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RSA Signature

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Abstract:RSA method has been a staple of cryptology for centuries. It is the corner stone of modern encryption method. This study explores how RSA encryption method has affected people's life, the use of RSA and the fundamental theory of RSA encryption. The report includes the history, development, application and future application and development of the RSA encryption method. In recent years, online banking, shopping, cloud technology has become wildly excepted and grow in popularity. In particular, the past two years had forced large population to incorporate internet activities to their norm. Most people have been using encryption technology without realizing or understanding it, which sometimes leads to information leaking or financial invader. By understanding the inner workings of the encryption process, people have a better chance of protecting themselves.

Key words:RSA, cryptology, electronic signature, RSA application, encryption, cyber security

1.Introduction

Since humans stepped into the information age around a hundred years ago, dissemination of information becomes much easier especially after the computer microminiaturization [1], the modernized information and communication processes became the driving force of our social evolution. As technology evolves, attacks on digitalized information are growing right along the side of it. Compared to the traditional way of disseminating information, digital information is more venerable to attack, forgery, and lacking authority. Along with the advancement of information technology, people have developed many methods to protect and validate important information. Some ways to ensure security like password protection or VPN are more well-known than other methods, like digital signatures. Overtime standards for security methods have become stricter. At present, one of the most used methods to ensure information security and validity are digital signatures generated by NIST- approved digital signature algorithms: DSA, RSA, and ECDSA [2].

2.Background

In this section, first I will briefly introduce digital signatures. Then, I will describe the history of RSA signature, the working process of RSA, Attack on and Security of RSA, and briefly discuss RSA applications. The knowledge of these concepts is necessary to understand the technical aspects of this project.

2.1 Digital Signature

In the most general term, a digital signature act as an electronic analog of a written signature, which provides assurance that the claimed signatory signed the information, and the information was not modified after signature generation [2]. In addition, digital signatures can be used to detect unauthorized modifications to data and to authenticate the identity of the signatory when the validity of the signature is questioned. In fact, digital signatures provide non-repudiation, which ensures the signatory cannot easily repudiate the signature after signing [3].

Digital signature is one of the Applications for Public-Key Cryptosystems. A digital signature scheme and key

generation algorithm are used to generate digital signatures. Through the digital signature signing process, signature generation algorithm [3] and private key are applied to the data that is formatted into a signable message to produce a signature. This signature is a data string for the message. This data string is a number dependent on the private key known only to the signatory, and the message being signed. The associated verification algorithm [3] is used in the verification process along with a method for recovering data from the message. The verification process and the public key are used by a verifier to verify the authenticity of the signature [3].

In practice, digital signature schemes are generalized into two classes:

1. Digital signature schemes with appendix require the original message as input to the verification algorithm.
2. Digital signature schemes with message recovery do not require the original message as input to the verification algorithm.

The first class is digital signature schemes with appendix relies on cryptographic hash functions, they are the most commonly used in practice because are less prone to existential forgery attacks. Some examples of mechanisms providing digital signatures with appendix are the DSA, El Gamal, and Schnorr signature schemes. The second class has the feature that the message signed can be recovered from the signature itself. In practice, this feature is of use for short messages. Examples of mechanisms providing digital signatures with message recovery are RSA, Rabin, and Nyberg-Rueppel public-key signature schemes.

2.2 RSA Signature

The RSA scheme is currently the most widely accepted and implemented a general-purpose approach to public-key encryption which developed by Ron Rivest, Adi Shamir, and Len Adleman at MIT in 1977 and first published in 1978. The Rivest- ShamirAdleman (RSA) scheme is the first cryptographic algorithm that responded to the new approach to cryptography that met the requirements for public-key systems. Despite RSA signature scheme is the first method discovered, it remains today one of the most practical and versatile techniques available.

Among the Public-Key algorithm families, RSA belongs to the Integer-Factorization Schemes algorithm family. In this family, public-key schemes are based on the fact that it is difficult to factor large integers. In particular, RSA relies on the practical difficulty of factoring the product of two large prime numbers, which is known as the “factoring problem”. When applies RSA encryption by itself, breaking the encryption is as difficult as the factoring problem. In fact, there are no published methods to defeat the system if a large enough key is used.

There are pros and cons to using RSA scheme. Since the mechanism of RSA scheme is to slice the original text into blocks that meet the required size, encrypt each block with the public key, and use the private key to decrypt the message. Therefore, an RSA signature has the feature that the message signed can be recovered from the signature itself. But notice that RSA is a relatively slow algorithm, which means RSA scheme is not commonly used to directly encrypt user data. Also, from the security point of view, although directly using RSA scheme is safe from algorithmic attacks with large enough keys; it is vulnerable to other attacks, such as existential forgery.

In practice, RSA is mainly used for encryption of small pieces of data, such as key transport, and digital signatures. To ensure the validity of a signature, two aspects of the process needs to be managed. First is during the key pair generation the length of the modulus for RSA should be: 1024, 2048, and 3072 bits [3]; afterward, the key pairs need to be protected and managed follow the key pair management [3] guideline. Then the signing process is that the message is first hashed to produce a short digest, which is then padded, then signed with RSA. When these two standers meet, the signature is safe against both algorithmic attacks and forgeries.

3.RSA scheme

This section is dedicated to explaining the operation process of RSA, And an example is provided for a clear understanding of RSA scheme.

In general, the RSA algorithm involves three steps: key generation, encryption, and decryption.

Key generation:

1. Select p, q, where p and q are both prime, $p \neq q$
2. Calculate $n = pq$
3. Calculate $\Phi(n) = (p-1)(q-1)$
4. Select integer e, where $\gcd(\Phi(n), e) = 1; 1 < e < \Phi(n)$
5. Calculate $de \equiv 1 \pmod{\Phi(n)}$
6. Public key, $PU = (e, n)$
7. Private key, $PR = (d, n)$

Encryption:

1. Plaintext: $m < n$
2. Ciphertext: $c = me \bmod n$

Decryption:

1. Ciphertext: c
2. Plaintext: $m = cd \bmod n$

When using RSA scheme to generate a signature, one needs to consider the format of the message. Since RSA algorithm only takes integers between 0 and n-

1. Therefore, OS2IP – Octet-String-to-Integer primitive (OS2IP) is used to convert a string into an integer which can be processed by the encryption algorithm; and Integer-to-Octet-String primitive (I2OSP) is utilized to convert integer to string such at verifier can verify the signature in string form if needed.

I will use an example taken from The Code Book: The Science of Secrecy from Ancient Egypt to Quantum Cryptography and show it in Figure 1 to explain the process.

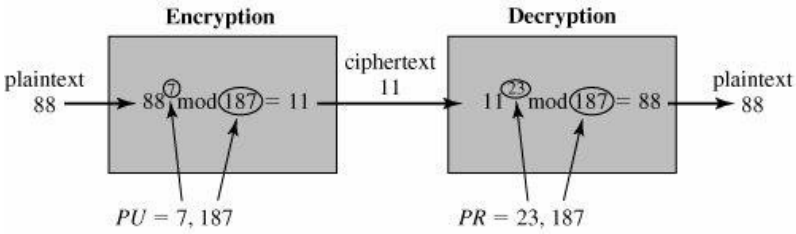

Figure 1. Example of RSA Algorithm

For this example, the keys were generated as follows:

1. Select two prime numbers, p = 17 and q = 11.
2. Calculate $n = p*q = 17 \times 11 = 187$.
3. Calculate $\Phi(n) = (p-1)*(q-1) = 16 \times 10 = 160$.
4. Select e such that e is relatively prime to $\Phi(n) = 160$ and less than $\Phi(n)$

we choose e = 7.

5. Determine d such that $de \equiv 1 \pmod{160}$ and $d < 160$. The correct value is d = 23, because $23 \times 7 = 161 = 10 \times 160 + 1$.

From above we get the resulting keys are public key PU = (e, n) = (7, 187), and private key PR = (d, n) = (23, 187). The example shows the use of these keys for a plaintext input of m = 88.

For encryption, we need to calculate $c = 887 \bmod 187$. Exploiting the properties of modular arithmetic, we can do this as follows:

887 mod 187 = [(884 mod 187) x (882 mod 187) x (881 mod 187)] mod187
881 mod 187 = 88
882 mod 187 = 7744 mod 187 = 77
884 mod 187 = 59,969,536 mod 187 = 132
887 mod 187 = (88 x 77 x 132) mod 187 = 894,432 mod 187 = 11
There for the encrypted data is c = 11.

