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Original Articles

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A Research on Text Analysis of Telecommunication Network Fraud Information

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Abstract: With the advancement of Internet technology, the telecommunication network text information has featured novelty and diversification. The ever-changing text information involving cyber fraud poses new challenges to maintaining social order and protecting users' legitimate rights and interests. This paper first interprets the necessity of an analysis on the telecommunication network text information involving cyber fraud. Then, it analyzes the characteristics of this kind of information from its definition, dissemination mode and audience. Finally, it illustrates the application of text analysis on telecommunication network text information involving cyber fraud and the problems to be further studied from the aspects of Chinese word segmentation, sensitive word frequency, dictionary construction, etc., and explains some precaution measures.

Keywords: Telecommunication Network; Text Analysis; Cyber Fraud

1. Introduction

Informatization promotes the rapid increase of Internet and telecommunication network users. Each coin has two sides, and network development is no exception. The arrival of the information age is accompanied by huge negative effects [1]. In recent years, text information involving cyber fraud in the telecommunication network has emerged continuously. The non-contact dissemination of illegal frauds through the network, illegal links, SMS, new social media and other carriers show a high incidence. Therefore, it is of great significance to analyze and study the text information involving telecommunication network fraud and improve citizens' precaution consciousness, thus further creating a good network and social environment.

2. Characteristics of Telecommunication Network Fraud Information

2.1 Definition

Telecommunication network text information involving cyber fraud is usually expressed and disseminated by publishers in a targeted way. With communication as the media and computer network information system as the operating platform, these publishers disseminate fraudulent information such as fictional facts, malicious rumors, distorted truths, etc. to unspecified society groups, luring telecommunication network users to believe it, or even virtually mislead victims to become the disseminators of frauds. Fraudulent information in the telecommunication network is mainly disseminated by text. Generally, there are traditional and new modes of disseminating this kind of information.

2.2 Dissemination Mode

2.2.1 Traditional Mode

SMS is a common traditional channel for disseminating telecommunication network fraud information. Nowadays, almost everyone owns a mobile phone. People's daily life has always been influenced by all kinds of SMS. We need to log in to third-party software, register and handle all kinds of business through mobile phones and verify identification by SMS. SMS service is like a double-edged sword, which not only brings convenience to our daily life, but also hides all kinds of information involving cyber fraud.

2.2.2 New Mode

In recent years, more and more shifts from SMS fraud to cyber fraud exploiting network tools have emerged. The *2019 Research Report on the Trend of Cyber Fraud* published on January 7, 2020 by 360 Hunting Net Platform once showed that the top three main channels for victims to get in touch with fraudsters or fraudulent information were QQ, WeChat and telephone. The reports of the frauds through the three channels accounted for 10.69%, 10.38% and 9.76% of the total respectively [2]. New modes of disseminating fraudulent information, including those applying the latest communication tools and social software, are constantly emerging.

2.3 Audience

The audience of telecommunication fraud can be both young people who are active in social networking and the elderly in various ways. The elderly or people with low literacy seldom use the Internet, so they are ill-informed, credulous, and lack judgment. Besides, they are even misled to become disseminators to spread the fraud information in their own circles. Consequently, it's difficult for them to be aware of cyber fraud. Usually, they will not find the fraud until they have spread the fraud information and suffered losses. Potentially, this is also an objective reason for the coexistence of new and traditional telecommunication network frauds [3].

3. Text Analysis on Telecommunication Network Text Information Involving Cyber Fraud

3.1 Chinese Word Segmentation

Word is the smallest, most isolated and most meaningful unit of a text. Word segmentation is the basis of phrase division, concept extraction, hotspot analysis and feature understanding for all kinds of texts, including telecommunication network texts involving online fraud. Simply put, Chinese word segmentation is to divide continuous Chinese character strings into individual words. Essentially, word segmentation is a process of re-segmenting successive Chinese character sequences according to the norms of Chinese words and then composing word sequences. Hence, word segmentation is also the key of text analysis involving telecommunication network fraud. Currently, there are three main word segmentation methods in the research field: ① word segmentation based on statistics ② word segmentation based on dictionary ③ word segmentation based on understanding [4].

Obtaining sensitive words involving cyber fraud is the first step for identifying the telecommunication network text information. The fundamental task of text analysis on telecommunication network text information is to quickly identify new topics, sensitive topics, emergencies, etc., from massive text data. The basic unit of text information is a single word, which is acquired by word segmentation algorithm.

3.2 Sensitive Word Frequency

Finding out the word frequency is a simple way to judge the importance of a word to the text. The judging index of word frequency statistics can be expressed by the ratio between the number of occurrences of a word to the sum of the occurrences of all words in the text. However, the main sources of telecommunication network text information are SMS, WeChat, QQ, MMS and network links. These data are all composed of short texts. Hence, in an identification with the word frequency, the words that appear most often are common words with no practical meaning, such as "yes" and "of". Therefore, before the word frequency statistics, we should first build a text data set based on a certain scale of information data, and use the corresponding algorithm to calculate the word frequency. TF-IDF is exactly an applicable method.

TF-IDF, a frequency-inverse document frequency algorithm, is a statistical method for evaluating the importance of a term to a document in a file set or a corpus.[5] TF (term frequency) refers to the number of times a specified term appears in a document. The normalization formula of TF is:

$$\mathrm{TF} = \frac{\text{Number of times term appears in a document}}{\text{Total number of terms in the document}} \quad (1)$$

As for IDF, if there are fewer documents containing a certain term, the higher the IDF will be. And a higher IDF indicates that the term enjoys a good ability to classify. The IDF value can be worked out according to the formula below, in which “+1” is to prevent the denominator from being 0.

$$\mathrm{IDF} = \log_e \frac{\text{Total number of documents}}{\text{Number of documents with a certain term}+1} \quad (2)$$

The high-frequency terms in a document, and the low file frequency of these terms can produce highly weighted TF-IDF values, so TF-IDF tends to filter out common terms and retain important terms.

$$\text{TF-IDF}=\mathrm{TF} \times \mathrm{IDF} \quad (3)$$

It is more reliable to measure the importance of a word to a category than to simply measure its importance to a document. However, TF-IDF only considers the word frequency, but does not consider the location information of words. Since words in different locations have different discrimination abilities, words in different locations should be treated separately. Hence, this algorithm also needs to be improved.

