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Optimization of Computer Programming System Based on Deep Learning Mathematical Algorithm

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Abstract: *With the rapid development of information technology, a series of information technologies, such as big data, artificial intelligence and cloud computing, have brought profound changes to our lives. And these, in fact, are inseparable from computer programming. In programming, data structure and algorithm constitute the program itself, and the optimization of algorithm directly determines the efficiency of program execution. Mathematical algorithm can play a good role in program optimization, which is particularly important for computer programming. Computer programming and mathematical algorithm have an inseparable close relationship, because mathematics and computer science have a very close relationship, the organic integration of the two is an effective way to carry out efficient programming. With the advent of the computer age, the influence industry of computer in people's daily life is becoming more and more important, and the connection with other disciplines is also closer, especially the proportion of cross development with the integration of mathematics discipline has become more and more, and the mathematical algorithm is indispensable for the computer. The efficiency and quality of computer programming can be effectively improved by optimizing mathematical algorithm in computer programming. Scientific data structure is closely related to the performance of the algorithm. In order to get close to the variables, it is more convenient to use the algorithm reasonably, reduce the memory space required by variables, and effectively improve the efficiency and level of mathematical algorithm. In this paper, a series of researches on the optimization and development of computer programming system are carried out by discussing mathematical algorithms.*

Keywords: *Mathematical Algorithms, Computers, Programming Systems, Programming*

1. Introduction

Now with the wide use of computer programs in life, mathematics is one of the most commonly used subjects [1]. Now mathematical algorithms have become a research project for many people. Computer programming mainly includes concept, design, algorithm and so on. There is a certain interaction between these contents [2]. In the current development trend, we can see that the structure of computer programming system is not very developed, which can stimulate the relevant scholars to be interested in the role of mathematical algorithms in computer programming optimization. Through investigation, some experts in the field of Computer Science in the United States believe that computer mathematics is the mathematics of algorithms [3].

Mathematical algorithm is an inductive algorithm, which mainly studies and summarizes several mathematical problems found, and reduces the workload in the analysis process [4]. In mathematical research and mathematical analysis, the most important is the basic mathematical algorithm, so we must first analyze the mathematical algorithm. Therefore, the algorithm is not only very important in computer programming, but also can ensure the demonstration effect of computer programming, and can ensure more. Ensure the smooth progress of program design [5]. In the optimization of computer programming, in order to better apply mathematical algorithms, it is necessary to maximize the use of mathematical theory and mathematical basis, while completing the corresponding optimization, reduce the cost, so that the two mathematical algorithms can be fully applied. Please make the most of the effect of computer programming [6]. Today's society is developing continuously, and the optimization of computer programming will also change with the development of society [7]. At present, computer programming needs to participate in mathematical algorithm in optimization. Although great achievements have been made now, the development of society is still continuing, and the computer

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programming system is also developing continuously. Computer technology should be better developed [8]. Through the application of mathematical algorithms, the computer programming system needs to pay attention to the multi-core computing mode to further improve the rationality of the construction of the distributed system. It also needs to constantly rectify the system scheme according to its application effect. The traditional serial mode will not only affect the computer operation efficiency, but also make the algorithm operation process prone to errors. However, the application of mathematical algorithms for system architecture rectification can avoid the problems of traditional algorithms, optimize computer programming, and make the computer run more high-speed and efficient [9].

At present, the internal software and hardware of computers used by most users in China have been greatly optimized, which can meet the needs of users in terms of configuration. At present, most computers are equipped with four core drivers, and the system distribution is also diversified. In order to further improve the operation efficiency of the computer internal system, the key points of computer language design should be considered, it should also ensure that the hardware and software can comply with the needs of users, constantly update with the development of science and technology, and meet the needs of users for computer configuration [10].

2. Algorithm Establishment

2.1 Mathematical Algorithm - K-means

The similarity between each sample and centroid is calculated, and the nearest centroid is selected. There are many functions and methods to measure the similarity:

For each class J, the centroid is recalculated:

$$U_j = \frac{\sum_{i=1}^{m} 1\{C^{(i)}=j\}X^{(i)}}{\sum_{i=1}^{m} 1\{C^{(i)}=j\}} \tag{1}$$

Euclidean distance is the most commonly used method to express vector distance in mathematics:

$$\mathrm{d} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \tag{2}$$

Where (x1, Y1) and (X2, Y2) are two points in space.