For decryption, we calculate m = 1123 mod 187:
1123 mod 187 = [(111 mod 187) x (112 mod 187) x (114 mod 187) x (118 mod 187) x (118 mod 187)] mod 187
111 mod 187 = 11
112 mod 187 = 121
114 mod 187 = 14,641 mod 187 = 55
118 mod 187 = 214,358,881 mod 187 = 33
1123 mod 187 = (11 x 121 x 55 x 33 x 33) mod 187 = 79,720,245 mod 187 = 88
There for the original text m = 88.

3.1 Computational Aspects

We now turn to the issue of the complexity of the computation required to use RSA. There we mainly focus on the process of encryption and decryption. Both encryption and decryption in RSA involve raising an integer to an integer power, mod n. If the exponentiation is done over the integers and then reduced modulo n, the intermediate values would be gargantuan. Fortunately, by application of a property of modular arithmetic: [(a mod n) x (b mod n)] mod n = (a x b) mod n. We can reduce intermediate results modulo n, which makes the calculation practical.

To further speed up the encryption operation, a smaller e is usually selected. The most common choice is 65537 (216 1); two other popular choices are 3 and 17. Unlike the encryption process, we cannot choose a small constant value of d for efficient decryption operation. A small value of d is vulnerable to a brute-force attack and to other forms of cryptanalysis. However, one can use the Chinese remainder theorem (CRT) and Fermat's theorem to speed up the computation process. Without going into too much detail, the result is that the calculation is approximately four times as fast as evaluating M = Cd mod n directly.

3.2 Security Aspects

The security of the RSA cryptosystem is based on two mathematical problems: the problem of factoring large numbers and the RSA problem. We can identify three approaches to attack RSA mathematically: factor n into its two prime factors, determining Φ(n) directly, and determining d directly.

Currently, the most promising approach to solving the RSA problem is to factor the modulus n. Determining Φ(n) given n is equivalent to factoring n.

With presently known algorithms, determining d, given e and n appear to be at least as time-consuming as the factoring problem.

To factor the modulus n, an attacker factor n into p and q, and computes l cm (p − 1, q − 1) that allows the determination of d from e. Although it is thought to be infeasible on the assumption, no polynomial-time method for factoring large integers on a classical computer has yet been found.

Therefore, we can conclude RSA signature scheme meets all three requirements for being an effective public-key encryption.

4.Conclusion

As I have said in the introduction, I believe digital signatures already sipped into every aspect of people's daily life. Considering the case of the dematerialization process occurs in the Public Sector, where paper documents should disappear, and long-term traditional archives should be digitalized by ensuring authenticity and integrity of documents by means of qualified electronic signature. In general, people expect that in e-government applications, and also in transactions between citizens and companies, the use of qualified electronic signatures will always keep increasing in the future.

In this paper, I have described my study on RSA signature in-depth. Because of the properties of RSA scheme, RSA signatures are mostly applied with hash function and padding. The use of smart cards is a great example of RSA signature application. Now, when considering RSA signature by itself, I believe its future may be limited. One of my concerns is the security of the RSA signature; although I have stated previously it is infeasible to break RSA signature, the continuing increase in computing power, and the continuing refinement of factoring algorithms poses threats to large key size. Considering with the limitation of the RSA scheme, I conclude, compared to RSA scheme, elliptic curve cryptosystems may be more popular in the future.

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Review of Facial Recognition and Liveness Detect

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Abstract:Facial recognition technology has been dramatically integrated into almost all the aspects of human life, such as mobile payment, identification applications, security management, and criminal cases, etc. However, these applications can be easily fooled by deliberate spoofing strategies. To ensure the identifications of users and avoid being spoofed are the central cores of this technology. As a result, its safeness and accuracy issues attract researchers to dig into this field. In terms of present existing deception and spoofing strategies, liveness detection plays a significant role in improving the robustness of facial recognition techniques. This paper will summarize the current mainstream facial recognition technology methods. The basic ideas, methods, implementations, and corresponding drawbacks of current facial recognition methods are in this paper. The future trends of facial recognition and liveness detection are also discussed and concluded.

Keywords: Facial Recognition, Liveness Detect, Deception, Spoofing Strategy.

1 INTRODUCTION

Due to the high convenience, durable stability, non-contact, and natural recognition characteristics, facial recognition technology is favored by tons of applications such as mobile payment, identification application, security management, etc. However, malicious deception and spoofing strategies are proposed deliberately to form an attack on the facial recognition and liveness detection system to gain personal information and possess it illegally.

Since the biological features of human faces are prone to be captured and accessed, the robustness and accuracy of this technology still require to be improved to certify users' identifications. The primary attack forms include (1) photo attack; (2) video attack; (3) 3-dimensional masks are made of bionic material to assure the verisimilitude of the spoofing face. When the attacker wearing the mask, the facial recognition system is not capable of distinguishing whether it is a natural face or not[1]; (4) attack aimed at neural network recognition method. Small perturbations [2-4] interfere with the performance of the recognition due to its vulnerability. Aiming at present deception methods, liveness detection has become a popular anti-deception system. It refers to ensure whether the captured face from the recognition system camera is a real human face or fake deception like printed photos, recorded videos, or 3D masks. In recent years, related research and liveness detection methods in the face recognition field have developed rapidly.

In this paper, we classify the existing anti-spoofing methods into interactive and non-interactive methods, which means whether the recognition system requires user cooperation. Then, describe each in the following sections. The remainder of this paper is organized in describing different categories as follows. We illustrate the interactive methods in Section 2 and non-interactive methods in Section 3. In Section 3, different methods in the subdirectory of non-interactive methods are summarized. Finally, the strengths and weaknesses of current facial anti-spoofing methods, as well as the analysis of their future, are concluded in Section 4.

2 INTERACTIVE METHODS

One way to confirm the liveness of the system user is through motion detection. It requires users to make corresponding actions within a specified time following the instructions displayed on the user interface, like turning the head, eye blinking, etc. In the interactive system of the preset action set, the subject can prove that it is a real face by making corresponding actions within the specified time according to the system requirements. This method prevents the 2D spoofing strategies successfully since static printed photos and pre-recorded videos cannot perform the randomly selected behaviors. Literature[5] calculates the area of the eye area and measures the teeth' HSV (Hue Saturation Value). The system then determines whether the user blinks, opens the mouth or not. Experiments have proved that attacker must use dynamic mouth and eyes to bypass the recognition which led to drastic changes in the facial structure. Although this method has a high recognition rate and can prevent photo and video deceptions, it requires a high degree of user cooperation without good user experience.

3 NON-INTERACTIVE METHODs

In reality, human faces are not absolutely static. It has various motions and micro-expressions. In terms of non-interactive methods, the liveness detection is executed without users' cooperation and consciousness. Many types of non-interactive methods are based on human face physical features[6], like texture, geometry, reflection rate, etc. These sub-classified strategies are illustrated in the following sections.

3.1 OPTICAL FLOW METHODS

The optical flow is the homeopathic movement of pixels. After relevant calculations, a collection of motion vectors (i.e., sports fields) of scenes or objects in the three-dimensional world coordinates in the image sequence can be obtained. Since the human face is a three-dimensional structure, its optical flow motion is quite different from that of the two-dimensional plane, so that the optical flow method can distinguish a fake human face from a real one. In literature[7], the Farneback Algorithm is first used to calculate the optical flow of the face area, and then the motion information, including the direction and angle, is converted into displacement data. Finally, SVM (support vector machine) is utilized to distinguish real faces and photos. Literature[8] modifies the ordinary approach by adding restrictions, and literature[9] uses Lucas Kanade Algorithm to reach a better performance. Although this approach is simple to be achieved, environmental factors like lighting are prone to be affected. Besides, the effect of anti-3D mask attacks is poor.

3.2 HYPERSPECTRAL, MULTISPECTRAL ANALYSIS

The hyperspectral and multispectral analysis has been proposed targeted at anti-spoofing the 3D mask attack. Since the materials used to make 3D mask figures special and have different physical characteristics with real human face skin, their imaging reflection rates vary in different wavelengths. In literature[10], the facial recognition system is implemented by combining the spectral, visual face, near infrared and thermal image to analyze the extracted human face features. Literature[11] used a fiber optic spectrometer to measure and compare the multi-spectral reflectance characteristic curves of human skin with common skin-like objects. The results show that the skin reflectance curve with a wavelength of 520nm- 600nm presents a "W" shape, which is obviously different from that of the photo. In literature[12], facial characteristics are collected by a hyperspectral imager. After analyzing the spectral characteristics under various lighting conditions and feature positions, the facial geometric features, the expression and posture changes, and the appropriate band is selected to perform anti-spoofing. The method based on multi-spectrum has higher accuracy and a more comprehensive range compared with the previously mentioned approaches, but it needs to be equipped with active light sources of different bands, such as infrared thermal imaging (spectral energy, and requires higher equipment. Besides, the stability under different ambient temperatures is not ideal, and it is costly to equip every facial recognition system with corresponding facilities.