3.3 Dictionary Construction

The dictionary used in most of the current research is How Net dictionary published by CNKI. The dictionary divides words into six categories: positive emotion, negative emotion, positive evaluation, negative evaluation, degree and level and proposition. On this basis, we should adopt manual reading and case screening to further refine the exclusive dictionary of sensitive words in telecommunication networks involving cyber fraud. This is because the information related to telecommunication network fraud generally includes prize winning, remittance, information interception, loan, shop recommendation, training and education, fund and stocks, etc.[6] The sensitive words it contains are mainly non-characteristic and conventional words, such as those related to user reply, money, telephone contact, bank, invoice, real estate, shops, training, education and so on. Therefore, we should further revise the conventional dictionary, delete some words that can express emotional tendency only in a specific context, and add some words that are ambiguous only in the case of telecommunication network fraud.

4. Conclusion

In recent years, with the development of information technology and application, new types of illegal and criminal activities, especially frauds, in telecommunication networks, are increasing day by day. Additionally, criminals still use traditional channels to disseminate fraudulent information. To address this issue, we should coordinate governance, keep pace with the times and constantly update our precaution measures.

Furthermore, due to the inevitable loopholes in the supervision of operators, it is difficult to effectively and accurately define and distinguish fraudulent information. Meanwhile, both the complicated industrial chains of disseminating fraudulent

information and hidden traps such as language snares, MMS pictures, harmful links pose great challenges to detecting and giving early warning of such illegal frauds. To this end, we not only analyze the dissemination characteristics and audience of telecommunication network fraud texts, but also formulate targeted treatment methods from the perspective of text analysis. On this basis, the combination of machine learning, emotion analysis and image text recognition will be a promising orientation for further research [7].

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Design Optimization and Application Analysis of Embedded C Program

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Abstract: From MCU (Micro Control Unit) to ARM (Advanced RISC Machine), from smart phone to industrial Internet of Things, and to embedded development technology, applications have changed rapidly in the past 10 years, and embedded system has been widely used. Due to the characteristics of C programming language and its flexibility in language level, more and more programmers have chosen the embedded application development. Therefore, by analyzing the characteristics of the embedded system and C programming language, this paper discusses the application and optimization of embedded system as well as C programming language, aiming to help developers to improve the efficiency of program development and execution.

Keywords: C Language Assembly Language; Mixed Programming

1. Introduction

Embedded system is a special computer system which takes application as the center, takes modern computer technology as the foundation, and can flexibly cut software and hardware modules according to user needs (function, reliability, cost, volume, power consumption, environment, etc.).One of its characteristics is that the software and hardware can be cut, so it needs a language which can control the hardware and is easy to program and transplant. The characteristics of C language are very suitable for embedded development. The most widely used C language should belong to Unix and Linux operating system. At present, Android and IOS kernel, which are widely used in smartphone operating system, are modified based on Linux and UNIX. However, with the development of embedded system, new challenges also make C language development meet rivals. Other languages such as Java, Object-C and python are also widely accepted by embedded programmers. Therefore, when using C language as embedded development application, we need to optimize it as much as possible to adapt to the current rapid development needs[i].

2. Advantages and disadvantages of embedded C language

C language as a high-level language, has the characteristics of high-level language, can realize some upper application development, has high readability, easy for programmers to write code, also has the characteristics of low-level language, facing the bottom, can read and write memory and register through pointer, so it is easy to access hardware. A standard library is defined in C language, which makes the program written by programmer applicable to all the libraries in compiler to the greatest extent, and is easy to compile and transplant. For example, it can't access some registers. It is a process-oriented language, and its expansibility is worse than other object-oriented languages. Therefore, we need to use the characteristics of other languages combined with the design and application characteristics of C language in embedded system to optimize.

3. Embedded C language development and design：

3.1 Development Environment

The development of embedded software has more strict and complex requirements than traditional PC. For example, in the windows operating system on PC, we can download the compiler tools on its platform, and directly compile and develop windows system programs, that is, local compilation. The development and debugging of embedded software is usually carried out in the cross compiling environment. We should first edit and use the compiler to compile on the ordinary PC, and then copy the executable file generated by the compiler to the arm platform to run. This process is cross compiling. Embedded system is usually integrated on a specific hardware platform, located at the bottom of the software, used to coordinate the interaction between hardware and upper software. In addition, most of the embedded applications play a role in aerospace control, which also makes the embedded software development language have higher and more stringent requirements[ii].Compared with low-level assembly language, C language has become a better choice for embedded software development. It not only has the efficiency of low-level programming language, but also has the development efficiency of high-level programming language.

3.2 Compiling Process

Once we have finished the source code work for C, we must compile it. Generally speaking, in the compilation process, C code should be compiled into assembly code through the corresponding assembly compiler. In order to run on the target machine, we must also link it to other files as executable binaries to identify the target. Therefore, assembly plays a bridge role in the compilation process. If we can handle the call relationship between C language and assembly language, we can improve the efficiency of the code.

4. Embedded C program design and application optimization

4.1 Mixed programming of C language and assembly language

In the design of embedded applications, if all the programming tasks are completed by assembly language, although the object code execution efficiency is high, but its workload will be large and difficult to maintain; if all the tasks are completed by C language, although it is concise and clear, but the object code execution efficiency is low, especially in the application with strong real-time performance, it will highlight the shortcomings of C. Therefore, an embedded application program is usually implemented by the mixed programming of assembly language and C language. In addition to the assembly language programming for the initialization part, the main programming tasks are usually completed by C.

4.2 Determination of parameter passing and calling relationship

Assembly language program and C language program involve parameter transfer when they are called, usually using stack for parameter transfer. In assembly language, BP is used as base register. The calling program first pushes the parameters in the C language program into the stack in turn, and then uses BP plus different offsets to stack the stack in turn when these parameters need to be used. Access the data in the operation. For the procedure or function to be called, it is necessary to explain and establish the relationship between the callee and the callee in advance. The procedure or function to be called should be specified as an external type in advance, so that it can be referenced by an external module. The calling program also needs to specify the name of the external module to be referenced in the program. When interpreting the calling relation, the corresponding assembly language format should be determined according to different storage methods. The small C program pattern corresponds to the near process of the assembler, while the large c program pattern corresponds to the far process of the assembler[iii].

