Design of Rational Resource Scheduling Model in Cloud Computing

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Abstract: Resource scheduling in cloud computing environment is affected by network space allocation interference, resulting in poor balance of resource scheduling, in order to improve the performance of resource equilibrium allocation in cloud computing environment. A resource efficient scheduling method based on fuzzy control constraints for cloud computing environment is proposed. The subspace feature analysis method is used to construct the resource information flow model in cloud computing environment, and the characteristic scale of the network resource communication data is extracted, and the global resource scheduling fusion processing is carried out in the cloud computing environment. The constraint function of association rules for resource allocation is constructed, and the adaptive fuzzy weighted control method is adopted to optimize resource scheduling. The simulation results show that the proposed method is reasonable for resource scheduling in cloud computing and has a strong ability to balance resource allocation.

Keywords: Cloud computing; Resource scheduling; Feature extraction; Fusion

1. Introduction

In the cloud computing environment, users' demand for network resources is increasing, which promotes the development of resource network. With the increasing of resource scale, resource optimization and scheduling are needed, combined with resource allocation and big data mining model[1]. Resource scheduling model is designed to improve the service level of QoS network. Therefore, resource scheduling in cloud computing environment is of great significance to improve network task scheduling and resource management. Cloud computing environment is a computing method to realize the optimal allocation of network resource data. Resource scheduling in cloud computing environment can improve the sharing ability of resource allocation[2].

At present, the methods of resource scheduling under cloud computing include Potter spacer equilibrium scheduling, neural network classification resource scheduling and resource scheduling based on adaptive grid segmentation[3]n. By designing intelligent scheduling methods for cloud computing environment resources and balancing network resource allocation, a balanced scheduler is constructed and cloud extraction is extracted. The regularization of resource information in the environment is calculated, and a better scheduling equilibrium is achieved by using the corresponding data clustering method. In the reference literature [4], a design method of cloud computing environment resource balancing scheduler based on adaptive minimum mean square error constraint is proposed, and the minimum mean square error criterion is used to construct cloud computing. The adaptive equalization channel model of environmental resources transmission uses the simple Bias classification method for resource classification and scheduling, which has good data recall and checking ability. However, this method cannot meet the needs of real-time resource scheduling in computing complexity and computing overhead, and it needs to be improved[5].

In order to solve the above problems, a resource efficient scheduling method based on fuzzy control constraints for cloud computing environment is proposed. The subspace feature analysis method is used to construct the resource information flow model in cloud computing environment, and the characteristic scale of the network resource communication data is extracted. The constraint function of association rules for resource allocation is constructed, and the adaptive fuzzy weighted control method is adopted to optimize resource scheduling. Finally, the performance of the proposed method is verified by simulation experiments, which shows the superior performance of the proposed method in improving the resource scheduling capability.

2. Resource Data Flow Model and Its Preprocessing in Cloud Computing Environment

2.1. Resource data flow model in cloud computing environment

In order to achieve efficient resource scheduling in cloud computing environment, it is necessary to construct resource data information flow model in cloud computing environment, and nonlinear time series analysis method is used to reconstruct the characteristics of resource data

in cloud computing environment. Big data information processing and classification scheduling are carried out in the reconstructed feature distribution space[6]. In the network resource communication network, it is assumed that the resource scheduling grid model in the whole cloud computing environment is represented by a connected directed binary graph $G=(V,E)$.

The influence degree of the attribute of network resource communication resource allocation is $f(\vec{attr})$ and $f(\overleftarrow{attr})$ respectively, representing the characteristic attribute of classification attribute of network resource data. The feature attribute is reorganized by nonlinear time series, and the data information flow is obtained as follows:

$$P=\{p_1,p_2,\mathbf{L}\ p_m\},m\in N \tag{1}$$

The flow of resources is:

$$flow_k=\{n_1,n_2,\mathbf{L},n_q\},q\in N \tag{2}$$

In the upper form, the q denotes the optimal resource allocation node location in multiple priority tables, and the scheduling sequence number is n_q, the network resource allocation information flow is expressed as the total number of scheduling tasks.