3.3 CONVOLUTIONAL NEURAL NETWORKS

CNN (Convolutional neural network), as a widespread technique in the artificial intelligence field, appeals to tons of researchers to dig into its further applications. This technique is also used in the facial recognition region. Since the structure of the CNN is vulnerable to deliberate attacks, some defense ways like enhancing the network structure and feature extraction steps are proposed to improve its performance. In literature[13], the CNN is initially imposed for face anti-spoofing. In the next phase, improved methods based on CNN are then emerging. Literature[14] illustrates an approach that combined the DCT with CNN to deal with the extracted features of human faces. The face feature value is first fused with the CNN. After weighted fusion of global features and local features, the resulting image is input into CNN. Except for the conventional CNN methods, literature[15] also proposes a methodology that combined motion detection (eye blinking) with CNN for anti-spoofing. In literature[16], researchers added an extra lip motion detection into the system and combined it with CNN. Similar multi-method fusion strategies are also proposed: Another way for anti-spoofing is to improve the existing deep learning algorithms to raise the defense ability. Literature[17] compares the performance with CNN and an adjusted model named (LRF)-ELM (local receptive field). Literature[18] combines the method of nonlinear diffusion with CNN to enhance the anti-fraud performance. It is now proved by tons of researchers that CNN promotes facial anti-spoofing methods through various approaches with satisfying results. However, due to the excessive number of parameters, the neural network often has an over-fitting phenomenon, which causes the accuracy of the test to be reduced. Secondly, the use of CNN requires a large amount of data, which costs a lot in gathering, labeling, cropping, and other pretreatments. This leads to increasing research costs.

3.4 TEXTURE DETECTION

The texture feature contains the regular distribution of gray values formed by the repeated arrangement of objects on the image. The fake face image is generally made by more than one collection. Therefore, the local highlights, shadow changes, and blur degrees of the image will differ from the real one. In the texture detection method, the image of the human face is first converted to the frequency domain using the two-dimensional Fourier transform, and the high-frequency components of the two-dimensional photo are less than the real human face. In the literature[19], by analyzing the joint information of texture and color, studying brightness and chroma channels, it is found that the research method based on color texture is better than gray texture. This method is susceptible to noise, more sensitive to changes in illumination, and the accuracy of high-quality photo recognition is reduced.

3.5 MICRO MOTION DETECTION

Real human faces are not absolutely static. Micro-expression, including eyeball rotation and facial muscle contraction, can be used as a basis for live detection. It can be analyzed by zooming in on the micro-movements of the joint. Literature[20] proposed a combination of DMD, local binary pattern (LBP), and a classification pipeline with a histogram intersection core composed of support vector machines (SVM). DMD captures visual dynamics in fixed-size images, LBP can effectively capture dynamic patterns, and SVM is considered an ideal general classification tool. This mode can effectively extract dynamic information to obtain temporal dynamic characteristics and capture coherent spatial structure.

3.6 DEPTH INFORMATION

To enhance the system's robustness against attacks, more sophisticated anti-spoofing techniques can verify the three-dimensionality of the face captured by the device, such as by laser scanning. Literature[21] proposes a method based on three-dimensional photoelectric scanning. About 8000 feature points are obtained and curvature of features are calculated. However, the accuracy of this method decreases when folding the image, and the recognition effect of the 3D mask deception method is flawed. Its prominent advantage is that there is no need for excessive user interaction, and the user experience is greatly improved compared to the interactive recognition mode.

3.7 PUPIL RECOGNITION

Literature[22][23] developed a pupil direction observation system for anti-spoofing in the face recognition system. First, the Haar cascade classifier is combined with a specially trained eye region detection classifier to extract the eye region from the real-time camera. The Kanade-Lucas-Tomasi (KLT) algorithm is used to extract and track feature points to minimize head movement and obtain a stable eye area. This method is a low-cost security solution. The KLT algorithm is used to solve the problem of providing a stable eye frame for the algorithm while also reducing the calculation time and improving the algorithm's performance.

4 CONCLUSION

Although there are many methods of facial recognition and liveness detection in the current state, they still own advantages and disadvantages. However, these issues can be inevitably tackled in both practical and theoretical ways. In the process of analyzing existing methods, it is found that the appropriate and efficient technology should satisfy the following requirements: (1) less user interaction to improve users' experience; (2) the restricted cost and requirements for the practical equipment; (3) improved accuracy and speed to distinguish real and fake faces; (4) the better safety performance in the applications; (5) less influenced by the environmental factors, such as light, with better performance in multi-scene usage. Therefore, it can be concluded that the future of facial recognition has excellent potential, and research based on the above conditions will also become the mainstream direction of facial recognition technology.

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A Discussion on the Application of Computer Software Technology in Big Data

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Abstract: We are now living in a new era of network, characterized by computer software technology and big data, each of which complement and influence the other. Focusing on computer software technology, this article will analyze the application direction of computer software technology in big data, and expound the relationship between computer software technology and big data, hoping that these discussion and analyses can better take advantage of the era characteristics of big data, and can contribute to effectively apply the computer software technology to practical operation, thus improving the efficiency and quality of people's work.

Keywords: Computer; Big Data; Software Technology: Relationship Analysis

1. Introduction

Today is a new era of Internet, and the popularity and promotion of the Internet has brought more convenience for people's work, which greatly improved the efficiency and quality of people's work. In the era of big data, computer software technology can give a better play to the era advantages in practice operation. However, it will also bring great challenge and opportunities to the development of computer software technology. The effective application of computer software technology will not only have a great impact on the development of the computer technology, but also will benefit our era and social development, which should be taken seriously. And it is prior to clarify the relationship between computer software technology and big data if we want to further promote our era and social development through computer software technology.

1.2. The relationship between computer software technology and big data

Computer software technology refers to develop the function of computer software based on the platform of computer to meet the demand of people's daily life as well as material production demand. And big data refers to completing the collection management and analysis of information by using network, and capturing and processing the data through conventional software. If we want to better apply the computer software into practice to bring more convenience for people's life and optimize the way people work, it is necessary to take the advantage of big data to provide more data resources so as to complete data procession and analyses. As big data can provide more data base for the development and application of computer software technology and promote its practical operation, it will certainly bring great development opportunities and development spaces for computer software. It will greatly improve the practical effect of computer software and achieve more functional development when applying it into big data, thus promoting economic progress and the development of our era.

3. Emerging computer software technology under the background of big data

3.1 Virtual technology

The progress and development of computer technology have derived a series of technologies, which provide more security and convenience for people's work and life. And virtual technology is an important result of the development of computer software technology under the background of big data. Virtual technology can conduct data arrangement through the computer software and effectively converse the data into virtual resources according to the needs of users. What's more, it can better classify and conclude the data through the management analysis and research on virtual resources, thus improving the performance of computer software and application direction to further enhance the practical application of computer software.

3.2 Cloud storage technology

In the era of big data, we are living under the torrent of information all the time. In such cases, everyone serves as both the receivers and maker of information. And tens of thousands of people produce a tremendous large amount of information every day, in which case people will need more information and data in their daily life. Therefore, it is obvious that traditional storage technology can hardly adapt to people's demand of data and information storage in the current stage. Meanwhile, traditional storage technology depend more on the hardware facilities, which leads to the ceiling and confines of traditional storage technology is relatively narrow. And the efficiency and security in the application is another critical problem that needs to take into consideration. Cloud storage technology can effectively solve this problem, which can store the information data in the Cloud through Internet. Under the background of cloud storage technology, the storage capacity of information data has been further improved, and the convenience has also been effectively improved at the same time. In addition, cloud storage technology can also better guarantee the security of information through password enhancement, which provides more convenience for people's life and work[1].

3.3 Information security technology

In the context of Internet era, people are sending information more and more frequent. As the popularity and promotion of the Internet has gradually permeated every corner of the people's work and life, in such cases, it will inevitably involve such problems as personal information and property and other related problems in their daily work and life. Thereby the information security is of critical significance to every people. Network is a double-edged sword, which will not only provide more convenience for people to create a more colorful world, but also will bring great risks for them at the same time. In this case, the information security technology has increased a lot. It can make people feel at ease when using Internet technology to protect people's personal privacy while reducing the potential hazards and disadvantages of the network through the information security technology. Through computer software technology, a more perfect and effective information security protection mechanism can be built from the perspectives of hardware, software, network and so on, so as to reduce security risks in the era of big data[2].