4.3 Design application expansion

From the above analysis, we can see that the compilation of C program needs to go through the process of compilation → link → executable. Therefore, it is inevitable to complete the compilation process again when debugging and controlling the application. C language is a process-oriented language. In the development of some upper level applications such as UI, it is not as easy to expand and maintain as object-oriented language. In order to extend the application of C program, Lua is adopted to meet the current requirements. Lua script language has been successfully applied to online games. By analyzing its characteristics, combining with the characteristics of C language and the requirements of embedded development, we can combine Lua and C into the development of embedded system. With the development of dynamic language, Lua can help programs to complete more functions and simplify the work of programmers. Therefore, the advantages of combining Lua with C are discussed here. Firstly, Lua is a script language, which is a programming language created to solve the traditional development language needs to be encoded, compiled, linked and executed. Unlike the advanced language, Lua does not need to compile itself, but performs "interpretation execution" when executing, because it can save compilation process and reduce development time. Lua script itself is very small, compared with other scripting languages such as python, it runs fast and occupies less memory, which is very suitable for embedded devices with limited memory resources. Secondly, Lua is open source . Lua itself is implemented in C language. The code is very concise and short, so it is easy to transplant to C programs, and it can be compiled on almost all platforms. Therefore, there is no need to worry about the problems of difficult transplantation and heavy hardware consumption. The characteristics of embedded system require good portability of software, so Lua is also accepted by many embedded developers. Finally, Lua has good expansibility, the defined variables have no type restrictions, and adopts the object-oriented rather than process-oriented design structure, which makes up for some shortcomings of C language in design. Through these three advantages, the combination of lua and C is a good choice for embedded application development. Lua's parser can be transplanted to C program, and a set of interfaces can be provided for Lua in the program Call, programmers only need to write a simple Lua script to call these interfaces, through UART serial port or USB transfer Lua file to the embedded device for analysis, to complete a series of control without modifying the C program code. For example, in the factory's mechanical arm operation, we need to change the operation action. We can use the combination of lua and C, and write Lua script to realize a new group of operation action, without having to go through the process of program modification compile run again, which greatly improves the development efficiency1.

5. Conclusion

In general, the code set of the compiler will become the assembly set of the compiler, and the compiler of the program will be compiled. It shall full play to their respective advantages, cross call each other, parameter transfer, and share data information and data structure. Since then, the software developed has become more practical, safer, and the development and programming work has been doubled. Therefore, we need to fully analyze and master the programming and application of C language to improve the applicability of embedded C program. In the process of its active development and utilization, it is necessary to study the actual electronic hardware system, and reasonably combine the embedded C language with assembly language (such as Lua language) in the development and design, and expand some functions, which can realize the functions that cannot be completed by high-level language components, and improve the efficiency of application development and execution.

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Simple Analysis of Pipeline Performance and Cycle Optimization in Computer Architecture

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Abstract: This paper first summarizes the performance analysis of pipeline and some problems related to the performance of pipeline, and then introduces the how to loop optimization in detail. Pipelining technology is a very important technology in the field of computer. Using pipelining technology, multiple executing device in the computer work in parallel. The idea of parallelism comes from the traditional production assembly-line model of factory. As early as in the 1960s, some high-end machines have begun to use pipeline technology. Up to now, the pipeline technology has been very mature. The IBM7030 was the first computer to adopt pipeline technology. Pipelined processor can meet the higher requirements of computer operation and improve the performance of CPU. Pipelined processor has become an important and indispensable part of computer architecture.

Keywords: Pipeline; Throughput Rate; Speed up Ratio; Efficiency; Loop Unrolling, Instruction Scheduling

1. Introduction

The emergence of new components has brought great changes to the development of computers. On the one hand, people are improving the performance of computers by improving old processes and trying to develop new components. On the other hand, attempts have been made to improve the performance of computers by improving their organizational structure. Among the many architecture improvements, the application of pipeline technology has a certain influence.

2. Pipeline performance analysis

The throughput rate, speed up ratio and efficiency are the most important three indexes to evaluate the performance of pipelined processors

2.1 Throughput rate

The throughput rate is the result of the amount of service or output provided by the pipeline per unit of time. TP (Through Put) = n / Tk (1.1)[1]

N is the number of tasks

Tk is the total time to complete n tasks.

In the pipeline with k sub-processes (K-level pipeline). The execution time of each segment is equal, and the tasks are continuously input, and the time taken to complete n tasks is $Tk = (k + n - 1)\Delta t$ (1.2)

Where Δt is the clock period .

According to Equation (5.1), in this case the throughput is equal to

$$TP = \frac{n}{(k+n-1)\Delta t} \quad (1.3)$$

As n approaches infinity $TP_{\max} = \frac{1}{\Delta t}$ (1.4)

If the execution time of each segment is unequal

$$T = \sum_{i=1}^{m} \Delta t_i + (n-1)\Delta t_j \quad (1.5)$$

Where m is the total number of sub-processes

Δ ij is the time required for the slowest period

n is the number of tasks

We can prove by example that pipeline technology improves efficiency and shortens the execution time of computer to process the same tasks. In a computer system, the execution of an instruction can be divided into three processes: instruction fetching, instruction analysis and instruction execution. If the instruction fetching time is 4 Δt , the execution time is 3 Δt , and the analysis time is 2 Δt , The time required to execute 800 instructions sequentially is $(4+2+3)\Delta t \times 800 = 7200\Delta t$ .If the instructions are executed in pipelined system, the time required is

$$(4+2+3)\Delta t + (800-1)\times 4\Delta t = 3205\Delta t$$

2.2 Handle the bottleneck of the pipeline

The speed bottleneck in the pipeline is the function segment with the longest processing time.[2] The bottleneck part of the pipeline is mainly to reduce the processing time of the pipeline. There are two methods to remove the speed bottleneck of the pipeline. The first method is to subdivide the bottleneck function segment.[3] For example, the pipeline is divided into four functional segments, and the time required to flow through each functional segment is Δt，3Δt，Δt，Δt. The bottleneck function segment of the pipeline is 3Δt. The bottleneck segment can be subdivided into three sub-functional segments whose time is equal to Δt. If the bottleneck function segment cannot be further subdivided, the bottleneck sub-function segments connected in parallel. [4] As shown in Figure 5.4.

