the actual running time of the algorithm gradually increases. Although the solution quality and efficiency of the optimization algorithm have been significantly improved, as the scale of the problem increases, the processing time of the government public service model algorithm under the traditional platform is still unacceptable, that is, the government public service model algorithm processing problem scale based on the traditional platform Limited, it can no longer meet the needs of people in the big data environment. It is necessary to map the government public service model algorithm to improve the limitations of the big data environment on the government public service model algorithm.

5. Conclusions

With the advent of the era of big data, the types and scale of data in human society are increasing at a rate of several orders of magnitude. The government must learn to adapt to this social environment that is gradually surrounded by data, and continuously improve its own governance level and effectiveness in this process. With the help of the big data network platform, the democratization and
scientificization of government governance can be realized. All these will have a revolutionary impact on our country's government governance. Therefore, we must accurately grasp the new situation, quickly respond to new changes, and correctly adopt new measures. This chapter first studies the problem of limited scale of government public service model algorithm processing problems, transplants the government public service model algorithm to the cloud computing platform, implements it based on the MapReduce model, and presents the standard government public service model algorithm based on the MapReduce model. The implementation framework and method of the government public service model algorithm has expanded the scale of the government public service model algorithm, and the big data environment has improved the limitation of the government public service model algorithm. Aiming at the regional migration strategy of the MapReduce model, the optimized government public service model algorithm based on the MapReduce model implementation process and specific methods are given, which provides a reference for the MapReduceization of the government public service model algorithm.

References

[1] Tong L, Hong T, Jing-Hua Z. Research on the big data-based government decision and public information service model of food safety and nutrition industry [J]. Journal of Food Safety & Quality, 2015(1):366-371.

[2] Malomo F, Sena V. Data Intelligence for Local Government? Assessing the Benefits and Barriers to Use of Big Data in the Public Sector [J]. Policy & Internet, 2017, 9(1):7-27.

[3] Hardy K, Maurushat A. Opening up government data for Big Data analysis and public benefit [J]. Computer Law & Security Review, 2017, 33(1):30-37.

[4] Nur R H, Mukiyo W, Nurhardjadmo W, et al. Constraints of E-Government Implementation in Public Service - A Study on the Application of SIAKAD in STAIN Ponorogo [J]. Malaria Journal, 2017, 10(1):235-235.

[5] Malomo F, Sena V. Data Intelligence for Local Government? Assessing the Benefits and Barriers to Use of Big Data in the Public Sector [J]. Policy & Internet, 2017, 9(1):7-27.

[6] Qian Q, Liu W. Quality Credit Supervision Research Based on Minimum Dataset: With the Licensed Enterprises in Kunming of China for Case [J]. International Journal of Fuzzy System Applications, 2016, 5(2):64-73.

[7] Pyo S H, Kim Y H, Kim H S, et al. A Study on the Developing of Big Data Services in Public Library [J]. Journal of the Korean Society for Information Management, 2015, 32(2):63-86.

[8] Chatfield A T, Reddick C G. Customer agility and responsiveness through big data analytics for public value creation: A case study of Houston 311 on-demand services [J]. Government Information Quarterly, 2017, 35(2):336-347.

[9] Tae-Min S, Seewon R. Big Data Analysis Framework for Healthcare and Social Sectors in Korea [J]. Healthcare Informatics Research, 2015, 21(1):3-9.

[10] Jin Z. Research on evaluation of public sports service in stadiums based on FNN algorithm [J]. Cluster Computing, 2019, 22(6):13835-13842.