Scholar Publishing Group
Distributed Processing System
https://doi.org/10.38007/DPS.2022.030302
ISSN 2790-0916 Vol. 3, Issue 3: 9-17

Process Migration and Implementation in Distributed System Based on Genetic Algorithm

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Keywords: Genetic Algorithm, Distributed System, Process Migration and Implementation, Algorithm Running Time

Abstract: Distributed system has attracted more and more attention, and the process migration and implementation in distributed system based on genetic algorithm is the current research hotspot. The process migration function is indispensable for the distributed system to obtain good load balance, high communication performance, high availability and other characteristics. The purpose of this paper is to study the process migration and implementation in distributed system based on genetic algorithm. In the experiment, the experimental environment is established, and the genetic algorithm is used. The experimental results show that the performance of the genetic algorithm is a certain performance improvement compared with ordinary algorithms. Its final completion time is better than the ordinary algorithm. Compared with that, it has a certain improvement and it can provide better system throughput with greater throughput.

1. Introduction

With the improvement of distributed system, it has more and more requirements. Moreover, as the application of distributed system is more and more extensive, the demand for mature distributed system technology will also increase [1]. Genetic algorithm has broad improvement prospects in distributed systems, and the research on process migration and implementation in distributed systems based on genetic algorithm needs further research.

Genetic algorithm is a good solution for the process migration and implementation of distributed systems, that is, it can find a better solution in a short time. Tarik B proposed that to the increasing success in the medical field, the institutions are trying to share patient data. In order to set the model,

they must make the data distributed horizontally. The previously solution is the fundamental of technology, but it will lead to performance loss. The researchers proposed an original solution without disturbance. This is to preserve the data utility, thereby maintaining performance. The proposed solution uses genetic algorithms, distributed classifiers and trusted third parties. For the same problem, the results obtained by the proposed method exceed those obtained by other researchers [2]. Ferraz r believes that the power distribution system can be noticed. In addition, inappropriate distributed energy integration may create problems related to the network. A specific study was carried out to optimize the distributed energy in terms of the operation constraints of the system. Considering the generation and load changes during the day, the distributed energy operation mode and all fault types, the reclosing fuse coordination is optimized to decrease the startup time. The IEEE 34 node test feeders are used[3]. The theoretical research on genetic algorithms and distributed systems has also developed rapidly.

This paper studies genetic algorithm and its flow chart, distributed system and process migration and implementation in distributed system. In the experiment, the experimental environment is established, and the genetic algorithm is used. Through the comparison of the running time of the algorithm, the experimental results show that the performance of the genetic algorithm algorithm , It has a certain performance improvement compared with ordinary algorithms , Its final completion time is better than the ordinary algorithm , Compared with that, it has a certain improvement , It can provide better system throughput with greater throughput.

2. Research on Process Migration and Implementation in Distributed System Based on Genetic Algorithm

2.1 Genetic Algorithm

Genetic algorithm is a computational model simulating Darwin's genetic selection and natural elimination of biological evolution process [4-5]. Genetic algorithm is often used to solve the optimization search problem. It has the ability of global search in a wide range, and has the advantages of simplicity, robustness and wide application. The flow chart of genetic algorithm steps is shown in Figure 1:

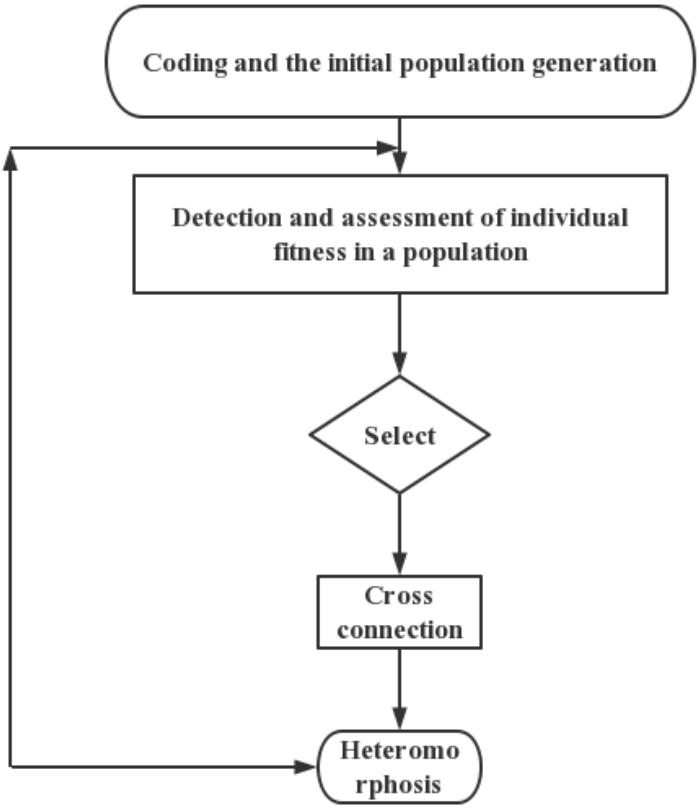

Figure 1. GA calculation steps

Genetic algorithm simulates biological evolution, uses the selection mechanism of the natural environment for the survival of the fittest, simulates the solution of the problem as an individual in nature, and achieves the goal of evolution through the combination and competition between individuals. The operation steps of genetic algorithm start from initializing the population, and through the iterative evolution of selection, crossover and recombination, an optimal solution is finally obtained and the calculation is completed. The concept and operation steps of genetic algorithm are described in detail below [6].

(1) Coding

Coding operation is the beginning of genetic algorithm. Since genetic algorithm can not directly process data in real problems, it must be expressed as string structure data of genetic space through coding [7]. In common solutions, the solution of a real problem is usually encoded into a binary string pattern, which is called a gene string. A fixed gene string also represents an individual in the algorithm. In the gene string, the position of each value is called a locus.

(2) Fitness

In nature, individuals who adapt to the environment are more likely to survive and reproduce. On the contrary, individuals who do not adapt to the environment have a great chance of being directly eliminated or unable to obtain the opportunity to continue the gene [8]. Based on this principle, the fitness in the genetic algorithm simulates the environmental pressure in natural selection. The fitness is the value obtained by a general function. Each solution has a unique fitness. The fitness is

used to express the adaptation of a specific individual to the environment, that is, the degree of good or bad solutions.

(3) Select

The purpose of selection is to screen individuals from the current population, which reflects the competition in natural selection and is an important step to limit the operation scale of the algorithm [9]. The function of selection operation is to make good individuals have the opportunity to stay in the population or replicate, and make poor individuals be eliminated by the environment.

(4) Cross

Crossover operation is the core part of genetic algorithm. It simulates the steps of gene recombination in biological evolution, achieves the goal of evolution through gene crossover and exchange, and ensures the search performance of the algorithm [10].

2.2 Concept of Process Migration

Process is a key concept in operating system. It includes data, stack, register contents, and specific state information directly related to the lower layer. Process migration is to move a process between the source node and the destination node. Some systems call this "node" as "host", which is actually the place where a process logically runs [11].

2.3 Process Migration and Implementation in Distributed System

The distributed system is built on the computer network, which logically and physically designs and distributes the presentation layer, application layer, logic processing layer, computing layer and data layer of the application software system into a network. At the same time, the overall system and each application node have the characteristics of high cohesion and high transparency possessed by the software system [12]. Because of this characteristic of software, the distributed system is different from the traditional centralized system in structure, function and working mode. The distributed system has a high degree of cohesion, which is achieved in functions and modules. Each application node in the system is highly autonomous and managed. These application nodes work together under the support of the distributed system. The distributed system is highly transparent and can dynamically allocate tasks to each application node, so as to realize the reasonable allocation of physical and logical resources dispersed among each application node [13-14]. The distributed system is a complete and transparent whole for the user's application system. The user does not need to know which application node the task is executed in and which database node the data is saved in. The distributed architecture is adopted and the original working mode of the user will not be changed.

Distributed systems are gradually migrating to more and more different types of applications. For example, the following system applications have advantages over other centralized system architectures: high concurrent and high-performance applications: e.g. mailbox, Internet portal, large computing capacity, mass storage and other application systems, which are composed of multiple data centers, computing centers and logic processing centers, and a large number of branch applications and distributed computing nodes are connected to the data center, This distributed architecture can improve the concurrency of applications and improve the processing capacity of application systems [15-16]. High fault tolerance application: compared with the traditional centralized application system, the application in the distributed system architecture realizes the cluster of multiple nodes, and one application node or database node crashes, which will not cause the paralysis of the overall application system [17-18].