2.2. Feature extraction of network resource data

Building a resource data flow model in a cloud computing environment is described as:

$$\begin{aligned} &x=(x_1,x_2,...,x_n)\\ &y=F(x)=(f_1(x),f_1(x),...,f_m(x))^T \end{aligned} \tag{3}$$

Within the communication time period DTS, the disruptions to resource transmission in cloud computing environments are:

$$DTS(v_i,p_q)=EST(v_i,p_q)-p\_available[q] \tag{4}$$

In the resource scheduling decision process of network nodes, the constraint conditions are satisfied:

$$\begin{aligned} &DTS(v_i,p_q)>W(v_{cp,i},p_q)\\ &\text{且}EFT(v_{cp,i},p_q)<EST(v_i,p_q) \end{aligned} \tag{5}$$

The queue length n for forwarding network resource data packets in slot can be expressed as:

$$q(n+1)=(q(n)+a(n)I_{\{u(n)=1\}}-d(n+1))^+ \tag{6}$$

The priority order of resource scheduling in cloud computing is expressed as follows:

$$RTT_s=(1-a)\times RTT_s+a\times RTT \tag{7}$$

In order to improve the balance of resource scheduling, a multidimensional scale decomposition method is used to prioritize resource scheduling.

3. Resource Scheduling Algorithm Optimization

3.1. Fuzzy Control constraints for resource scheduling

This paper presents a resource efficient scheduling method based on fuzzy control constraints in cloud computing environment. Subspace feature analysis method is used to construct resource information flow model in cloud computing environment, assuming that the characteristic scale of resource information flow is: at the task priority stage[7], the dynamic weight of executing task is defined as:

$$DR(p_i,n_j)=rwd_{ik}\times PET(p_i,n_j) \tag{8}$$

For different allocation categories of cloud computing resource scheduling, the inertia weight of feature fusion is d_i, where the priority order of resource scheduling is $d_1,d_2,\mathbf{L},d_m$. The fuzzy weighted constraint method is used to reconstruct multi-dimensional resource scheduling. A typical eigenvalue $c_1,c_2,\mathbf{L},c_n$ is obtained and processed, so as to improve the clustering ability of resource scheduling

3.2. Information fusion and output of resource scheduling

In the cloud computing environment, the global resource scheduling fusion processing is carried out, and the fuzzy grid clustering algorithm is used to carry out the classification attribute weight pairing of network resources. The clustering characteristic attribute set of resource scheduling in cloud computing environment is represented as follows:

$$S=(U,A,V,f),\quad P\ \mathbf{I}\ Q=f,\quad A=P\ \mathbf{U}\ Q \tag{9}$$

Construct a time allocation window for resource scheduling as shown in figure 1.

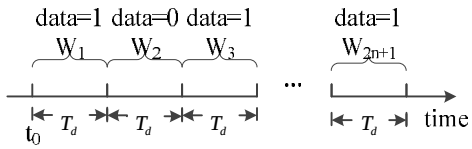

Figure 1. Time allocation window of network resource communication resource scheduling

The fuzzy grid clustering method is used to classify the attribute of network resource communication resources, and the time window function of resource scheduling is obtained:

$$x_1+x_2+\mathbf{L}+x_{m+1}=T+t-m\times t \tag{10}$$

In this paper, the delay attribute of network resource classification in cloud computing is given. The constraint boundary of clustering center is obtained as follows:

$$bnr_b(X)=R_bX-R_bX_1 \tag{11}$$

The sum of the efficiency optimizations of resource scheduling in cloud computing environments is $\sum_{s} m^{mw} T_s^w$, where $w \subseteq \{G,T,W,L\}$, $m \in [1,n]$.

Define the average efficiency of information resource scheduling convergence for all cloud computing tasks in the network: the global efficiency $E(G)$ is:

$$E(G) = \frac{1}{N(N-1)} \sum_{i \neq j} \frac{1}{d_{ij}} \tag{12}$$

The association rule constraint functions for building resource allocation are:

$$\{W_{final}\} = \{x_F^i\}_{i=1}^N = \{\frac{1}{N}\sum_{i=1}^{m+a} ; x_H^i, \frac{1}{N}\sum_{i=1}^{N-m-a}(1-Kd_i^{\max}); x_S^i, \frac{1}{N}\sum_{i=1}^{N-m-a} Kd_i^{\max}; x_L^i\} \tag{13}$$

In the cloud computing environment, the adaptive fuzzy weighted control method is used to optimize the resource scheduling[8], and the optimal scheduling output is obtained:

$$MTTA = \sum_{i,j,l=1,1,1}^{M,n,N} d_{ijl} \cdot Q(d_{ij})^{-1} \cdot T(s_l) \Big/ (N-1) \tag{14}$$

In this paper, the optimal scheduling of resources in cloud computing is realized, and the ability of resource fusion and balanced allocation is improved.