2.3 Speed up ratio

In the field of parallel computing, the pipelining ratio is how much faster the sequential algorithm is compared to the pipelining (parallel algorithm) for the same task.[5] The formula for calculating the acceleration ratio is as follows:

$$S_p = \frac{T_1}{T_p} \text{------(1.6)}$$

P is the number of CPUs

T_p is, pipeline execution time

T_1 is the sequential execution time

According to formula 5.2, when the execution time of each segment is equal and the input task is continuous

$$S = \frac{k \times n \times \Delta t}{(k+n-1)\Delta t} = \frac{k \times n}{(k+n-1)} \quad (1.7)$$

When n approaches infinity, S = k. This limit indicates that when the number of pipeline segments is limited, the larger the number of tasks, the less obvious the acceleration effect. However, under normal conditions, the acceleration ratio is always greater than 1. The speedup of the above example is $\frac{7200\Delta t}{3205\Delta t} = 2.2465$

2.4 Efficiency calculation in pipeline

The efficiency of the pipeline is the percentage of the time of n tasks and the total running time (time for processing tasks and idle time) which can be understood as the utilization rate of the equipment of pipeline equipment. In the pipeline time-space diagram, the efficiency of the pipeline can be obtained by counting the number of grids. E=the space-time region occupied by n tasks (colored cells)/the total space-time region occupied by k flow segments (all cells).

$$E = \frac{T_0}{k \times T_k} = \frac{k \times n \times \Delta t}{k \times (k+n-1) \times \Delta t} = \frac{k \times n}{k \times (k+n-1)} = \frac{n}{k+n-1} \quad (1.8)$$

The quantitative relationship between throughput, pipeline and efficiency

$$S = \mathrm{k}E \quad (1.9) \quad E = TP\Delta\mathrm{t} \quad (1.10) \quad S = TP\mathrm{k}\Delta t \quad (1.11)$$

Examples 1

Floating-point addition and subtraction usually go through five levels: matching of exponents-Mantissa Operation-Results normalization-rounding-overflow judgment You can calculate the value of 10 floating point numbers by using A 5-segment floating point adder with the same delay time for each segment. The pipeline has enough buffer registers and direct data path. Z = A+B+C+D+E+G+F+H+I+J

Find the throughput rate, efficiency and speed up ratio of the pipeline.

If we set the delay time of each segment as Δt

According to the space-time diagram, the the pipeline has completed nine tasks within 20Δt.

$$\text{Throughput } T_{\mathrm{p}} = \frac{9}{20} = 0.45\frac{1}{\Delta t}$$

$$\text{Speed up ratio } S_p = \frac{9 \times 5}{20} = 2.5$$

$$\text{Efficiency} : E = \frac{45}{20 \times 5} = 45\%$$

Example 2

When calculating addition and multiplication on a dual-function pipeline where addition is divided into three levels and multiplication is divided into five levels, it should be noted that the same section of the pipeline with different functions should not overlap. (A1 + B1) * (A2 + B2) * (A3 + B3) * (A4 + B4)

Calculation order: $x_1 = a_1 + b_1, x_2 = a_2 + b_2, x_3 = a_3 + b_3, x_4 = a_4 + b_4$

$y_1 = x_1 \times x_2, y_2 = x_3 \times x_4$

So z is equal to $y_1 \times y_2$

Notice that when two different functions are realized in the same pipeline, the space-time diagram cannot overlap.

$$Throughput: T_p = \frac{n}{T_k} = \frac{7}{17 \times \Delta t}$$

$$Speedup: S = \frac{(4 \times 3 + 3 \times 5)}{17} = 1.88$$

$$Efficiency: E = \frac{(4 \times 3 + 3 \times 5)}{17 \times 6} = 0.264$$

The comparison of the two examples above shows that in order to improve efficiency, it is necessary to minimize function switching, process as many instructions as possible, and refine each function segment. Pipelining works better for independent instructions.

3. Cycle expansion optimization

3.1 Instruction scheduling

Instruction scheduling is performed by the compiler. [6] As mentioned earlier, the pipeline works better for independent instructions. The purpose of instruction scheduling is to find out such instruction sequences and execute unrelated instructions on the pipeline in order to reduce the execution time of the whole instruction

For convenience of discussion, the delay of floating-point pipeline used is

The instruction that produces the result	Instructions for using results	Delay (Cycles)
Floating point calculations	Another floating-point calculation	3
Floating point calculations	Floating point store (S.D.)	2
Floating point Load (L.D)	Floating point calculations	1
Floating point Load (L.D)	Floating point store (S.D.)	0

Table 3.1

(The result of the floating-point load instruction can be sent to the store instruction through the directional path in time, so the delay is 0)

Example 3

For the following source code, converted to MIPS assembly language, without instruction scheduling and instruction scheduling conditions, analyze the time of a loop.

```
for (i=1000; i>0; i--)
x[ i ] = x[ i ] ＋ S;
```

Start by translating the program into MIPS assembly language code

```
Loop:   L. D        F0, 0(R1)
        ADD.D       F4, F0, F2
        S.  D       F4, 0(R1)
        DADDIU      R1, R1, #-8
        BNE         R1, R2, Loop
```

In the case of no instruction scheduling, according to the instruction execution delay in the floating-point pipeline given in the table, the actual execution of the program is as follows

```
Loop:   L. D        F0, 0(R1)
        ADD.D       F4, F0, F2
        S. D        F4, 0(R1)
        DADDIU      R1, R1, #-8
```

	Instruction outflow clock
Loop :L.D F0, 0(R1)	1
idle	2
ADD.D F4, F0, F2	3
idle	4
idle	5
S.D F4, 0(R1)	6
DADDIU R1, R1, #-8	7
idle	8
BNE R1, R2, Loop	9
idle	10

Table 3.2After the instruction scheduling

	Instruction outflow clock
Loop :L.D F0, 0(R1)	1
DADDIU R1, R1, #-8	2
ADD.D F4, F0, F2	3
idle	4
BNE R1, R2, Loop	5
S.D F4, 0(R1)	6

Table 3.3

3.2 Loop unrolling

Loop unrolling is a kind of program transformation that reduces the number of loop iterations and branching instructions by performing more data operations in each iteration. For example, we can replace the code:

```
for (i = 0; i < len; i++) {
sum += arry[i]
}
```

with the code[7]:

```
for (i = 0; i < len; i += 2) {
    newSum += arry[ i ] + arry[i + 1]
    }
```

3.3 Notes on loop unrolling and instruction scheduling

Pay attention to effectiveness and correctness.

Use different registers.

Delete redundant test instructions and branch instructions.

Correct the end of loop code and the new body of loop code accordingly.

Pay attention to the correlation analysis of memory data and new correlations.

Conclusion

Pipeline technology is one of the two major breakthroughs in the history of processor: it enables the processor to execute multiple instructions at the same time. This special working mode of pipeline technology not only increases the workload per unit time, but also helps to improve the CPU frequency. The classification of pipeline technology is more complicated, its description is mainly through the space-time diagram, through the space-time diagram, we can see the factors that affect the efficiency of the pipeline, and more intuitive to see the characteristics of pipeline technology. The throughput acceleration ratio and efficiency are used to evaluate the pipeline processor. And the scope of study is exaggerated to provide information for pipeline cycle optimization. It is very helpful to understand the pipeline processing technology for the study of computer structure and time parallel technology.

