Computer Network Reliability Improvement Method Based on Genetic Algorithm

Kun Huang*
Urban Vocational College of Sichuan, Chengdu 610043, China
*Corresponding author e-mail: huangkun@scuvc.edu.cn

Abstract. With the continuous growth of economy and the continuous development of society, once the computer came out, it has been rapidly developed and popularized, especially now, people's life is more and more inseparable from the computer, and they have a serious dependence on the computer. Some industries even directly use the computer as the business pillar, once such industries leave the computing industry Therefore, the reliability of computer network is a very important topic. It is very important to improve the reliability of computer network. In order to explore the effect of genetic algorithm on improving the reliability of computer network, two experimental groups are set up in this paper. The experimental group adds genetic algorithm in its computer network operation, while the control group uses the traditional algorithm. Finally, the experimental results show that the accuracy and security of the computer network in the experimental group are higher than those in the control group. For example, the highest accuracy and security of the experimental group are 99.78% and 98.83% respectively, while the highest accuracy and security of the control group are 84.31% and 88.58%. These experimental data show that the genetic algorithm can play a positive effect on the security of computer network.

Keywords: Genetic Algorithm, Computer Network, Network Reliability, Improvement Methods

1. Introduction
In this century, mankind has gradually entered the information age. With the rapid development of the Internet, people can read thousands of books and travel thousands of miles at home [1-2]. By the digital, network, information interwoven information age depends on the perfect network system everywhere. It can be said that the network is the cornerstone of the development of information technology, only the stable growth of network development, the road of information technology can be long-term development. However, we also know that in today's technology is so developed, we will still have a variety of problems in the use of computer networks, small problems may only affect the specific operation or user experience, big problems may affect the sustainable development of computer networks. Therefore, the relevant personnel must pay attention to the research on strengthening the reliability of computer network system in time. These problems are discussed below [3-4].
Today's society and network technology are inseparable. The development of network technology also promotes the development of modern society. The two depend on each other. Network technology generally depends on software and hardware, through the incompatibility of the two, the reliability of network technology is also diverse. At present, on the road of computer network development, the development of reliability is still the focus of researchers. Therefore, the state vigorously advocates relevant personnel to conduct in-depth research on the reliability of computer networks, so as to lay a better foundation for the future development of computer networks. Whether we are in life or at work, it is inevitable for us to contact computer networks. People will use computers to transmit information and search for more information. Many non users use this point to steal users' information, which leads to threats to users' property, privacy, etc., and makes users' experience and favor drop sharply, which makes the reliability of computer network also drop sharply. Of course, the system of computer network itself also has loopholes. If it is only reflected in the operation level for ordinary users, it is OK. If it is for enterprise users, any subtle loopholes may lead to the leakage of confidential information and the loss of property, which is difficult for people to accept, and this is one of the reasons why its reliability is not high. Although technicians have long noticed that there are many ways to avoid the above situation, they still need to be vigilant as users. In modern society, computer network has more and more influence on human life. It is no exaggeration to say that every aspect of society can not do without computer. But we all know that in the process of using the computer, all kinds of problems often appear, which seriously affects the reliability of the development of computer network. In view of the importance of computer network, the relevant personnel must pay attention to the research on strengthening the reliability of computer network system. With the development and application of network technology, it gradually diversified development, and also appeared a variety of problems. In the process of the continuous development of information technology and resources, all kinds of information are easy to obtain. Many illegal people carry out corresponding activities according to the network, in order to obtain high profits. Thus, information supervision and network environment security management are important network security guarantees [5-6].

With the rapid development of computer network, while bringing countless convenience to human life, there are also a variety of problems. In the process of the continuous development of information technology and information resources, all kinds of information are easy to obtain [7-8]. Thus, information supervision and network environment security management are the key to ensure work safety. There is no doubt that modern human society highly depends on computer network. In view of the above-mentioned problems related to the reliability of computer networks, relevant personnel must pay attention to them, strengthen the supervision of the network world, and intensify the research on the reliability of computer networks [9-10].