4. The specific application of computer software technology in big data

4.1 In commercial field

In general, the development of science and technology is most widely used in the commercial field, which will better promote the development of business. So will the computer software technology. At this stage, the computer software technology has created great transformation in business, of which the most typical one is the e-commerce industry. E-commerce industry abandoned the traditional way of store marketing, which reduces the operating cost while providing more convenience for consumers to purchase through the computer network platform. Meanwhile, it pushes the accurate information to the people in need through the big data calculation, which also provides convenience for the marketing work and realizes the accurate identification of target customers. Under this circumstance, the enterprises can make targeted marketing strategies according to the target customer's consumption habits and gender, personal work as well as his location so as to maximize their profit[3].

4.2 In communication field

The advent of the era of the Internet brings tremendous information to people, and also promotes the development of communication industry. With the promotion and popularity of network as well as people's increasing dependence on network, 5G network also gradually entered people's vision. It is the computer software technology that pushed the promotion and popularity of 5G network. With the development and further research of computer software technology, current network technology and communication become more and more convenient, and people can receive and pass the information in more diverse and casual way, no longer limited by time and place and form. At the same time, 5G network coverage area driven by the computer software technology is broader with faster information spreading. With the continuous development of computer software technology, China's Internet technology will continue to optimize and improve.

4.3 In enterprise information management system

The promotion and popularity of the network is not the only characteristics of our country, and it belongs to the characteristics of our age. In today's era, various countries have realized the promotion and popularity of the network, which largely solved the time and space problems in communication, gradually forming a world market. And the formation of world market brings in more and more resources, which also brings broader market for the enterprises. However, it will also bring more intensive competitions and greater operation risks for the enterprises. In this case, enterprises have to pay more attention to information management to capture more valued information so as to provide more guarantee and basis for the formulation of strategic objectives and strategic decision-making of enterprises[4]. With the advent of the era of big data, enterprises can receive more information and data for reference in the process of operation at the present stage. Through the effective identification, selection, calculation and analysis of computer software technology, the most scientific, effective and accurate data can be obtained. According to these data, enterprise leaders can estimate the operational risk in the process of enterprise operation, the capital return of project investment as well as the current actual situation of the enterprise, which will have an important impact on the improvement of enterprise competitiveness and the long-term development of the enterprise.

5. Conclusion

The Internet has brought great convenience for people's life and work, and the effective application of the computer software technology can better promote the development of the Internet era. Its most remarkable achievement is to play the advantages of the Internet and the special features of the data and information value maximally to promote the progress and development of our era, as well as the virtual technology, cloud storage technology and information security technology, which has played an important role in helping and influencing the current economic development and the way people work and live. In the future, computer software technology will further develop, and then promote the development of the era of big data, benefiting people's work and life in such fields as the commercial field, communication field, enterprise information management field and the forth..

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Research and Computer Realization of Fault Tree Quantitative Calculation Algorithm

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Abstract: Through the research and understanding of FTA, analysis of its role in reliability engineering and its working principle, for the application of FTA method in the computer to make a reasonable demonstration. From the overview of FTA and the research status at home and abroad, the working principle of reliability engineering and the importance of an important branch -- FTA are analyzed. From the qualitative analysis and quantitative calculation algorithm of FTA, and its quantitative calculation module, FTA is studied separately. Hope to be able to provide help for this professional researchers.

Keywords: FTA, reliability engineering, quantitative calculation, quantitative calculation module

1.Introduction

The rapid development of computer technology provides more convenience for people's life. For example, the important method of quantitative calculation of fault tree is to use computer for auxiliary calculation. Unfortunately, the current fault tree qualitative analysis and quantitative calculation algorithm is not widely used, but only limited to the fault tree of monotonic correlation system. Only by continuously testing various failure causes, can we further determine all possible combinations and their probability of occurrence.

2.Research and application status at home and abroad

The application research of fault tree is mainly reflected in the following aspects: the integration of fault analysis methods, computer-aided fault tree analysis, fuzzy fault tree analysis method. Compared with foreign countries, China started late. During the period of reform and opening up, China introduced FTA technology for the first time. In foreign countries, this technology has been developed for decades, coupled with the external blockade, China's FTA technology in the same period is relatively backward. It was not until 1989 that there was a new research result, that is, a method of using matrix to study fault tree. After decades of development, we have a relatively perfect situation today. The research progress of FTA has driven the development of more fields. It has gradually expanded from cutting-edge fields to various fields. Thanks to the efforts and popularization of generations of researchers, it has made drastic changes in terms of cost and operation difficulty, So that more fields can apply it to such individual objects as computers, of course, this also opens up a new research direction for FTA.

3.Overview of reliability engineering

Reliability is a measure of the ability of a product to work without failure. Generally speaking, reliability refers to the ability of the product to complete the specified functions under the specified working conditions and within the specified time. The four quality characteristics of products are: product performance, reliability, safety and economy. As one of them, reliability is undoubtedly important, so the research on product reliability has important theoretical significance and practical value. The reliability discipline has experienced decades of development and improvement since it was proposed. The fundamental reason for the formation of this discipline is that the traditional quality analysis

methods can not solve and deal with the failure problems in practice.[1]

In view of the failure or unreliability of some products, many researchers aim to solve the failure probability of products from human factors, product itself, design defects and the impact of the environment, which is the ultimate idea to reach the lowest. These are the narrow sense of reliability engineering, reliability engineering is not only from the program and software to deal with the failure rate of products. According to the failure rate of products, after a series of system analysis, as the main sub module of fault tree plays an indispensable role, can save a lot of manpower and material resources, also improve the efficiency of reliability engineering.

In order to analyze its reliability, we must first determine the reliability model of the system, and then analyze and determine the reliability characteristic quantity of the system according to the topological structure of the system and the reliability quality and status of the constituent units in the system. Secondly, system reliability prediction, reliability index allocation and reliability optimization are all based on system reliability analysis, so it is the core and foundation of system reliability research.[2] Reliability engineering directly determines the satisfaction of the product, is an indispensable part of the test, so it is also very important.

4.Fault tree analysis

Its function is to complete a logical reasoning with preconditions. To put it simply, FTA is to conduct an internal system analysis of various external and internal factors (covering four factors of hardware, software, environment and human factors) that are easy to cause system failure or failure, from the overall analysis to the idea of dividing each part into parts, The processing method is named after the dendriform structure of the photo, which adopts the progressive way. In summary, the logic block diagram formed by the above is called fault tree.

After the completion of the above analysis, after the investigation, to determine the various combinations and occurrence probability of the causes of system failure (failure), the analysts need to control the system according to the obtained data, or the system should still take corresponding measures according to the results, so that theoretically there will be no failure and no failure. In fact, it is an analysis method to reduce the failure probability.

The characteristic of fault tree analysis is that it has great flexibility and will not be too rigid. The analysis and algorithm of fault tree can deal with the problem of product failure. It is a promising research direction that this method can be applied to more fields, It is worthy of the relevant scientific researchers to spend a lot of time to practice the theoretical knowledge and promote it, so as to provide more convenience for more fields. Later, this paper represents the feasibility of this idea through the quantitative calculation algorithm module of fault tree, which is not limited to the general analysis of system reliability, but also can analyze various fault states of the system; It can not only analyze the impact of some parts failure on the system, but also analyze the special causes of these parts failure: the process of FTA analysis is the process of in-depth understanding of the system. It requires analysts to grasp the internal relationship of the system, be able to clearly know the way and degree of the impact of various potential factors on product satisfaction (failure), and require analysts to have the ability of self judgment for the collation and analysis of data, so as to find and solve problems in time in the later analysis process, So as to greatly improve the reliability and credibility of the system, so as to enhance the customer experience of the product.

5.Calculation module design

In fault tree analysis, the key to build a fault tree is to clearly understand the logical relationship of the analyzed system function and fault mode, impact and criticality. The perfection of the fault tree directly affects the correctness of the qualitative analysis and quantitative calculation results. The fault should be the correct abstraction of the logical relationship of the actual system fault combination and transmission. The whole building process is the analysis and thinking process of engineering and technical personnel to the system.

The function of the quantitative calculation module is to complete the quantitative calculation of the reliability characteristics of the fault tree. For the basic fault tree, the structure function can be used for certain calculation, and certain qualitative analysis results can be obtained through the mathematical expression.

