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Integration Technology of Distributed System Based on Multi-objective Hotopy Algorithm

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Abstract: With the progress and growth of society, the field of computer science and technology has also continued to improve rapidly. Human beings have conducted in-depth research on algebraic learning, solving multi-objective homotopy algorithm nonlinear equations and applying them to integrated technology systems of distributed systems. More and more people's attention. In order to solve the shortcomings of the existing research on the integration technology of the distributed system of the multi-objective homotopy algorithm, this paper uses the function equation and the integration of the distributed system in the distributed system integration technology based on the function of the multi-objective homotopy algorithm. On the basis of discussing the characteristics of the technology, the development tools and development environment of the distributed system integration technology based on the multi-objective homotopy algorithm are briefly introduced. And it discusses the workflow design of the model of the integration technology of the distributed system based on the multi-objective homotopy algorithm, and finally compares the data classification accuracy and operation of the application of the multi-objective homotopy algorithm in the integration technology of the distributed system with CGX, The SVN algorithm is compared and experimentally analyzed. The experimental data shows that the multi-objective homotopy algorithm is better than the CGX and SVN algorithms in data classification accuracy, and the classification accuracy is as high as 99.87%. In the running situation, the multi-objective homotopy algorithm and CGX are not much different.but the multi-objective homotopy algorithm is still better than CGX.

1. Introduction

With the popularization and development of computer technology, software systems are gradually moving from distributed and integrated systems. Distributed systems mainly include business processing systems, information systems, client systems and service systems.

Nowadays, more and more scholars pay attention to the design and application of various algorithms and technologies in the integration technology of distributed systems, and through practical research, they have also achieved certain research results. The algorithm proposed by Zoss BM utilizes the clustering technique and provides an effective method for realizing the dynamic reconfigurability of the design with new software service components. The algorithm is able to handle large system datasets and is also suitable for multi-level redesign problems. Taking the robot path planning class diagram as an example, the algorithm is compared with the similarity scoring algorithm [1]. Kubiuk Y describes the problem of applying a reinforcement learning-based adaptive method to assign computational tasks to nodes in a distributed Internet of Things (IoT) platform. IoT platforms are composed of heterogeneous elements, namely computing nodes. The methods, methods and algorithms of traditional distributed and parallel systems are not suitable for task assignment in IoT systems due to their own characteristics. Reinforcement learning methods allow you to solve the problem of building distributed systems due to the adaptive formation of sequences of computing nodes and corresponding computing tasks [2]. Khan NA proposes an optimal homotopy analysis algorithm using nonlinear reaction-diffusion systems. The algorithm is based on linearization, and the optimal decomposition of homotopy series solution is constructed by using Taylor series approximation of nonlinear equations. The proposed algorithm is numerically compared with the standard homotopy method to verify the computational efficiency and pertinence of the algorithm. The standard homotopy method is used for the analytical solution of reaction-diffusion systems. Numerical results show that the linearization-based algorithm improves the accuracy and convergence of homotopy series solutions. The algorithm can be further used for fast convergent series solutions of different types of partial differential equations [3]. Although the existing research on distributed system integration technology is very rich, the research on distributed system integration technology based on multi-objective homotopy is still insufficient.

Therefore, in order to solve the existing problems in the research of the integration technology of the existing multi-layer distributed system, the multi-objective homotopy algorithm is used for design and application in this paper. First, the function equation steps of the multi-objective homotopy algorithm and the distributed system are introduced. The characteristics of the integration technology, secondly, the development tools and environment of the distributed system integration technology based on the multi-objective homotopy algorithm are discussed, and finally the model architecture of the distributed system integration technology based on the multi-objective homotopy algorithm is designed. The application of the multi-objective homotopy algorithm in the integration technology of distributed systems is compared with the other two algorithms. The final experiment shows that the multi-objective homotopy algorithm proposed in this paper is effective in the integration technology of distributed systems.