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Python-Based Little Dinosaur Game Design

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Abstract: Python is a cross-platform and interpreted high-level programming language which is open source and free. It has a rich and powerful library that can easily connect various modules made in other languages, so Python is often called the "glue" language. [1]The Python language has developed rapidly in recent years and has a wide range of applications. A large number of Python applications can be found in such fields as Web programming, graphics processing, hacker programming, big data processing, web crawlers, scientific computing, and game programming and so on. The invention and research of the Python language are mainly for facilitating learning and application. Therefore, the Python language is open source, with characteristics of simple syntax and developer-friendly writing and understanding. This article aims to master the advantages of Python language in the field of game development through the design and analysis of the little dinosaur game.

Keywords: Python; Little Dinosaur; Game Design

1. Overall planning design of game development

As we all know, Google Chrome will provide a dinosaur game when there is no network connection to help ease our anxiety. At this time, just press the space bar, the little dinosaur will move and begin to run wild in the desert, and then there will be a steady stream of obstacles such as cacti, birds and so on. Players need to control the little dinosaur to jump into the air to avoid these obstacles. Enter chrome://dino/ in the address bar of the browser, and you can play this game even when connected to the Internet.[2]

With the rapid development of the Internet industry, various powerful programming languages and real-time electronic game development modules have also been born, such as the Pygame module in Python, which provides a technical basis for the development of game programs. For this reason, this article proposes the development of a little dinosaur game based on Python language. According to the running process of the game and the embedding of game elements, the development is divided into 4 classes: dinosaurs, obstacles, layouts, and integrals. Finally, it will encapsulate each class together.

2. Detailed design of game program

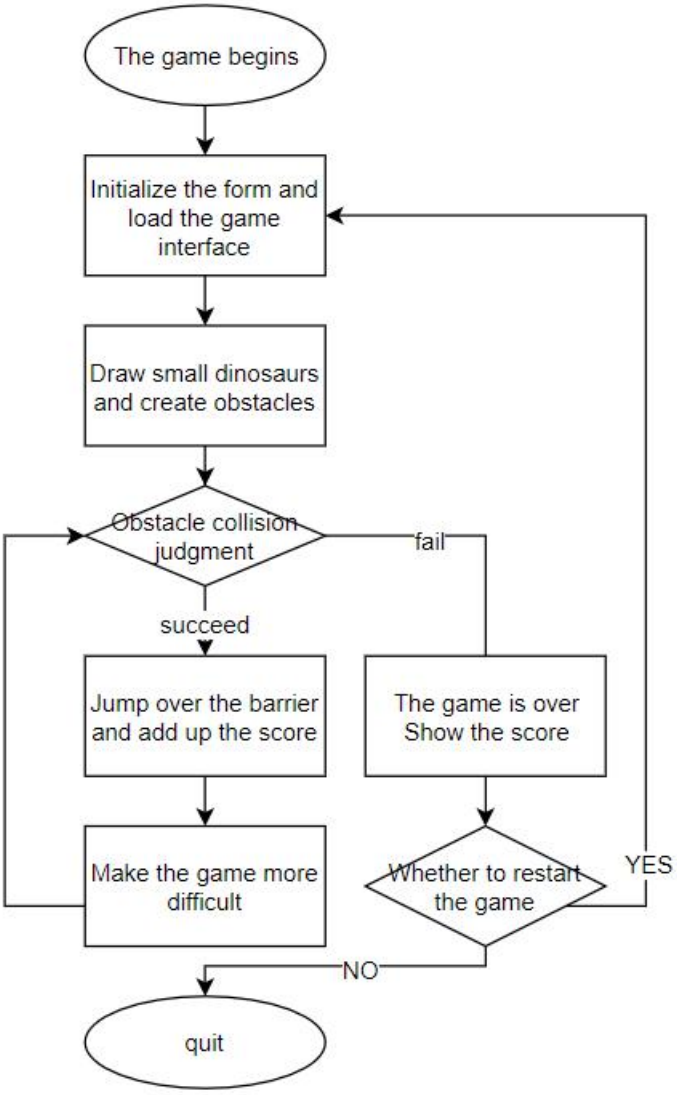

Figure 1

2.1 Background building

In Python game development, the Pygame module is mainly used. After importing the library using import, it will start laying the background. The entire scene of the game needs a window as a carrier to display the picture in the game. For the simplicity of the page, the background size can be set to 1000*500. At the same time, in order to unify the character and background style of the entire game, a background picture is prepared. During development, you can directly call the method in the module to import it.

2.2 Little dinosaurs and their movement patterns

When the little dinosaur jumps, you first need to set the default fixed position of the little dinosaur on the map, and then judge whether the space bar in the keyboard is pressed. Same as the background picture, you need to import three pictures corresponding to running and jumping, and switch the pictures through the state transition to complete the corresponding action. In order to adjust the difficulty and track the status of the little dinosaur, you need to create a little dinosaur and set three parameters at the same time, position, velocity, and acceleration. You need to record the position, speed and acceleration of the little dinosaur respectively. At the same time, in order to return to the initial state when restarting, the initial values of velocity and acceleration must be set to 0. Finally, call the function in the main function to draw the little dinosaur.

Then realize the movement of the little dinosaur. According to its game function, we divide the movement mode of the little dinosaur into the most basic two categories, namely, running and jumping. In order to avoid obstacles, jumping is the key step.

The specific implementation method is as follows: [3]First, the implementation of running is to set the position of the little dinosaur unchanged, and scroll the background to achieve visual advancement. Next, in order to realize the jump, two parameters need to be set: jump-velocity and gravity, which are the displacement and gravity when jumping, to ensure that gravity will be added to the little dinosaur to return to the initial position after the little dinosaur jumps up. Set up a function jump to encapsulate related operations, and realize the up and down displacement of the little dinosaur through the addition and subtraction of parameters and the acceleration of gravity. Then by detecting the pressing of the space bar, call the jump function to complete the jump.

2.3 Obstacles and their movement patterns

Before realizing the appearance of obstacles, it is necessary to consider the size, moving speed and interval of the obstacles. If the obstacles that appear each time are the same, then the game will lose the fun. Therefore, it is necessary to load multiple obstacle pictures of different sizes, and then randomly select and display them. In addition, you need to calculate how often an obstacle appears and display it in the main window.