The calculation of the unreliability and importance of the associated system is also a very important calculation process. Only after these processes are calculated can the parameters of the fault tree be better judged. In addition, the calculation of the parameters of the repairable system can calculate the unavailability, and then there is the system fault tree analysis method with statistical dependent events. There will be many complex parameters in the calculation steps, We must pay attention to the correlation of these parameters.

Finally, the management of calculation results mainly includes two aspects, one is the management of intermediate calculation results, the other is the output of final results.

This paper introduces the following categories:

(1) Main functions of event class cbeventdata:

long GetIndex （）；

double GetUnreliability（）；

CBeventData*GetNextEvent （）；

void Setlndex(long Eventlndex)；

void SetUnreliability(double EventUnreliabiity)；

void SetNextEvent(CBeventData*pEvent)；

Main data:

double BeventUnreliability；

long BeventIndex；

CBeventData*NextEvent；

(2) The main functions of ccaldatallaader are as follows:

CBeventData*GetMCSEvent()；

CCalDataHeader*GetNextMCS （）；

void SetMCSEvent(CBeventData*pEvent)；

void SetNextMCS(cCalD8taHeader*pMCS)；

Main data:

CBeventData*MCSEvent；

CCalDataHeader*NextMCS；

(3) Cut set class: ccalculationdata main functions:

CCalDataHeader*GetHeader（）；

CCalDataHeader*CreateHeader （）；

Main data:

CCalDataHeader Header；

int IACSNumber；

(4) Main functions of Ccalculation class:

double Unrellability(CCalculationData*CalData)；

double ProbImportance(int BeventIndex，CCalculationData*calData)；

double Strulmportance(int geventlndex，CCalculationData*CalData)；

double CruxImportance(int BeventIndex，CCalculationData*CalData)；

double Ws(CCalculationData*CalData)；

double Vs(CCalculatLonl)ata*alData)；

double MTBF(CCalculationData*CalData)；

(5) According to the ccalculationresult class, the main functions are as follows:

void SetBeventProb(int BeventIndex，double Prob)；

void SetBeventStru(int Beventlndex，double Prob)；

void SetBeventCrux(int BeventIndex．double Prob)；

void SetRUnreliability(double Unreliability)；
void SetRWs(double RWs)；
void SetRVs(double RVs)；
void SetlwTBF(double MTBF)；
double GetBeventProb(int BeventIndex)；
Itoubl e GetBeventStru(int BeventIndex)；
double GetBeventCrux(int geventIndex)；
touble GetRUnreliability（）；
d(mbl．e GetRWs()；
double GetRVs()；
double GetRMTBF（）；

Cbeventdata class is mainly responsible for storing and providing the basic data of the bottom event, which can be called by Ccalculation. Ccaldata header class organizes the bottom event objects in the form of disjoint cut sets, and each ccaldata header object corresponds to a disjoint cut set. Ccalleulationdata class is mainly responsible for the organization of ccaldata header object, which is the total connection F 1 of data. The ccmulation class obtains data from ccalculationdata object for calculation, and the calculation result is handed over to ccalculationresult class for processing. Ccalculationresult class is the external output interface of the module.

6.Implementation theory and analysis of quantitative calculation module

The quantitative calculation module adopts the software development technology based on COM and encapsulates the calculation function in the form of DLL file, which increases the universality of the module. The quantitative calculation function is realized by the member function of Ccalculation. On the one hand, whether the quantitative calculation result of fault tree is accurate or not depends on whether the drawn fault tree can fully and accurately reflect the causes of system faults and the relationship between them, which requires the operators who draw fault tree to have a deep understanding of the system. The more we understand the system, the more the fault tree can reflect the nature of the system fault; On the other hand, because the quantitative calculation of fault tree is complicated, it usually needs computer-aided calculation.[3] The quality and accuracy of computer-aided algorithm also affect the accuracy of calculation results to a certain extent.

7. Conclusions

For the calculation of fault tree, it is a very complex project, which requires a certain engineering precision index. In each case of large error, we must check all possible factors in time. Due to the short space of this paper, only a few of them are listed, such as the error between the calculation formula used in the module and the accurate calculation formula, When the computer stores data, it uses binary system, which can’t accurately represent all decimal system, resulting in storage truncation error. Under the interference of some unrelated factors, computer-aided still needs to be very careful. Moreover, there are still many problems to be solved in the fault tree analysis, which can only be studied continuously, In order to provide some help for the related research.

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Make Python Learning Vivid and Efficient Through a Variety of Methods

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Abstract: Python is one of the easy-to-learn languages and is easy to code and read, with high expressiveness. This article focuses on introducing basic content of learning Python, and discusses the ways to learn it efficiently with related cases, for the reference of learners.

Keywords: Python; Learning; Efficient Methods

Introduction Python is an object-oriented programming language released in the year of 1989. Python syntax is concise and clean, with large class library that be extended to other languages to complete module production. It can also be well embedded in C language and C++. These advantages make Python not only easy to read and code, but also elegant and concise, which may be favored by users. Therefore, it is important to explore efficient learning methods for applications of Python.

1. Basics about Python learning

1.1 Python programming language

Python programming language is relatively simple and programmer-friendly in terms of syntax. Therefore, learners are convenient to know which problems remain to be solved in each language when coding and reading. Moreover, Python is easy to understand, which is friendly for beginners to learn. Python is open-source which means it can be applied regardless varies systems and platforms, allowing free than ever network communication, and it also has different types of third-party libraries.[1]

1.2 Machine learning

In terms of machine learning, while data is input into a system, corresponding answers can be obtained. With the help of data model and rules, it is applied to new data to generate the answer. Active learning is acquired through training instead of programming.

Advantages of machine learning are listed as following contents. Firstly, machine learning is more accurate, compared with human learning, that key points to solve problems can be found through data. When the amount of data increases gradually, the accuracy of data will become higher. Secondly, the active learning mode is characterized by automation, which means it will automatically complete learning a new mode and can be embedded into the automatic work flow. It makes the learning process more rapid because results will be obtained within a few milliseconds after data is input, showing a real-time response and having good effect. Thirdly, it can be customized. Most data-driven problems can be solved by machine learning. Learners are allowed to use their own data to complete the learning model construction and optimize it by using any standard. Fourthly, the use of machine learning can also effectively deal with the problem of data growth and the use of cloud computing to deal with large-scale data in the process of business

development.

1.3 Deep learning

Deep learning, which is similar to the brain neural structure, is a mathematical model belonging to network assists information processing. Convolutional neural network (CNN) is one of the typical image data processing models, in which there are two-dimensional convolution layers with spatial information such as height and width. Pictures are a matrix composed of pixels, and each pixel has three RGB channels, which enable continuously expansion of data volume, up to three times. If a programmer wants to convert pictures into data and input them into a computer, the data volume will be enormous, slowing down the running speed of the system. At this time, CNN can be used for cross-correlation operation instead of full connection to process pictures efficiently. In neural network, each neuron only needs to perceive local pixels instead of all pixels of the image to combine local information and obtain image representation information, which is quite comprehensive.

2. Case study of Python

2.1 Emotion analysis

2.1.1 Obtain data

This article chooses the analysis of stock data as a case through Python to carry out emotion analysis. All data is obtained from the network for the analysis of text emotion. Although there are application class interfaces in all kinds of social networks, there is no interface that can directly obtain the information of listed companies and a stock up to now. It is necessary to utilize the interface of application programs to obtain tweets first, and then filter out information related to stocks. Crawlers can also be coded to grab relevant information directly, with the judgment of keywords. However, the application of anti-crawler technology in social networks is constantly changing, which leads to the fact that the extraction of data features in this way is not completely reliable, and it is difficult to successfully apply to the production and trading environment.

2.2.2 Use word segmentation

Most titles are coherent sentences, and the use of word segmentation can obtain coherent sentences according to specific rules and recombine them into different sequences. For a simple sentence, it can be changed into different word combinations to form different results through word segmentation. At the same time, meaningless stop words or punctuation can be filtered out by word segmentation according to your requirements.[2]

2.2.3 Text vectorization

After data acquisition and information filtering, feature extraction can be completed. The so-called text vectorization means explaining the semantic meaning of the text by means of numerical vectors. Generally, there are several ways to express the vectorization. First, the One-Hot method: the presented words all have their numerical values of 1, and the unexposed words all have their numerical values of 0 in the word sequence. Second, TF method: the numerical value of the presented words is equal to the frequency of the words appearing in the text, while the numerical values of the words not presented in the word sequence are all 0 in the word sequence. Third, TF-IDF method: the number of words presented in the word sequence is equal to the product of the frequency of appearing texts and the frequency of inverse documents, and the number of words not presented in the word sequence is all 0. The third text vector method is selected below.