In two-dimensional space, the Manhattan distance formula between two points is as follows:

$$\mathrm{d} = |x_1 - x_2| + |y_1 - y_2| \tag{3}$$

The cosine angle is also called the vector angle. The vector angle is used to measure the direction difference between two vectors. The formula of the angle between two vectors in two-dimensional space is as follows:

$$\cos\theta = \frac{x_1x_2+y_1y_2}{\sqrt{x_1^2+y_1^2}+\sqrt{x_2^2+y_2^2}} \tag{4}$$

In the process of K-means calculation, the K value of the final data set should be set first. Second, the center point of initial data cluster should be generated randomly. Taking the initial stage as the center, the algorithm performs the first cycle, classifies all the data for the first time, and then selects the k data points closest to the k center. This is the result of repeated clustering. The new central point is the central point of various categories of the results of the former military integration. Cluster jobs can be repeated through a new central point, which is used to calculate a new cluster.

2.2 Adaboost Algorithm

First, we use D_m with probability distribution. The basic classifier is obtained by learning from the training data set of.

$$T_m(x): X \to \{-1, +1\} \tag{5}$$

Secondly, the classification error rate of the classifier is calculated:

$$e_m = P(T_m(xi) \neq yi) = \sum_{i=1}^{N} wmiexp\big(-a_m yiT_m(xi)\big) \tag{6}$$

The coefficient of TM (x) is calculated:

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$$a_m = \frac{1}{2}\log\frac{1-e_m}{e_m} \tag{7}$$

Update the probability distribution of training data set:

$$D_{m+1} = (W_{m+1}, 1, \dots, W_{m+1}, i, \dots, W_{m+1}, N) \tag{8}$$

$$W_{m+1,i} = \frac{W_{mi}}{Z_m}\exp\left(-a_m y_i T_m(x_i)\right), (i = 1,2, \dots, N) \tag{9}$$

After completing the above steps, a linear combination of classifiers is constructed:

$$\mathrm{f(x)} = \sum_{m=1}^{M} a_m T_m(x) \tag{10}$$

The final classifier is as follows:

$$\mathrm{T(x)} = \mathrm{sign}\big(\mathrm{f(x)}\big) = \mathrm{sing}[\sum_{m=1}^{M} a_m T_m(x)] \tag{11}$$

2.3 Reasonable Design of Scientific Data Structure

Scientific data structure is closely related to the performance of the algorithm. It is more convenient to use the algorithm to access variables, reduce the memory space required by variables, and effectively improve the efficiency and rules of the algorithm. For example, for rare ranks, if there are many factors, we should fully consider the storage space of the team and compress it appropriately. In order to save the matrix and define the two-dimensional permutation directly, there are many zero elements in the rare matrix, which can only waste the storage space. Therefore, we can use triples in the rare matrix which is greatly compressed. When touring the memory space and team occupied by rare teams, it can effectively reduce the number of rounds, and greatly improve the efficiency and quality of the algorithm. In addition, in the aspect of sharing variables, the Federation method is generally used to guide multiple variables to share memory space in the same segment. This is a method to reduce the space complexity of the algorithm and improve the efficiency and level of the algorithm.

2.4 Reasonable Design of Data Structure

If you want to optimize the mathematical algorithm in computer programming, it is necessary to design the data junction reasonably. If you want to achieve the effect of programming optimization, the design of data knot is essential, because it can change the position of variables. In order to achieve the goal of computer programming optimization, the optimization of mathematical method is to reduce the running space of variables. For example, sparse matrix has many elements, and the matrix space needs to be compressed. If it is compressed directly, it will waste two-dimensional array. In order to compress the matrix, we need to use triples to compress, so as to reduce the complexity of the algorithm space.