2. Research on the Integration Technology of Distributed Systems Based on Multi-Objective Homotopy Algorithm

2.1. The Functional Equation of the Multi-Objective Homotopy Algorithm

This paper uses multiple objective homotopy algorithm functions to express the model design of distributed system integration technology. Its original purpose is to express the performance of various aspects of complex distributed system integration technology[4]. In this paper, the objective function of the data layer of the distributed system is selected first, and its use is to obtain the sum of squares of errors between the collected data and the estimated data, that is, the least squares criterion; in the second service layer, the objective function is selected, and its use is to consider the service The logical processing of the layer; the third message layer selects the target function, and its use is to consider the basic idea of asynchronous calling. The first objective equation is the sum of squared errors of the collected and estimated data, the imaging least squares criterion, which is expressed as:

$$k_1(H_1) = \lambda_1 \sum_{u=1}^{v} \left\{ ract - \sum_{y=1}^{X} tact^* H_1 \right\}^2 \tag{1}$$

Among them, v is the number of collected data; y is the number of data types contained in the data layer; λ_1 is a normalized constant, and tact is the data processing time. Select this data processing time, so that the sum of squares of the difference between the data and detection values caused by it is extremely small [5].

The second objective equation is the logical processing of the service layer. Under normal circumstances, the processing state of the service layer is very stable, that is, the imaging is relatively stable. If this factor is considered, the variance of the processing speed of the service layer should be minimized. The expression equation is:

$$k_2(H_1) = \lambda_2 \sum_{x=1}^{X} (H_{1y} - \overline{H}_1)^2 \tag{2}$$

Among them, $\overline{H}_1 = \sum^{X} H_1 / X$ is the average value of the processing speed of the service layer, and H_1 must be such that $k_2(H_1)$ is the smallest. At this time, the logical processing of the service layer is the most accurate. X is the number of data types contained in the data layer [6]. Similar to λ_1, λ_2 is also a normalized constant, so it can cooperate with other system layers for system operation, increase the accuracy of system processing results, and provide system services with higher value and quality [7].

The function of the objective function of the third message layer is to consider the basic idea of asynchronous synchronization, and the expression of its objective function is (3):

$$k_3(H_1) = \lambda_3 \left[\frac{1}{2} \left\| tact^* H_1 - ract \right\|^2 + \alpha \sum_{u=1} \left\| X_u * H_1 \right\| \right] \tag{3}$$

Among them, A is similar to B, and is also a normalization constant, C is the regularization factor, usually taking the value 0.02; D is the variance function vector matrix, that is, E is the G-th row of the F matrix vector [8]. The H matrix is listed as the U matrix. Optimize the accuracy of the message layer.

2.2. Integrated Technical Characteristics of Distributed Systems

In distributed system integration technology, there is an integrated host as the only integration node to collect the task information of each part of the system, and other hosts as computing nodes are responsible for accepting simulation tasks, computing and reporting data results. The integration node globally controls the status information of the task nodes, and assigns the corresponding task amount to the task nodes according to the performance status of the task nodes[9]. This integrated technology strategy is characterized by:

(1) The integrated node host controls the information of the entire system, can make a good decision on the task allocation of the node machine according to the situation of each node, and easily track the execution of the computing node [10].

(2) Since each computing node in the system only interacts with one integration node, the program algorithm is relatively simple and easy to implement [11]. However, there is only one integrated host in the system, and the information reported by the nodes needs to be processed by it, which undoubtedly makes the integrated host often run with a high workload. Therefore, the multi-objective homotopy algorithm proposed in this paper can play an optimization role in it [12].

3. Investigation and Research on the Ontegration Technology of Distributed Systems Based on Multi-Objective Homotopy Algorithm

3.1. Integrated Technology Development Tools for Distributed Systems Based on Multi-objective Homotopy Algorithms

Eclipse is used as the program code editor, debugger and compiler during development. Eclipse is a set of open source integrated development environment. Its powerful editing function makes the compilation of source code simpler and more convenient. It not only supports breakpoint debugging of java class files [13]. It supports breakpoint debugging of JSP files, which brings great convenience to software debugging. Eclipse also supports java plug-ins, plug-ins can provide more and more professional functions, which makes eclipse more flexible than the fixed-function IDE[14].

3.2. Integrated Technology Development Environment of Distributed System Based on Multi-Objective Homotopy Algorithm

BorlandJBuilder is the best Java development tool for creating a cross-platform environment and pure Java end-to-end solution based on JavaZ enterprise platform [15]. Jbuilder10.0 is a powerful rapid development tool (RAD) for developing EJB and java-based applications. It provides an integrated development environment and a large number of wizards for developing applications [16]. JBuilder greatly simplifies the development and configuration management of Web applications [17]. Web applications may contain some or all of the following technologies :HTMLXML, JavaSerVletS, JSPS, and Applets. JBuilder provides tools for the use of all these technologies [18].