2.2.4 Classify emotions

According to the characteristics of text vectorization, it is regarded as an input feature. Then the prediction of headline emotion in stock review is carried out to judge whether it is positive emotion or negative emotion, and the classification of emotion is completed with the help of support vector machine.

2.2 Analysis of travel data

In the learning process, real data provided by Mobike is selected, and travel data are analyzed in different time and space dimensions.

2.2.1 Describe the original data

Original data set contains the following information: first the order number, second the vehicle ID, third the user ID, fourth the vehicle type, fifth the riding start date and time, sixth the riding start block position, and seventh the riding destination block position. Data from 0: 00 on May 10 to 24: 00 on May 23, 2017 are selected below, including 3,085,688 order data, 348,066 user data and 481,757 vehicle data.

2.2.2 Analyze time characteristics

According to the daily order numbers shown in Figure 1, it can be found that the number of rides generated every day had been decreasing since May 20th, which may be related to Mobike's sales strategy.

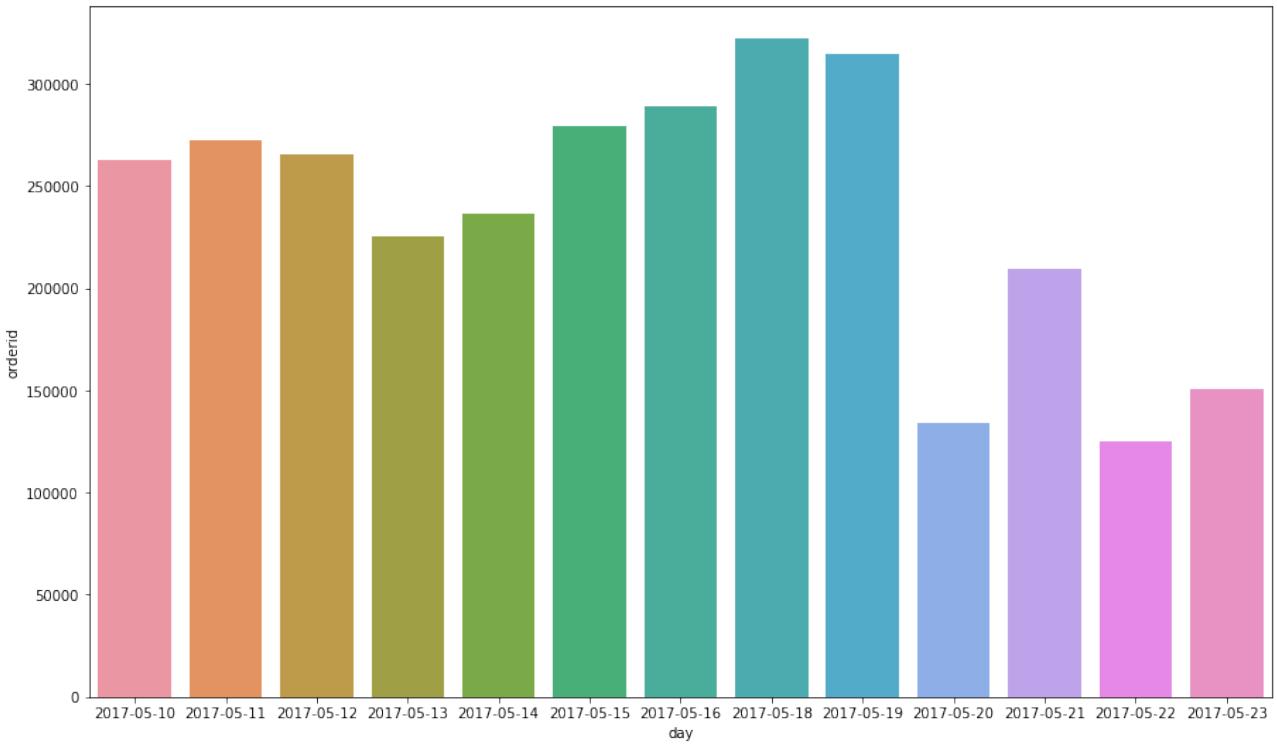

Figure 1. Chart of daily order numbers.

According to the information given in Figure 2, order volume generated in each period can be learned. The number of people who traveled by bike before 5: 00 am was relatively small, which could be ignored. The peak started from 7: 00 am to 9: 00 am and from 17: 00 pm to 19: 00 pm, which was obvious. In addition, there was also a small peak of riding during the lunch break.

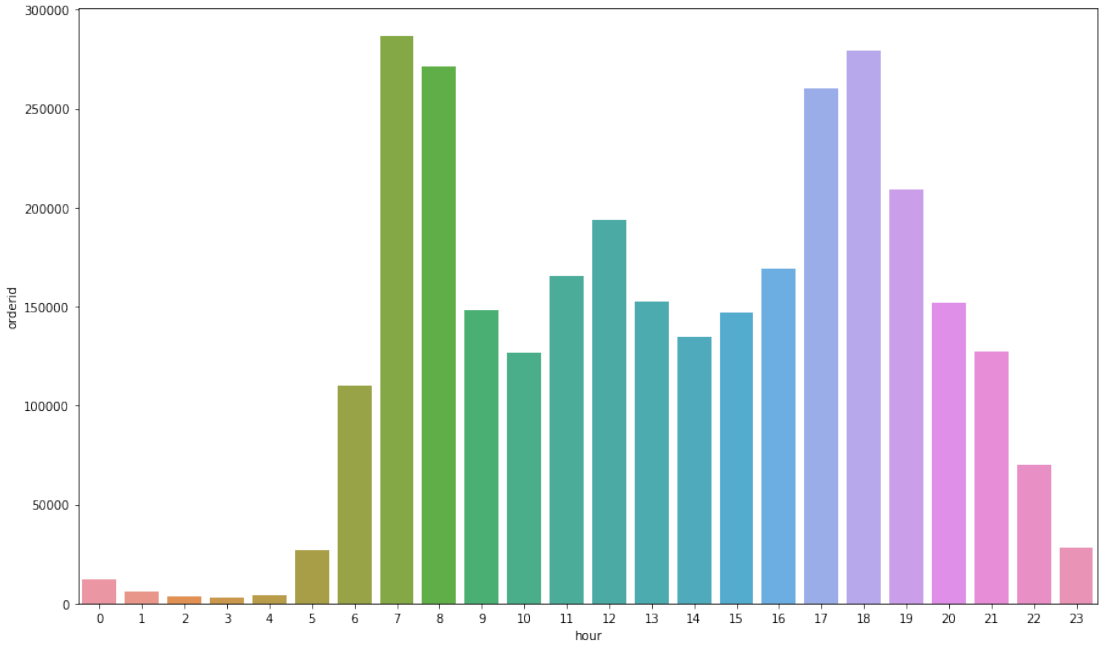

Figure 2. Number of riding orders in each period.

2.2.3 Analyze the spatial characteristics

In figure 3, distribution characteristics of riding distance can be found. The average riding distance of all users is 815m. Among these users, 75% people could reach 949m, with 660m of median distance. From the above data, most users who chosen Mobike were riding at close range, so the analysis results are relatively reasonable. However, the farthest riding distance reached 44,900m, which is very likely to be an abnormal value. Therefore, value that is higher than 5km can be eliminated, and then the analysis shows that the distance that most users choose to ride is no more than 1000m .