The specific implementation method is as follows: [4]first import random numbers, create an obstacle class named Obstacle, define a parameter in the class, and then load the obstacle picture in the initialization method. Create a random number from 0 to n, and select obstacles based on this number, and finally create the size of the obstacle rectangle based on the width and height of the picture, and set the drawing coordinates of the obstacle. Then in the Obstacle class, first create the Moving method to realize the movement of the obstacle, and then create the Obstacle method to realize the drawing of the obstacle. Define the time to add obstacles and the list of obstacle objects in the main method, place them in the code of drawing dinosaurs, and set the interval of the time between obstacles. If the interval is too fast or too slow, it will affect the normal progress of the game.

2.4 Collision and integration functions

When realizing collision and integration, you first need to judge whether the two rectangular pictures of the little dinosaur and the obstacle collide. If there is a collision, the function is called to end the game, otherwise, the little dinosaur has crossed the obstacle and added points. And the score is displayed in the form.

The specific implementation method is as follows: In the Obstacle class, create the showScore method below the Obstacle method to display the score in the top middle of the form. Complete the game ending method above the main method, and finally load the game ending picture and display the picture in the middle of the window, and display the score at the same time. In the main method, under the code for drawing the obstacle, it is necessary to judge whether the little dinosaur collides with the obstacle. If there is a collision, the game end function is called, otherwise, the score is increased and the current score is displayed.

3. Important game details and function optimization:

3.1 The overall operation of the game

There are several problems in game running: how to judge when the game is in progress or over, and how to restart the game.

Solve the first problem first. You need to set a variable running to distinguish the state of the game, and set a function to end the game, and the running and continuation of the game only need to determine the value of running. Initially set the value to 1, and then all parts that should stop the game will call the game end function to set running to 0 for unified management.

Then solve the second problem. The game ends when the little dinosaur hits an obstacle. At this point, you need to ask

the player whether to restart and adjust the data accordingly.

The specific implementation method is as follows: first display the prompt sentence in the center of the screen, judge that the player enters N and Y from the keyboard, and automatically close the window when the input is N and exit the game. When the input is Y, you need to clear the obstacles on the screen and redraw Little dinosaur and reset other key parameters in the game.

3.2 Detailed optimization on the small dinosaur movement mode

Recalling the previous implementation of the small dinosaur movement mode, the small dinosaur jumps by adding and subtracting parameters, but in actual play, the player often presses the space bar many times, and the small dinosaur will continue to jump in the air at this time, which is obviously not consistent with common sense. Therefore, it is necessary to add a parameter jumping before the original jump function, which is initialized to 0 at first, and is updated to 1 when the jump function is called, and the judgment is performed until the little dinosaur returns to the initial position and it is updated back to 0. During the game, as long as the value of jumping is 1, it means that you are in the air and cannot jump again.

3.3 Memory optimization for game running

In the implementation of the previous obstacle module, this function was realized by randomly calling obstacles and setting their moving speed and appearance interval. But at the same time, a problem arises. When calling obstacles, each obstacle is an independent individual. When the little dinosaur jumps over the obstacle, the obstacle does not disappear but just moves outside the main window, and the player cannot see it. That's it. As the number of obstacles in the later game increases, new obstacles are constantly called, and the memory consumed by the game will continue to increase.

To solve this problem, you can set a function remove-out-bound-ememies to loop through each obstacle. When the coordinate of the obstacle is detected as a negative number, that is, after it has exceeded the screen, it will be destroyed and the memory will be recycled.

3.4 In-game difficulty enhancement function

In actual games, a single game content will make players feel boring and lose interest. For this reason, the difficulty of the game needs to be adjusted to increase the playability.

The specific implementation method is as follows: Set the function increase-enemy-velocity, and increase the obstacle moving speed after a period of time, in which attention should be paid to the adjustment of the obstacle appearance interval set before, and both too fast speed and too short interval will cause the game to appear A situation that must fail.

Conclusion

With the development of artificial intelligence in recent years, the application of the Python language has become more and more common. Using the Pygame module in the Python language to design a little dinosaur game, you can find that the Python language is also very easy to develop games, and it can complete the same function with less code than other languages. [1]Python has a powerful standard library. [5]The core of the Python language only contains common types and functions such as numbers, strings, lists, dictionaries, and files, while the Python standard library provides additional power such as system management, network communication, text processing, database interfaces, graphics systems, and XML processing features. The Python standard library has a clear naming interface and well-documented, so it is easy to learn and use.

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Analysis of Hot Spots and Trends of Cultural Security Research Based on Citespace

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***Abstract**:* With the development of The Times, the connotation of national security is increasingly enriched, and the influence of non-traditional security factors on national security is increasing day by day, eventually forming the overall concept of national security. As an important part of non-traditional national security, cultural security can be further analyzed based on the review of its research process and the excavation of research hotspots by using Citespace software. From the perspective of research process, although the overall trend of cultural security research in China is increasing, it has stagnated in recent years, and is faced with the problems of insufficient number of core authors and low degree of journal diversification. In terms of research hotspots, China's cultural security research has shortcomings such as scattered research hotspots and single research fields, and it is necessary to further deal with the relationship between resisting cultural invasion and enhancing national cultural soft power.

Keywords: Cultural Security; National Security; Knowledge Map

Introduction

At present, globalization has become an irreversible trend, and the rise of network technology and the globalization of cultural industry have made the situation of cultural security in China more complicated. Therefore, how to enhance cultural strength under the influence of many external threats has gradually become the upsurge of cultural security research in China. Based on Citespace software tool, through the acquisition of the CSSCI database cultural security research in recent 20 years, the journal of those papers, authors and key words such as information visualization knowledge map analysis, intends to illustrate cultural security for nearly 20 years of research history and research hotspot, and discussed the development trend of China's cultural security research and research frontier.

1. Data Sources and Research Methods

1.1 Data Sources

In this study, Chinese Social Science Citation Index (CSSCI) was used as the data source. With "cultural security" as the key word, the period was limited to 2001 to 2020, and 355 literatures were obtained after initial retrieval. After manual elimination of irrelevant documents such as "conference", "report" and "review", 341 papers were obtained.

1.2 Research Methods

Based on the CITESPACE software developed by Professor Chen Chaomei's team at Drexel University, and supplemented by the statistical function of Chinese Social Science Citation Index (CSSCI), this study preliminarily analyzes and discusses the hot spots and trends of cultural research. CITESPACE integrates bibliometrics and information visualization methods, presenting a visual knowledge map in the form of nodes and links, which provides a powerful support for reviewing the research process and further exploring research frontiers and trends[1].