2. Method

2.1 Genetic Algorithm
In the 1970s, John, a famous American scholar, studied the law system based on the law of biological evolution in nature, which is called genetic algorithm. It draws lessons from Darwin's theory of evolution. The core field of Darwin's theory of evolution is natural science. Genetic algorithm inherits it well and combines it with modern science image, which provides great convenience for various fields. The principle of this algorithm is to transform the problem in the data into the problem in genetics according to the mathematical theory, and find the optimal solution according to the idea of gene mutation in genetics. Especially in some complex problems, compared with conventional ideas, genetic algorithm can provide ideas and solve problems in a very short time. The algorithm has been widely used in artificial intelligence, machine learning and other fields. Because it does not rely on other auxiliary tools in computing, it is often calculated according to the overall search strategy, and it also provides a general framework for itself, so it does not have to pay attention to the field of problem generation, only focus on the problem solving path, which is why it is widely used in the field of science.
2.2 Computer Network
For computer network, the simplest definition at the beginning is the integration of multiple computers. So the early machines are terminal oriented, each machine has a high degree of self-sustaining, they become online system through the connection. However, with the development of the times, the above views can no longer meet its definition. Now we think that in different locations, different environments, different network environments, each computer and related external devices through network connection to achieve a certain connection, and can achieve resource sharing environment under the scheduling of network communication, we can turn it into a computer network. Because it is closely related to communication technology, so another name is computer communication network.

2.3 Reliability of Computer Network
In order to resist external threats, computer network system itself has certain stability. The birth of computer network is to make different responses according to the behavior of different users, so as to provide useful information for each user. Therefore, in terms of its reliability, relevant researchers have also studied many solutions to deal with the possible problems, so as to ensure that the computer network will not be easily damaged by human, or the data will be easily tampered with. Of course, the computer network is the product of science, but also the product of human beings. So its reliability is general at present. In the targeted network destruction, although the computer network can resist most attacks, there are still some vulnerabilities exposed. This is also a topic that contemporary network designers have been studying.

2.4 Related Operation Method
In experiments, we usually use some formulas to count and calculate the experimental data, and then we can use some probability formulas to deduce some unknown conclusions according to the obtained data:

\[ P(X = k) = C_n^k p^k \]

\[ f(x) = a_0 + \sum_{n=1}^{\infty} \left( a_n \cos \frac{nx}{L} + b_n \sin \frac{nx}{L} \right) \]

\[ E(X) = \int_{-\infty}^{\infty} x f(x) dx \]

3. Experiment

3.1 Purpose of Experimental Study
In order to explore whether the application of genetic algorithm to computer network can improve the reliability of the computer network, we set up two experimental groups as the experimental research object, one group we applied genetic algorithm to computer network, which is called the experimental group; the other group used conventional algorithm in its computer network, which is called the control group.

3.2 Experimental Research Steps
In order to explore the reliability of the two experimental groups, we tested the accuracy and safety of the two experimental groups for many times. In order to ensure the objectivity and authenticity of the experimental data, we checked and analyzed the obtained experimental data for many times to eliminate subjective factors as far as possible, so as to make the experimental data and the conclusions more meaningful persuasiveness.
4. Discussion

4.1 Accuracy Survey of Computer Network System of Two Experimental Groups

We investigated the accuracy of the computer network system of the two groups with five groups of experimental data. The experimental data obtained are as follows:

|                  | Experience group | Control group |
|------------------|------------------|---------------|
| Group one        | 88.93%           | 82.17%        |
| Group two        | 91.27%           | 84.31%        |
| Group three      | 95.80%           | 79.50%        |
| Group four       | 97.52%           | 77.81%        |
| Group five       | 99.78%           | 80.79%        |

![Figure 1](image)

Figure 1. Investigation on the accuracy of computer network system of two experimental groups

From the chart above, we can see that there is a big difference between the accuracy of the computer network systems of the two experimental groups. Among them, we can know the accuracy of the five experimental surveys of the experimental group through the above charts. The specific data is as follows: the accuracy of the first group is 88.93%, the second group is 91.27%, the third group is 95.80%, the fourth group is 97.52%, the fifth group is 99.78%, and the fifth group is the highest, which shows that the experimental data obtained by the fifth group is the highest. The accuracy of the computer network system in the control group was 82.17%, 84.31%, 79.50%, 77.81% and 80.79% respectively. These experimental data show that the accuracy of the computer network system of the control group is low, which reflects the higher reliability of the computer network system of the experimental group from the side. Genetic algorithm has a positive effect on the improvement of the reliability of the network.