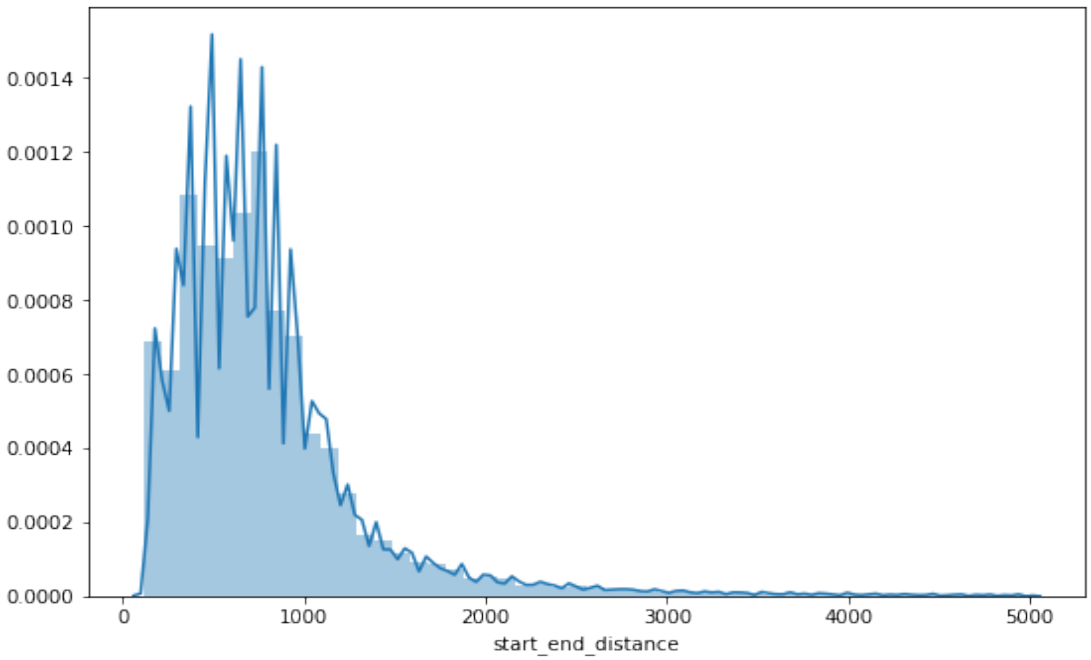

Figure 3 User's cycling distance distribution

3. Conclusion

In summary, the above analysis indicates that by dint of its features, Python language can be widely used to solve life problems if one learns its basic knowledge. Therefore, learners are suggested to have a further study on Python, and improve the effectiveness of Python learning by applying and mastering its grammar to eventually solve a series of problems related to big data in practical cases.

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An overview of the influence of IoT on computer communication network

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Abstract: With the rapid development of society, computer network technology has also reached a new high, and especially the product of the evolution of the Internet - IoT, the influence of the computer communication network is more and more obvious. Internet of things technology can affect the total number of computer communication network project access to a certain extent, but also enrich the types of Internet communication network, the most important thing is that IoT can improve the stability and security of computer network communication itself, so it is very necessary to study IoT in today's view.

Key words: IoT; Computer communication network; stability

1.The development status of IoT

IoT controls the performance of the corresponding physical objects through the transmission of signals, so as to improve the connection between different physical objects. However, this connection is no longer aimed at the transmission of analog signals, but effectively realizes the connection between different objects and carries on the control, so as to further play the role of the communication network. There is no denying that Internet of Things technology has become an indispensable part of our life today[1].

2. The framework for IoT

As for IoT, it mainly takes the Internet as the carrier to complete the transmission of data and information through the Internet, breaking the previous situation that it is only limited to the physical space. Internet technology can make use of the transmission signal to complete control of the physical, different types of computer through the LAN, can ensure the whole stability of data transmission, quickness, further broaden the scope of IoT technology for physical control, finally create a set of informatization, intelligent remote-control network. The realization of the functions of IoT includes the main framework of information application module, information transmission module and information perception control module[2].

2.1 Information application module

The information application module in IoT mainly contains multiple application software, so IoT system has acquired such a large data resource, through which to complete the control and management of physical objects.

2.2 Information transmission module

The information transmission module in IoT mainly includes the section for the implementation of IoT. At present, the information transmission plate relies on a variety of network forms, including mobile communication network,

local area network and the Internet. Different networks accomplish different types of information control through communication technology, thus constructing the information transmission platform and resource control platform of IoT, and finally ensuring the stability and security of information transmission between different sectors[3].

2.3 Information perception control template

The information perception control module in IoT is mainly composed of different types of controllers and sensors. It mainly senses the physical objects within the control range of IoT, converts the collected data and information into the format of communication, and then completes the follow-up transmission based on the network.

3.The impact of Internet of Things technology on computer communication networks

According to the above, the realization of IoT function includes the main frameworks of the information utilization module, the information transmission module and the information perception control module. The following is also mainly based on the above three sections to discuss the impact of IoT technology on the computer communication network.

3.1 The impact of IoT technology on the perception layer of computer communication networks

In IoT, the perception layer is the foundation of the entire Internet of Things technology. If there is a problem with the perception layer, the entire Internet of Things technology will be paralyzed. The perception layer can obtain the information of all the physical objects covered by the network, and for the perception layer, it will also convert the acquired information and transfer the information through the network, so as to realize the control of the physical objects by IoT technology[4].

3.2 The impact of IoT technology on the computer network communication transmission layer

The transmission layer mainly completes different types of data transmission through the Internet, computers, etc., so that information can be effectively combined through the transmission layer. The application of computer network communication can classify and combine scattered and different types of communication data. The application of IoT is not only a function of transmitting signals, but more importantly, it is necessary to connect people and things to each other through the network. Realize people's faster and more convenient communication. For the supplementary aspect of IoT technology, it needs to be considered in combination with the actual situation. Only in this way can IoT technology play the greatest role.

3.3 The impact of Internet of Things technology on the application layer of computer network communication

The impact on the application layer is the core of IoT technology, through the processing of information to achieve the desired effect. IoT technology can promote the effective arrangement and utilization of data in the process of computer network communication applications, so as to meet the needs of people with different needs. In order to enable further development of IoT technology and enable the demanders to have a better experience, people will invest more experience and develop more high-tech equipment. The application layer is the link between people and things and things and things, so that the control of things is no longer restricted by time and space. In order to promote the further development of IoT technology, it is necessary to further accelerate the integration of related industries, so as to realize the accurate exchange of information between things and provide us with better services[5].

4.Summary

Nowadays, people's lives are inseparable from network technology, which has also promoted the rapid development of network technology. As an emerging technology today, IoT technology has realized information sharing and promoted the progress of the entire society. At present, my country's Internet of Things technology is still in research and development, and further improvement is needed. It is undeniable that with the further development of IoT, it is bound to play a significant role in promoting the development of computer network communication technology.

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The design of over travel of automobile relay and its automatic control

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Abstract: with the development of the automobile industry, more and more general electrical parts are used in automobiles, and the quality of platform and standardized electrical products is also paid more and more attention. Relay plays an important role in auto regulation, safety protection and conversion circuit, so it is widely used in the whole vehicle. Over travel is one of the important parameters of automobile relay, and its consistency affects the life of relay and other main performance. In traditional manual assembly production or semi-automatic assembly line, due to the inherent errors in parts and assembly, a large number of manual adjustment relays are often needed to over travel.

Key words: automobile, Relay, Overstroke design, Automation control

According to the different systems of automobile relay, the environmental factors are different, such as high temperature, high current, humidity, etc. If the use of relay is not emphasized, the failure of automobile relay may occur, which may affect the function of the relay system and may endanger the safety of driving. Therefore, in the design of automobile relay and the test of vehicle model, it is necessary to fully analyze and demonstrate the factors and performance requirements of its working environment, and verify the reliability of the working performance of automobile relay. Most of the relay structures used in the automobile are clapping types, which are not very different from the ordinary clapping type electromagnetic relay. However, the automobile relay needs to meet the requirements of shock, vibration, high temperature, high humidity, salt fog dust and strict electromagnetic compatibility due to its worse environment. Therefore, the performance parameters of the relay are different.

1. The use environment of automobile relay

(1) Temperature

The individual installation position of automobile relay is close to the heat source of automobile engines, and it bears a high temperature environment. The plastic shell aging is fast, and the inner coil is easy to short circuit and open circuit.

(2) Silicon environment

Some silicon system gum can not be used around the automobile relay, otherwise, silicone gas will be directly generated, which will cause silicon to attach to the contact, which will lead to poor contact and failure.

(3) NOx production

If the humidity of the environment is too high, the arc will be generated directly. Under the action of the arc, N2 and O2 in the air will produce NO2 and react with the moisture in the air, so as to produce nitric acid and nitric acid which has great corrosiveness, and will corrode the metal parts inside the relay, which will bring great damage to the work of the machine and electrical equipment. Therefore, the humidity should not exceed 85% RH.

(4) External magnetic field

For cars, relays cannot be placed in an environment with speakers, then the magnetic field will affect the relay and

hinder its normal operation.

2. The relevant matters needing attention in the correct use of automobile relay

First, in order to ensure the normal use of automobile relay, then it is necessary to have a comprehensive understanding of the relay and analyze its characteristics, so as to understand the use conditions and environmental conditions of the relay, and to formulate the relevant use plan for these conditions. Meanwhile, attention should be paid to in the use: to avoid the relay falling and being impacted, to ensure the normal use of the relay, if there is a large dust in the use environment, it is necessary to place corresponding protective cover on the relay to avoid dust penetration into the relay; Resin and preservative containing silicon cannot be used, otherwise contact failure will be caused, which will affect the use of relay; It is necessary to connect coil power supply and contact power supply according to the correct regulations. For the service life and load of relay, it is mainly specified under relative standard conditions, but it will still be affected by relevant environmental conditions and external factors in actual use, and the ambient temperature of relay must meet relevant standards. The relay should be used correctly and reasonably.