2. Analysis of Research Results

2.1 Overview of cultural security research in China

2.1.1 Number of Papers and Trend of Change

On the whole, the change trend of cultural safety-related literature in CSSCI and CNKI databases is basically the same, which can be divided into three stages. The first stage is from 2001 to 2010. Although the change of literature quantity fluctuates in a few years, it shows an overall upward trend. In the second stage, from 2010 to 2018, the annual number of publications in the field of cultural security remained at a high level. The third phase is from 2018 to 2020, with a decrease in the number of articles published.

2.1.2 Author Analysis

2.1.2.1 Core Author Analysis

The results of core author analysis showed that Hu Huilin had the highest number of publications, with 12 articles in total. According to Price's law, the number of publications of the most prolific authors is substituted into Price's formula: $M=0.749\sqrt{N_{max}}$, and the M value is 2.59. Accordingly, after selecting the authors who published at least three papers as the core authors, there are 11 core authors and 45 papers in total, accounting for 13.1% of the total literature, far below the standard value of 50% proposed by Price's Law, indicating that a stable core author group has not been formed. Among the above core authors, Hu Huilin ranks the first. His research on cultural security not only spans economy, cultural industry, cultural system, law and ideology in terms of knowledge dimension, but also has a strong sense of The Times.

2.1.2.2 Cited Author Analysis

According to statistics, there are 7 authors cited more than 15 times. As the core author with the highest number of publications, Professor Hu Huilin has been cited the most (60 times), and is a worthy leader in the research field of Cultural security in China. In addition, Pan Yihe (27 times) studied cultural security from the perspective of non-traditional security, further clarifying the connotation of cultural security and the problems faced by China's cultural security and its countermeasures. Liu Yuejin (22 times) is one of the earliest scholars in the field of non-traditional national security research. His book National Security Has great influence and he is one of the most core scholars in the field of national security research [2].

2.1.3 Journal Feature Analysis

In terms of discipline distribution, periodicals on current politics and ideological politics accounted for 42.9%, those on comprehensive social sciences 35.7%, those on communication 14.3% and those on ethnology 7.1%. It can be seen that the high-quality literature of cultural security research is mainly concentrated in the ideological and political field, and its disciplinary diversification degree needs to be improved.

2.2 Keywords Analysis and Research Hotspots and Trends

2.2.1 Keywords Co-occurrence and Research Hotspot Analysis

Keywords co-occurrence analysis provides a visual map for revealing the research hotspots of cultural security. In addition to cultural security, globalization, ideology and cultural industry appeared the most frequently, and the keywords of cultural soft power, cultural confidence, network cultural security, cultural hegemony and cultural construction had higher centrality. In general, although relevant researches on cultural security have involved different fields, the number of hot words with high influence is small, indicating that current researches still have certain limitations in the field.

2.2.2 Keywords Cluster Analysis and Research Process Evolution

On the basis of keyword co-occurrence analysis, cluster analysis is carried out on keywords, and the final clustering results are as follows:

Cluster #0 "National cultural security" is the first cluster to reach the threshold, and the largest cluster, which can reflect the overall progress of cultural security-related research. From 2001 to 2007, the focus of cultural security research is to prevent the invasion of external culture. From 2008 to 2016, studies related to cultural security focused on improving China's cultural strength, mainly discussing ideology, and studies related to national culture also received attention during this period. From 2017 to 2020, cultural security-related research entered a brief bottleneck period in this stage.

Cluster #2 "Cultural Confidence" runs from 2002 to 2016. Before 2010, cultural confidence in a narrow sense was a research hotspot during this period. After 2011, studies related to cultural security not only deepened on the basis of previous studies, but also began to pay attention to cultural confidence in a broader sense, such as "sports culture", "soft power" and "new media".

Cluster #3 "Globalization" lasted from 2004 to 2016. Before 2007, studies on cultural security focused on the challenges faced by Chinese national culture in the context of globalization. After 2008, studies began to focus on the relationship between China's social problems and cultural security, and paid more attention to improving China's cultural strength to cope with the threats to cultural security in the context of globalization.

Cluster #4 "Cultural industries" lasted from around 2005 to 2016. Appeared around 2010 "harmonious culture" and "advanced culture" are associated with "cultural resources", related research hot spots for this period: the rich cultural resources into strong "culture industry", in the cultural exchange and collision, adhere to the "advanced culture" in the direction to build socialism with Chinese characteristics "harmonious culture". Around 2015, the issue of "government supervision" and "marketization" of cultural industry has become a new research hotspot.

Cluster #5 "Cyber cultural Security" lasted from around 2008 to 2016. Keywords such as "security threat", "information technology" and "network culture" appeared in the early stage of the cluster, indicating that the research on network culture security at this stage focused on the threat faced by network culture under the influence of the emerging technology of network from the perspective of communication mode.

3. Conclusions and Prospects

In this paper, Citespace software is used to carry out knowledge graph visualization analysis of cultural security related researches in CSSCI database in the past 20 years, and the following conclusions are finally drawn:

Although the research results of cultural security are increasing on the whole, they have declined in recent years. Based on the changes in the number of articles published, it can be seen that the research on cultural security has continued to grow after 2001. Since 2007, many research hotspots such as "cultural confidence", "cultural industry", "globalization", "network cultural security" and "ideology" have erupted in succession, keeping the research results on cultural security at a high level. However, since 2017, only "cultural development" has reached the threshold of research hotspot, and the number of research results has begun to decline, which still requires more attention from scholars.

Cultural safety research has not yet formed a stable core group of authors, and the degree of journal diversification needs to be improved. According to the results of author analysis, hu Huilin is the most prolific author in China's cultural security research, and his citation frequency is also the highest. However, compared with him, the number of publications of other core authors needs to be improved to form a larger core author group. From the perspective of published journals, most of them are ideological and political journals and comprehensive journals of social science, which can hardly reflect the different fields involved in research hotspots such as cultural industry.

The research hotspots are scattered and the research fields are limited. Based on keywords co-occurrence analysis, in addition to the keywords "cultural security", only "globalization", "cultural industries" and "ideology" and "cultural confidence" four keywords co-occurrence frequency up to 10 times, and the key words show that there are more cultural security related research in macroscopic perspective as the breakthrough point, therefore further research can broaden the cultural security research field, appropriately Further exploration of micro-level research should be strengthened.