4.2 Computer Network Security Investigation of Two Experimental Groups

We also tested the computer network security of the two experimental groups for five times, and then recorded the experimental data in the table. The specific data is shown in the following chart:

|                  | Experience group | Control group |
|------------------|------------------|---------------|
| Test one         | 95.30%           | 85.71%        |
| Test two         | 93.42%           | 88.58%        |
| Test three       | 94.79%           | 83.27%        |
| Test four        | 96.79%           | 79.56%        |
| Test five        | 98.83%           | 87.60%        |
First of all, we can see the specific safety data of the two experimental groups from Table 2. In the experimental group, the first group of computer network security test data results were 95.30%, the second group of experimental data were 93.42%, the third group of security data results were 94.79%, the fourth group of security data results were 96.79%, the fifth group of security data results were 98.83%; while the control group of the five groups of security test data results were: the first group of security was 85.71%, the fourth group of security data results were 96.79%, the fifth group of security data results were 98.83%. The safety of the second group was 88.58%, the third group was 83.27%, the fourth group was 79.56%, and the fifth group was 87.60%. So we can see from these data that the safety of the experimental group is much higher than that of the control group. This shows that the genetic algorithm is able to improve the security of computer network, which also has a certain help to improve the reliability of computer network.

5. Conclusions

In a word, with the application of genetic algorithm is more and more widely, and the improvement of computer network reliability is also a very important social problem, so many scholars try to use genetic algorithm to improve the reliability of computer network, and the experimental results of this paper really prove that genetic algorithm is accurate and safe for computer network. Therefore, it shows that genetic algorithm is helpful to improve the reliability of computer network to a certain extent.

Reference

[1] Yu ruipeng. Principle and application of genetic algorithm in computer network optimization design. Electronic technology and software engineering, 2020, No. 190 (20): 20-21
[2] He Wei. Research on methods of improving computer network reliability. Electronic technology and software engineering, 2016, 000 (012): 212-212
[3] Ding Ning, Lu Jian, Hu Lai, et al. Research on graph reconstruction method based on neural network and genetic algorithm. Microelectronics and computer, 2019, 36 (007): 81-86
[4] Zhao Shi. Research on the method of improving the reliability of computer network. Heilongjiang Science and technology information, 2018, 000 (006): 65-66
[5] Zhang Chunsheng, Liu Shudong, Tan Qin. Research on short-term traffic flow prediction method based on BP neural network optimized by improved genetic algorithm. Journal of Tianjin urban construction university, 2017, 023 (002): p.143-148
[6] Liu Jia, Song Tao, Hu Ying, et al. Research on virtual network mapping method based on
hybrid genetic algorithm. Minicomputer system, 2016, 37 (04): 773-777

[7] Wang Meng, Tan Yuesheng. Simulation Research on Emergency Scheduling of network public resources on cloud computing platform. Computer simulation, 2018, 035 (002): 371-374405

[8] Zhang Dan, song Xiaoqiu. Research on software quality evaluation model based on genetic algorithm and BP artificial neural network. China new communication, 2016, 018 (004): 84-87

[9] Liu Jian Jian, Chen Xiao. Application of genetic algorithm in computer network optimization design. Computer knowledge and technology, 2019, 15 (12): 192-194

[10] Liu Yali, Li Yingna, Li Chuan. Research on line loss calculation based on BP neural network optimized by genetic algorithm. Computer application and software, 2019, 036 (003): 72-75