3. Investigation and Research on Process Migration and Implementation in Distributed System Based on Genetic Algorithm

3.1 Test Environment

Hardware configuration: CPU; Memory: 2GB; Hard disk: 100g; Operating system: Microsoft WindowsXP.

3.2 Genetic Algorithm

A subset of n individuals in the individual space s (individuals are allowed to repeat) is called an N_ population , Abbreviation: population , Record as

$$\overline{X} = (X_1, X_2, ...X_N) \quad (1)$$

Where $X_j = (j = 1,2,..., N) \in S$, n is called population size. All N_ Set of population composition:

$$S^N = \left\{ \overline{X} = (X_1, X_2, ...X_N), X_i \in S(i \le N) \right\} \quad (2)$$

Called N_ Population space , Population space for short.

4.Process Migration and Implementation in Distributed System Based on Genetic Algorithm

4.1 Experimental Examples

The examples used in this experiment are eight tasks , Two resources , The running time of each task on the two resources is shown in Table 1 and Figure 2:

Table 1. The table of task and resource

Assignment	Machine	
	M [0]	M[1]
T[0]	8	10
T[1]	9	10
T[2]	8	12
T[3]	5	7
T[4]	6	9
T[5]	17	12
T[6]	8	8
T[7]	9	6

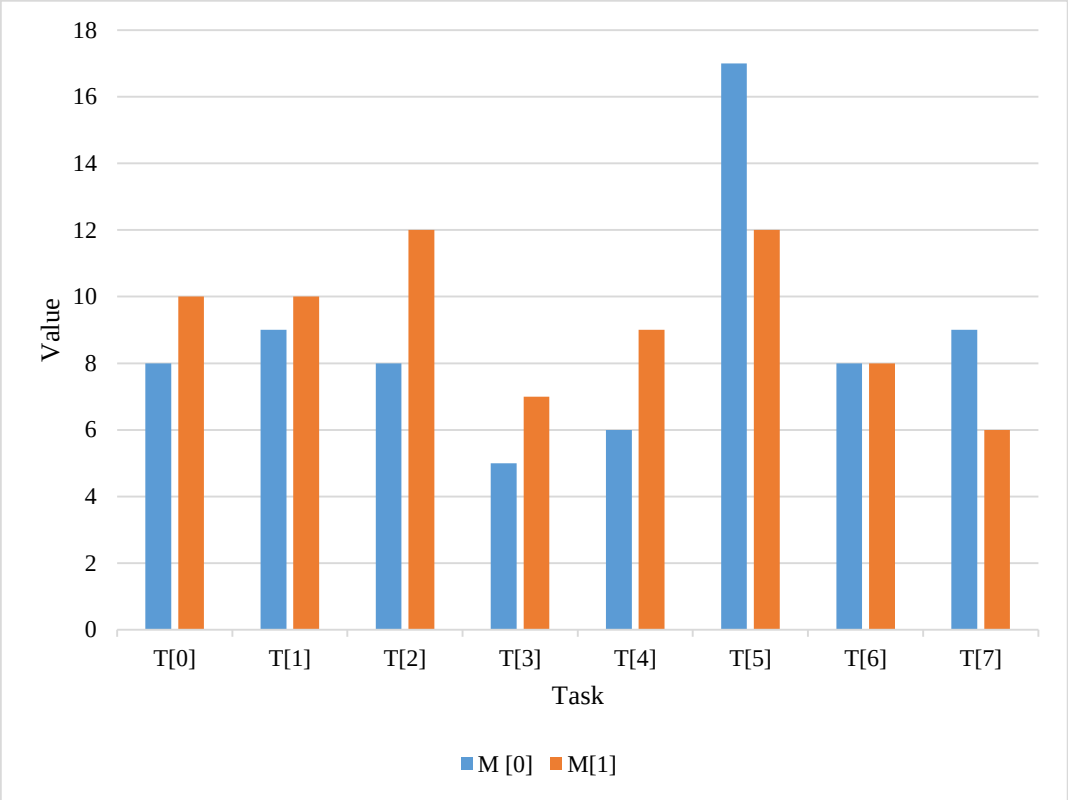

Figure 2. Task data comparison Figure

4.2 Test Results

For better verification results, verify the distributed system for genetic algorithm. The experiment is also done in this paper. The size of the parameter body is 20. The DAG map is generated. The running time of each task on each algorithm is assumed to be 50-70 units. Common algorithm and genetic algorithm are used to solve the problem. Record the completion time of the best solution obtained when the algorithm is completed. The algorithm simulation results are shown in Table 2 and figure 3:

Table 2. Algorithm runtime data table

Finish time	Ordinary algorithm	Genetic algorithm
20	754	781
60	554	561
80	404	412
100	387	392
120	354	359

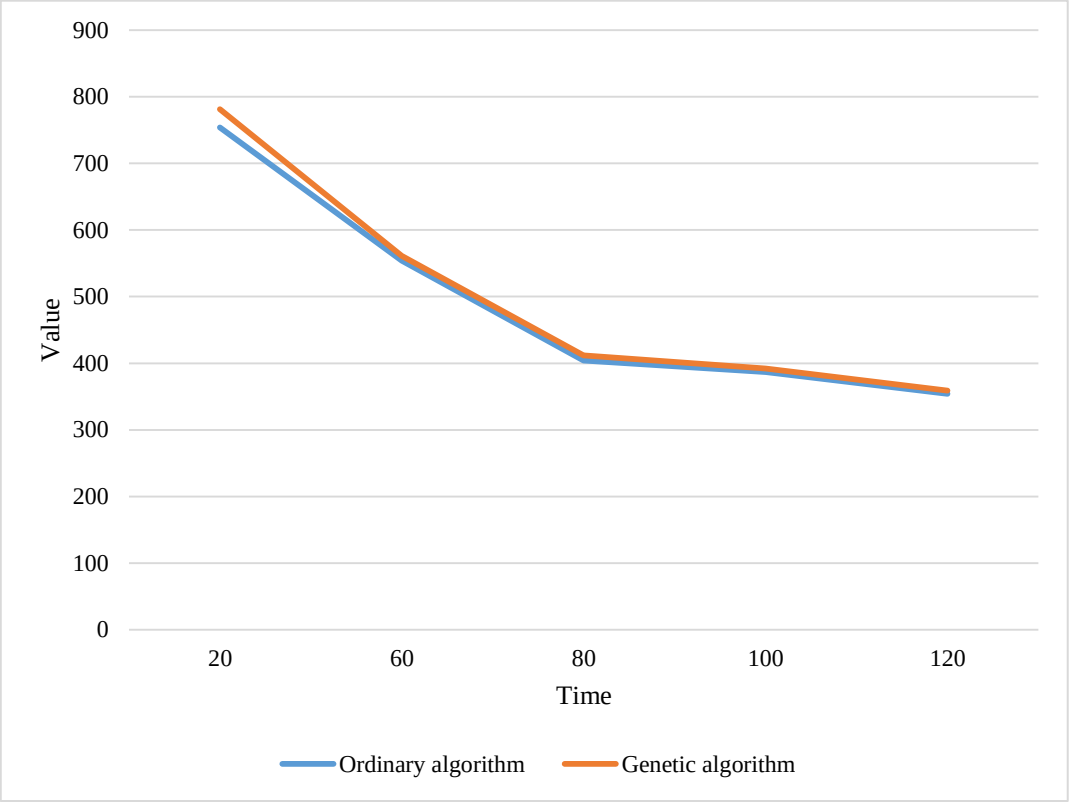

Figure 3. Static performance curve of algorithm

The experimental results show that the time required by each algorithm is assumed to be 50-70 unit time. We can see the performance of the improved genetic algorithm. It has a certain performance improvement compared with ordinary algorithms. Its final completion time is better than the ordinary algorithm. Compared with that, it has a certain improvement. It can provide better system throughput with greater throughput.

5. Conclusions

Process migration and implementation is an important topic in distributed system research. A reasonable process migration scheme can make full use of existing computing resources, avoid the waste of computing resources to the greatest extent, and shorten the overall running time of tasks. Therefore, process migration and implementation is a very important part of distributed computing system. According to the problems existing in the current genetic algorithm, it is improved on the basis of genetic algorithm. Finally, the improved genetic algorithm is used to realize the process migration and implementation of a distributed system, and the improvement effect is analyzed and verified by experiments.

Funding

Project No.: LJKQZ2021124

Project Name: basic scientific research project (Youth Project) of Liaoning Provincial Department of education in 2021

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