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Application Research of Computer Technology in Office Automation

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Abstract：With the rapid development of global economic integration, people all over the world can communicate with their friends and colleagues through computers, which not only brings convenience to people's lives, but also brings great convenience to their work. Industries, enterprises have to face increasingly complex tasks, their work ability and comprehensive quality requirements are also increasing. The traditional management concept and management mode can not adapt to the needs of enterprise office automation. The enterprise should keep pace with the Times, flexible use of computer technology, further improve the efficiency of office automation.

Keywords: Computer; Office Automation; Application Research

Introduction

With the acceleration of the process of information, office automation also comes into being. Office automation refers to the flexible application of computer technology to the information processing system with automatic function, so as to make office automation get better development. Office workers often use a variety of computer technology and equipment to collect, handle, process and store data and perform a range of tasks. Due to the huge consumption of manpower, material resources and financial resources in the traditional office mode, personnel spend a lot of time and energy on the communication between various departments such as document processing and personnel allocation, which is cumbersome and prone to human error and negligence, which seriously affects the quality and efficiency of work. Applying computer technology to the office process can make all kinds of office work simple and fast.

1. The necessity of the application of computer technology in office automation

The application of computer technology, computer network technology and all kinds of electronic equipment has effectively optimized the traditional way of office, formed a new way of office, and improved the quality of staff's work. With the development of computer technology, we should constantly introduce new technology in the field of office automation, and constantly update and optimize. At present, in office automation, the application of computer technology in several aspects, such as: the traditional writing and recording are completed by pen and paper. Such work efficiency is low, but the application of modern automation equipment and computer technology makes the office mode optimized and improved. Combining the traditional office organization structure with the new automated office mode can effectively improve the collaborative ability of staff, optimize and expand it, and create a better working environment.

In the traditional office mode, most of the complex work such as data collection, sorting and processing is manual operation, which consumes a lot of manpower, making the number of employees keeps increasing, and the labor cost is getting higher and higher. The use of computer technology and advanced instruments, can improve the efficiency of the staff, let the computer deal with much tedious work, reduce the need for the number of staff office work. The application of modern computer technology and information technology can effectively improve the convenience of the office. In practical work, no matter in document approval, document processing, personnel management and other aspects, office automation can change the original office mode to a certain extent, so as to maximize the use of its own value and function. Effectively save human resources to achieve efficient office to provide strong support.

In addition, the implementation of office automation can also effectively promote the coordinated development of work, and innovation in the way of communication in various departments, effectively promote the steady development of the company. The use of computer technology to achieve the integrity, independence and security of office automation system, effectively simplify the office process, to ensure the security of information documents, so as to achieve the development of enterprises.

2. The superiority of computer technology in office automation

2.1 Optimizing office procedures

In the daily work of the enterprise, the traditional office mode due to the restriction of space, time and other factors, makes the staff cannot be handled in a timely manner, receive all sorts of important work, thereby reducing office efficiency, so must be the introduction of computer technology, to promote office automation, and effectively optimize the office environment and working conditions. In addition, with the use of computers and information technology, the network system can instantly transfer files, and can effectively optimize the office process, reducing the workload of staff. The application of video conference, document fax and other office forms has effectively promoted the rapid development of the company.

2.2 Improving one's working efficiency

In office automation, computer applications and databases are independent of each other, which improves security. Using computer technology, you can use login passwords and permission settings in automated offices, increase the security of the core content of the office. Using computer technology, can unify the complicated work process, realize the automation and integration of the process, effectively improve the correctness and accuracy of the office operation, and can prevent the huge loss caused by the operation error. The computer records the work of each link and staff in detail, thus laying a solid foundation for the realization of closed-loop management. In daily work, use a variety of commonly used office software to edit and process the text, improve the working efficiency of the text work; All kinds of image processing software are used to process the video and improve the quality of work. Using the communication advantage of computer technology can enhance the communication ability of all departments, achieve a high degree of information exchange and resource sharing, so as to improve work efficiency.

3. Analysis of problems of computer technology in office automation

At present, the application level of computer technology in office automation is becoming more and more mature. With the development of the social economy, people's requirements for the office environment are constantly improving. In office automation, the application of computer technology needs to be constantly strengthened and improved. At present, with the opening and expansion of network environment, the possibility of malicious attacks on computers continues to increase. Once the computer is subjected to malicious attacks and network virus intrusion, it will pose a serious threat to the security of data information, and it is very easy to tamper with, loss and other problems. With the professional enhancement of computer hardware and software, new requirements are put forward for staff, who need to have corresponding professional knowledge, operation skills and safety awareness, but many staff still generally have low professional literacy.

4. Coping strategy of computer technology in office automation

4.1 Sound office automation system

At present, some enterprises in the implementation process, not fully considering the actual situation, cannot correctly choose computer software, or blindly pursue better, more expensive equipment and software, resulting in a large amount of capital investment, affecting the cost control and development of enterprises. Therefore, it is necessary to strengthen and improve the construction system of office automation, carry out quantitative statistics and analysis of various needs, improve the economy of technology application, and effectively reduce the investment cost of enterprises.

4.2 Strengthen internal cooperation

The use of computer technology can also maximize the use of resources and increase enterprise flexibility. In office work, there is a lot of program work, such as editing documents, receiving and sending different business reports, and reviewing them. Because these tasks are so formulaic, computer technology can make them faster and more efficient, while reducing unnecessary workload. In addition to these process-based tasks, computer technology is also widely used in daily management, such as food management, meeting management, workshop management and project management. This daily management work is very important. It will have a certain impact on the operation of the whole company.

4.3 Increase the computer skills of office staff

In order to improve the application effect of computer technology, it is necessary to improve the computer application ability of employees and ensure the application of computer technology. To provide staff with more opportunities for training and learning, so that they can skillfully use the office equipment and software used, so that computer technology can be fully used.

4.4 Attach importance to innovation of office automation technology

In order to adapt to the development of The Times, we must continue to strengthen the application of computer technology, strengthen the innovation of office automation technology, and strengthen the development of cloud computing, big data and other technologies. We should also actively use office automation to make it more efficient and further promote the sustainable development of office automation.

Conclusion

To sum up, with the rapid development of science and technology, the computer industry has achieved unprecedented development. Computers are widely used in people's lives, work and entertainment. Nowadays, the use of computer technology, not only can relieve the pressure in the work, can effectively improve the work efficiency, can promote the development of office automation, to ensure the safety and accuracy of work. Computer technology is a key link in modern office automation systems. It connects all the links of office automation and promotes the rapid development of enterprises.

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