4. Research on the Integrated Technology Design and Analysis of Distributed Systems Based on Multi-Objective Homotopy Algorithm

4.1. Design of Integrated Technology Model of Distributed System Based on Multi-Objective Homotopy Algorithm

The model structure of the integration technology of the distributed system based on the multi-objective homotopy algorithm mainly consists of four parts: the integration technology data layer, the multi-objective homotopy algorithm service layer, the multi-objective homotopy algorithm message queue layer and the integration technology client,the specific structure is shown in Figure 1:

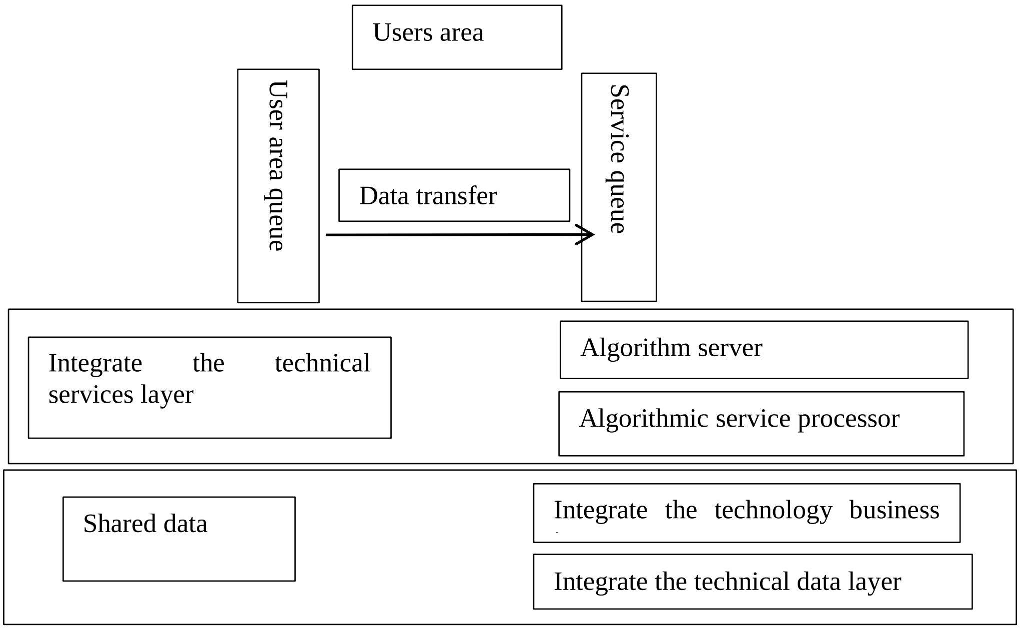

Figure 1. The integrated technical model structure of the distributed system of the multi-objective homotopy algorithm

(1) Integrated technical data layer

The integration technology is applied to the data layer and business logic layer of the distributed system, mainly the data processing logic of the control system, and the data layer is to divide the received data into corresponding categories.

(2) Multi-objective homotopy algorithm service layer

The multi-objective homotopy algorithm constructs a unified application service layer, and the multi-objective homotopy algorithm contained in it encapsulates the original logic components, which are realized through the service layer of the multi-objective homotopy algorithm.

(3) Multi-objective homotopy algorithm message queue layer

The multi-objective homotopy algorithm message queue layer is used to implement asynchronous calls between the server and the client. When the server cannot be online due to some faults, the client can store the call of the multi-objective homotopy algorithm to the server in the local message queue, so as to ensure the successful delivery of the message and realize the asynchronous call.

(4) Integrated technology client

The client of distributed system integration technology is the application program, which is used to invoke the functions provided by the service. The client application of the distributed integration technology will communicate with the service through the server.

4.2. Application of Integrated Technology of Distributed System Based on Multi-Objective Homotopy Algorithm

In order to measure the feasibility and effectiveness of the integration technology of the distributed system based on the homotopy algorithm, this paper has successively applied the data classification results of the homotopy algorithm and other algorithms in the integration technology model of the distributed system and the application of the distributed system integration technology. Experimental analysis and comparison of the operation of the homotopy algorithm,First of all, this paper randomly generates moment drop C,D and vector d_1,d_2 in the bad environment of MATLAB2010(b), in which C,D , d_1,d_2 obeys standard normality. x_1,x_2 takes $\frac{x}{2}$, u,v takes $\frac{y}{2}$. In this paper, a fixed termination value $\lambda = 0.2$ is selected. Under the same conditions as above, k are respectively in this paper. 10-dimensional, 50-dimensional, 100-dimensional, 150-dimensional cases run CGX, SVN and homotopy algorithms.