4. Simulation Experiment

In order to verify the performance of this method in the implementation of efficient resource scheduling in cloud computing environment, the simulation experiment is carried out. The Matlab simulation design is used in the experiment. The number of resource distribution clusters increases linearly from 400 to 1000 in cloud computing environment. The time interval of resource sampling in cloud computing environment is 0.45 s and the sampling frequency is 320KHz. according to the above simulation environment and parameter setting, the resource scheduling simulation experiment in cloud computing environment is carried out, and the data sampling of resource information flow in cloud computing environment is carried out. The waveform of the test data set is shown in figure 2.

In this paper, resource scheduling in cloud computing environment is carried out, and the result of scheduling output is shown in figure 3.

In figure 3, it shows that this method performs better in resource scheduling output under cloud computing. The accuracy of resource scheduling in cloud computing environment is tested by comparing this method with the traditional method, and the comparison results are shown in figure 4.

Figure 4 shows that the proposed method is accurate and balanced, the proposed method is reasonable for resource scheduling in cloud computing.

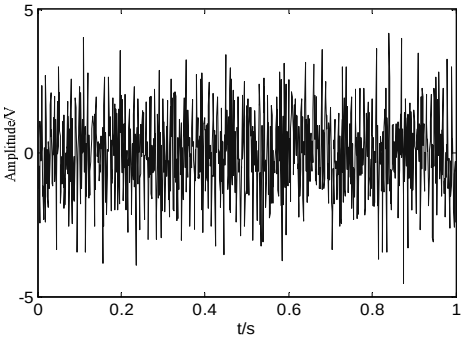

Figure 2. Time domain waveform of resource information flow

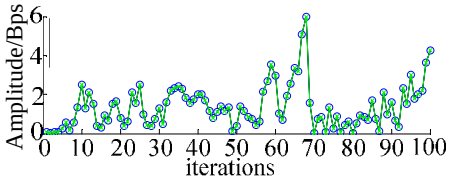

Figure 3. Output of resource scheduling

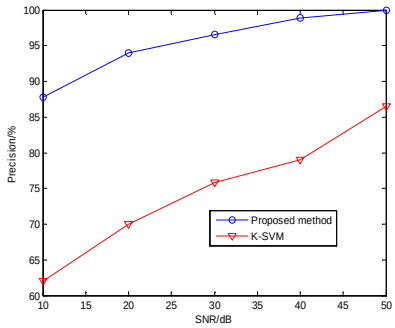

Figure 4. Scheduling performance comparison

5. Conclusions

In this paper, a resource efficient scheduling method based on fuzzy control constraints for cloud computing environment is proposed. The subspace feature analysis method is used to construct the resource information flow model in cloud computing environment, and the characteristic scale of the network resource communication data is extracted, and the global resource scheduling fusion processing is carried out in the cloud computing environment. The constraint function of association rules for resource allocation is constructed, and the adaptive fuzzy weighted control method is adopted to optimize resource scheduling. The simulation results show that the proposed method is reasonable for resource scheduling in

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References

[1] JI Yugang, LI Yitong, SHI Chuan. Aspect rating prediction based on heterogeneous network and topic model[J]. Journal of Computer Applications, 2017, 37(11): 3201-3206.

[2] YANG Huanhuan, LI Tianrui, CHEN Xindi. Visualization of time series data based on spiral graph. Journal of Computer Applications, 2017, 37(9): 2443-2448.

[3] ZHANG Y, LI Z R, LIU X D. Active learning SMOTE based imbalanced data classification[J]. Computer Applications and Software, 2012, 29(3):91-93.)

[4] YANG Z M, QIAO L Y, PENG X Y. Research on datamining method for imbalanced dataset based on i mproved SMOTE[J]. Acta Electronica Sinica, 2007, 35(S2):22-26.

[5] GU Q, YUAN L, XIONG Q J, et al. A comparative study of cost-sensitive learning algorithm based on imbalanced data sets[J]. Microelectronics and Computer, 2011, 28(8):146-149.

[6] MAO W T, TIAN Y Y, WANG J W, et al. Granular extreme learning machine for sequential imbalanced data[J]. Control and Decision, 2016, 31(12):2147-2154.

[7] GU Q, YUAN L, NING B, et al. A noval classification algorithm for imbalanced datasets based on hybrid resampling strategy[J]. Computer Engineering and Science, 2012, 34(10):128-134.

[8] GUO Huaping, ZHOU Jun, WU Chang'an, FAN Ming. k-nearest neighbor classification method for class-imbalanced problem. Journal of Computer Applications, 2018, 38(4): 955-959.