3. Modeling Method

3.1 Network Structure Model

Definition $\mathrm{I_{LR}}$ and $\mathrm{I_{HR}}$ is low resolution data and high resolution data. Firstly, bicubic interpolation algorithm is used.

$$\mathrm{F_{-1}} = \mathrm{H_{bic}}(\mathrm{I_{LR}}) \tag{12}$$

In the formula, $\mathrm{H_{bic}}$ is bicubic interpolation function, $\mathrm{F_{-1}}$ is the data obtained by bicubic interpolation function. We can get the following results:

$$\mathrm{F_0} = \mathrm{H_{CFEN}}(\mathrm{F_{-1}}) \tag{13}$$

In the formula, $\mathrm{H_{CFEN}}$ is a rough feature extraction network. Its function is to extract the shallow features of data through a layer of convolution operation as the input of multi-level feature fusion unit. Let the network include d multi-level feature fusion units, $\mathrm{F_d}$ represents the output of the d-th multi-level feature fusion unit, $\mathrm{F_d}$ by $\mathrm{F_{-1}}$ and $\mathrm{F_0}$ to start the step-by-step calculation of the function.

In the formula, $\mathrm{H_{CFEN}}$ is a data rough feature extraction network. Its function is to extract shallow features of data through multi-stage feature fusion unit input and line operation hierarchy. The network contains D multi-stage feature fusion units, $\mathrm{F_d}$ represents the output of the second stage feature fusion unit of D, $\mathrm{F_d}$ calculate in stages$\mathrm{F_{-1}}$and $\mathrm{F_0}$.

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$$F_d = H_{MFU,d}(F_{d-1} + F_0) =$$
$$H_{MFU,d}(H_{MFU,d-1}(\cdots H_{MFU,2}(F_{-1} + F_0)\cdots)) \quad (14)$$

After D mfus, the network finally obtains the feature information F_D. Using F_{-1} And F_{end} constitutes the global residual learning architecture.

Given a data set {x ^ ((I)), x ^ ((I))}_ (I = 1) ^ n, n is the number of training data in the training set, x ^ ((I)) is the real data, x ^ ((I)) is the low score data:

$$L(\theta) = \frac{1}{2N}\sum_{i=1}^{N} ||\tilde{x}^{(i)} - I_{HR}(x^{(i)})||^2 \quad (15)$$

4. Evaluation Results and Research

In this paper, we do experimental research on the calculation of CUDA parallel programming, mainly aiming at the parallel optimization of network structure algorithm and AdaBoost algorithm. The test platform is based on four core Linghua industrial computer. We compare the data running time of network structure algorithm without parallel optimization and the data running time after parallel optimization under CUDA Programming, as shown in Table 1.

Table 1 comparison of running time before and after CUDA parallel optimization (unit: ms)

Number	Before CUDA parallel optimization	After CUDA parallel optimization
1	8	1.60
2	9	1.66
3	9	1.65
4	8	1.62
5	9	1.66
6	9	1.64

There are a certain number of grids in the structure of GPU, and many threads are opened up in the grid for computing. The processing speed of GPU is better than that of multi-core CPU. The experimental results show that the computing speed of network structure algorithm is increased by more than 4 times after CUDA parallel optimization, which verifies the advantages of GPU in image processing parallel optimization.

In recent years, in the computer programming system, through the optimization of mathematical algorithm of deep learning, the programming system is faster and faster, and the error is also reduced, as shown in Figure 1.