Table 1. Comparison of homotopy algorithms for distributed system integration technologies

X	Y	CGX	SVN	Homotopy Algorithm
10	20	53.206	53.207	53.218
50	30	97.502	97.496	97.526
100	40	145.456	145.435	145.523
150	50	352.235	352.214	352.268

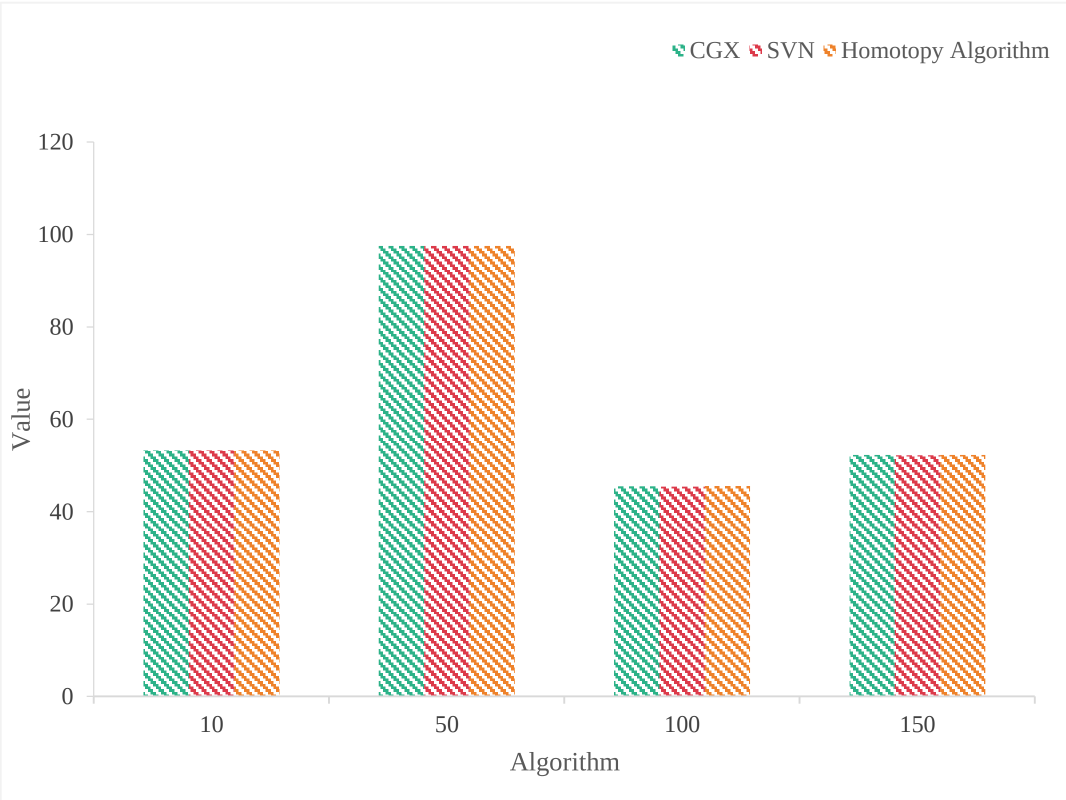

Figure 2. Comparison of homotopy algorithms for distributed system integration technology

As shown in Table 1 and Figure 2, the operation of CGX, SVN and the homotopy algorithm in the distributed system integration technology are compared. From the running results, the optimal value of the homotopy algorithm and CGX is similar. It shows that the homotopy algorithm is feasible and effective. At the same time, the application of the homotopy algorithm in the integration technology of distributed systems can obtain the optimal solution set on the entire regular path, which is convenient for the adaptive selection of parameters. However, CGX has no such effect.