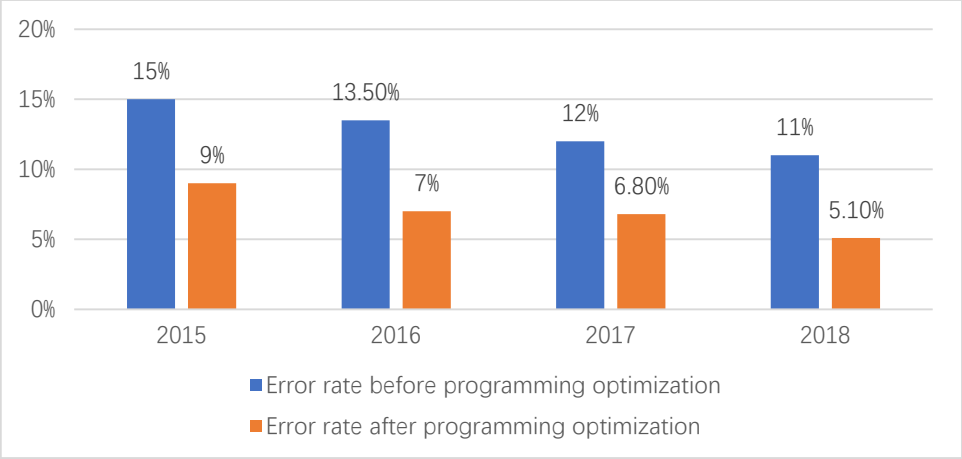

Figure 1 Programming Comparison Chart by algorithm optimization in recent years

As can be seen from Figure 1, in recent years, through the optimization of mathematical algorithm, the error rate of the programming system has been greatly reduced, from 15% in 2015 to 5.1% in 2018, and the computer age has also made great progress. Through the analysis of the effect of computer programming optimized by mathematical algorithm, we can find that after the mathematical algorithm optimizes the computer programming language, the running speed of the computer is indeed greatly

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increased, which can meet the needs of users.

There are also a small number of people who do not agree with the optimization of computer programming system through mathematical algorithm. They think that mathematical algorithm can not produce any change in the programming system. Some people agree with this move, as shown in Figure 2:

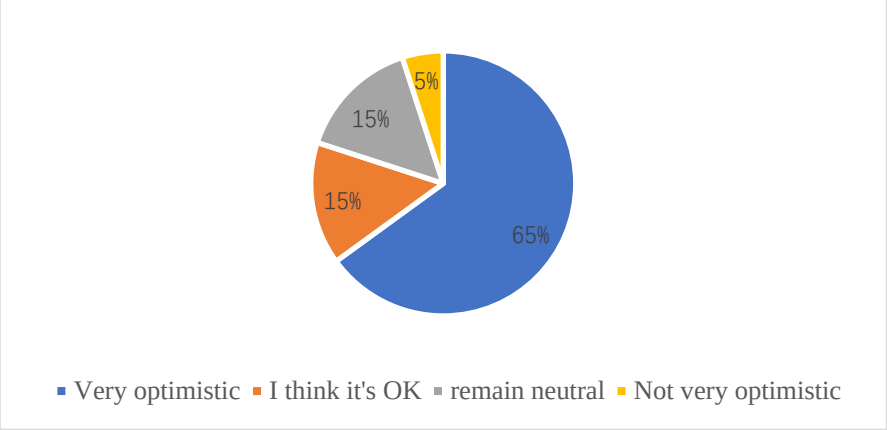

Figure 2 some people's views on the algorithm

It can be seen from Figure 2 that most people are very optimistic about the application of mathematical algorithms in computer programming systems, but some people are not so optimistic. In order to use mathematical algorithms, it is necessary to build mathematical models according to the needs of computer applications, and sort out the computer related program languages. On this basis, the program is tested. During the program test, the problems in the test process are recorded in time, and the actual problems are introduced into the computer to understand whether the problems are related to the program language, the program code of computer consists of various formulas, which is the reason and purpose of using mathematical algorithm.

5. Conclusion

Based on the design of mathematical algorithm k-means and network structure model, this paper studies the mathematical algorithm of computer programming system, and compares and verifies the optimized computer program by not using or using mathematical algorithm. The results show that mathematical algorithm is almost essential in computer programming system. Computer programming is the "foundation" and the most basic content of the computer field, so focusing on the optimization of computer programming can contribute to the greater development of computer technology. The application of mathematical algorithms in computer programming is an appropriate period to optimize the efficiency of computer programming. Therefore, in order to improve the work efficiency, we should find and analyze and study the mathematical rules existing between things, and make full use of the advantages of mathematical algorithms. In the process of programming, it is necessary to consider the efficiency of the algorithm in the early selection. Although we can't approach the program design blindly, in order to meet the actual calculation requirements, the algorithm selection and program design are organically combined. To sum up, mathematical algorithms play an important role in the optimization of computer programming. Scholars in computer related fields conduct in-depth analysis and research, and strive to create more advanced ideas and technical methods.

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