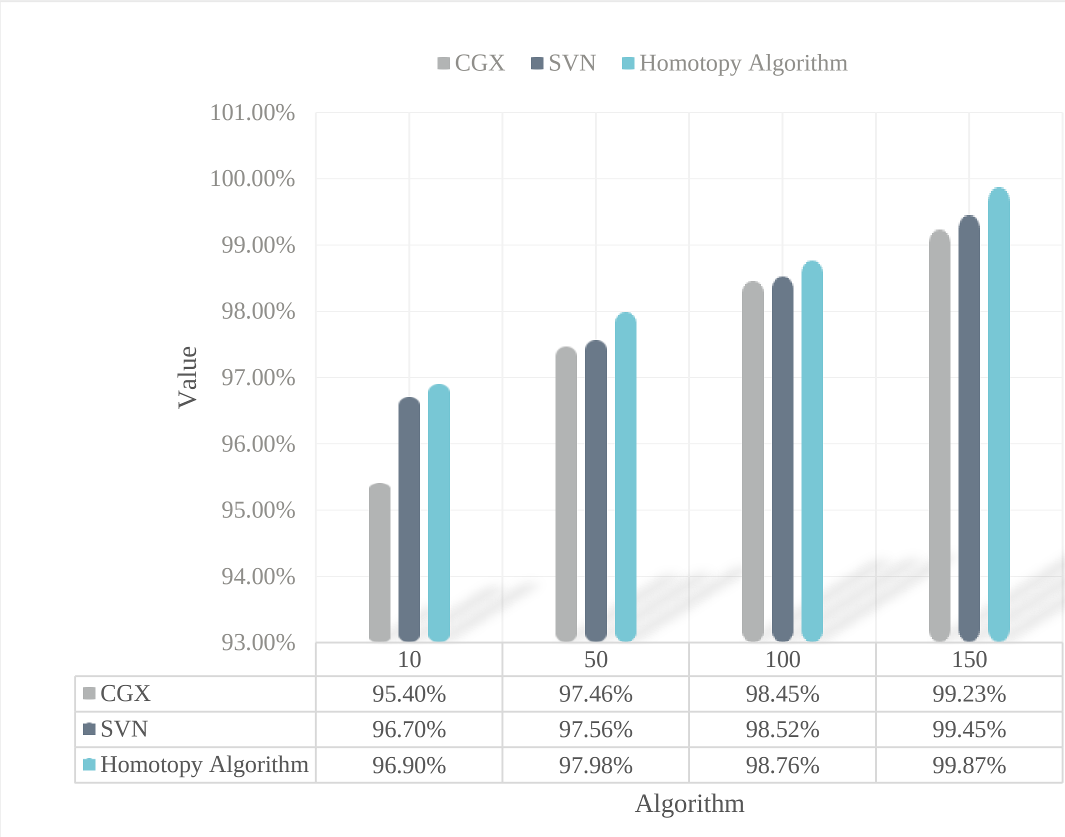

Figure 3. Comparison of classification accuracy of homotopy algorithm

Table 2. Comparison of classification accuracy of homotopy algorithm

Algorithm	CGX	SVN	Homotopy Algorithm
10	95.40%	96.70%	96.90%
50	97.46%	97.56%	97.98%
100	98.45%	98.52%	98.76%
150	99.23%	99.45%	99.87%

As shown in Figure 3and Table 2, the gray bar is the data classification accuracy of the CGX algorithm, the dark blue bar is the classification accuracy of the SVN algorithm, and the light blue bar is the data classification accuracy of the homotopy algorithm, by comparing the results of the data classification accuracy of CGX, SVN and homotopy SVM algorithms, it is found that the data classification accuracy of the homotopy algorithm is higher than the other two algorithms. This data experiment shows that the homotopy algorithm applied in the distributed system integration technology Have strong data classification ability.

5. Conclusion

Therefore, in order to enrich the research on the integration technology of distributed systems based on the multi-objective homotopy algorithm, this paper first briefly introduces the function equations of the multi-objective homotopy algorithm and the characteristics of the integration technology of distributed systems, and then discusses the multi-objective homotopy algorithm. Based on the analysis and discussion of the integration technology of the distributed system based on the multi-objective homotopy algorithm, the development tools and environment of the integration technology of the distributed system based on the multi-objective homotopy algorithm are investigated and designed. Secondly, the design and analysis of the model architecture of the integrated technology of the distributed system of the multi-objective homotopy algorithm is carried out. Finally, the experimental data is compared and analyzed for the application of the integrated technology model of the distributed system of the multi-objective homotopy algorithm designed in this paper. The final experimental results The applicability of the integration technology of distributed systems based on the multi-objective homotopy algorithm in this paper is verified.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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