Secondly, for the attention of coil input, to ensure the stable and reliable operation of relay, the rated voltage must be ensured. If the voltage of the coil exceeds the rated voltage, it will directly cause the coil to drop and finally burn back. And the resistance value of relay will change with the temperature. If the temperature of the coil is too high, the voltage will rise accordingly. After that, the automobile relay is mainly driven by battery, so that the maximum load will directly lead to the voltage reduction of the power supply, and also affect the service life of the relay. Therefore, it is necessary to pay attention to the influence of the fluctuation of the power supply voltage on the reliability of the relay. If the coil is pressurized for maximum continuity, the stability of relay operation will be affected, mainly because of the limitation of insulation performance, so we should know the insulation performance of the product enameled wire and correctly pressurize it. After the automobile relay works for a long time, the coil will be broken due to the influence of the environment and other factors. Therefore, it is necessary to ensure that the coil of relay and the positive pole of power supply are disconnected.

Finally, the attention to the use of contacts, the most important part of relay, is. Contact, contact working condition will be affected by factors such as sub chat, voltage and current. For contact voltage, if the energy of voltage is too large, it will accelerate the contact electrical corrosion, so pay attention to it. For the current of the contact, the current of the contact in the combination and disconnection has a greater impact on the contact. If the impact current is larger when the contact is in group, the greater the impact on the contact will be, which will cause great loss of the contact. Therefore, the protection of contact should be done well. Some contact protection elements and protection circuits should be used to reduce the reverse voltage of contacts, so as to protect the work. At the same time, some contact materials against transfer should be selected to protect the circuit.

3. Over stroke design

Over stroke is the distance from the armature center to the horizontal plane of yoke and armature hinge contact when the contact is just contacted. It is defined as the “structural over stroke” of relay, which is obtained by the combination of parts, namely the structure; Similarly, over travel B is the distance from the horizontal surface of yoke and armature hinge contact to the core when the contact is just contacted. It is defined as “magnetic circuit over travel” - this over stroke is obtained when the relay rivets the magnetic circuit. Why should the over travel be divided into two parts? This is mainly considered that the over travel of automobile relay is designed to obtain greater contact pressure according to different load requirements: between 0.15-0.30mm, some special relays even require more, so it is impossible to get all the over travel from magnetic circuit riveting, so some of the over travel needs to be designed into the structural dimension. The over stroke of the structure is obtained by the combination of relay parts; The other

part is obtained by riveting the iron core and yoke iron during production and assembly. That is, the magnetic circuit is over stroke. How much is the magnetic circuit over stroke appropriate? The general recommendation is as follows: small relay: 0-0.05 mm; Medium relay: 0.05-0.10 mm; Large relay: 0.08-0.13mm. We know from the magnetic field circuit that magnetic circuit efficiency is the highest when yoke iron and armature are parallel to armature (i.e. when the magnetic circuit overstroke is zero). Therefore, it is at the expense of magnetic circuit efficiency to increase the magnetic circuit overshoot. Therefore, it is recommended to add the value of small value in design. When the relay over stroke exceeds the above recommended value, it is recommended to increase it to the structure over travel. The following factors should be considered when selecting the ratio between the structure over travel and magnetic circuit: small magnetic circuit overshoot can increase the magnetic circuit efficiency, so the magnetic circuit overstroke should be small and not large; For relay with high over travel requirement, the over stroke of magnetic circuit may cause contact at the back half of the contact and affect the contact clearance. Therefore, the appropriate proportion should be selected in the design to achieve both.

The design of the structure over stroke is better, mainly due to the control of the machining accuracy of the later parts. The long dimension chain like over stroke (the typical snap in relay involves about six parts and the size of more than seven gears). However, due to the function of probability, tolerance will always offset one part of each other, so the actual results must be better than “extreme cases”, which also conforms to the normal distribution law. Therefore, the correct way to design the structure over stroke should be: do not lengthen the dimension chain artificially during design; Improve the precision of key dimensions of parts; Monitor the feed parts and so on. The over travel of magnetic circuit needs to be controlled in the later production and assembly. In the manufacturing process, the existing automobile relay, except for the structure over travel, can obtain the magnetic circuit overstroke by controlling the difference of riveting height between the iron core and yoke iron. Because the height of the hinge surface between yoke and armature has a certain tolerance; The setting height of the iron core is of certain tolerance when riveting the iron core by punch, and the core is of three section type, which has the disadvantages of difficult riveting, large force on the core and easy deformation; The position height of static contact has a certain tolerance after assembly; Armature, reed, dynamic contact three have certain tolerance after riveting; Because of the superposition of the above factors, the over travel consistency is poor, so the over stroke of traditional relay needs manual correction to ensure its consistency after assembly. In order to ensure the effective control of the over stroke of each relay in production, we improved the design of the coordination of relay core and yoke iron. See Figure 4. The two drawings clearly show the difference between the improved core and yoke iron in structure: the core is changed from three-stage to two-stage; The end of the core is designed with a taper of about 3 degrees; The yoke riveting hole and the cone table at the end of the core are interference fit, which is designed to match the over stroke control in production and assembly.

4. automatic control in relay over stroke production

In manual production line or semi-automatic assembly line, the calibration work is still the main type of relay assembly. Due to the improvement of the quality requirements of relay and the substantial increase in labor cost, automatic production is the only way for the development of the relay industry. Here, how to realize the automatic control of relay over stroke is the top priority of relay automation production.

In order to realize the automatic production and control of relay over stroke, the automatic production line is equipped with computer, high-precision punch, two displacement sensors and two hydraulic riveting machines in this station to realize simultaneous riveting of two stations to improve production efficiency and reduce manufacturing cost.

The main working flow of relay over stroke automatic control station is as follows: core insertion pre pressing → armature assembly → over stroke control and measurement → riveting of iron core → over stroke recheck → qualified blanking.

The whole operation process is detailed as follows:

First, the core is pre pressed. The specific steps are as follows: the core is inserted into the core (coil) center hole;

Press the cone table at the end of the core into the riveting hole of yoke iron; When the end face of the iron core is flush with the yoke end, the pressing shall be stopped. The riveting hole between the core and yoke is interference fit, and the core will not loose and move; At this time, the distance between armature and core center is “structural overstroke”, which is inconsistent due to the tolerance factors of parts and assembly.

Secondly, the manipulator installed the armature assembly into the yoke assembly, and the assembly was not completed, and the iron core and yoke were still in the pre riveting state.

Thirdly, relay over stroke automatic control and measurement and riveting of cone table at the end of core are as follows: the mechanical press head is equipped with displacement sensor, and the press head moves downward and pushes the reed, armature and moving contact to move synchronously; When the dynamic contact and the static contact moment, the displacement sensor begins to calculate the armature displacement distance, that is, the relay over travel measurement; The press head continues to move downward, and pushes the reed and armature to move downward. When the armature contacts the end face of the core, the displacement distance a, namely the structure over stroke, is pushed down; The press head continues to move downward, and pushes the reed, armature and iron core to move downward. The moving distance is B. The moving distance is the magnetic circuit over travel. When a + B is equal to the design over travel of relay, the feedback signal of displacement sensor is sent to the computer, and the press head stops pushing; Repeat the above process to measure the over stroke according to the programming instruction and ensure consistency with the design data.

Then, the press head is held still, and the hydraulic riveter at the other end of the iron core rivets the cone platform extending out of the yoke iron to the yoke iron.

Finally, the press head returns to the original position and measures the over stroke. The qualified products are unloaded and entered the next station. The relay over stroke automatic control, measurement and riveting assembly are completed.

Concluding remarks

In a word, the design and improvement of the relay for vehicle should focus on the adjustment of product structure, the change of production process and the improvement of production conditions.

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Application of Electrical Engineering and Automation Intelligent Technology in Building Electrical

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Abstract: In the construction engineering system, electrical engineering plays a very important role. In recent years, the level of science and technology in China has been continuously innovated and developed, and has been widely used in various fields of people's production and life. The electrical automation and intelligent technology of construction engineering are the inevitable development trend. As a product of the development of science and technology, the intelligent technology of electrical engineering automation realizes the organic combination of various technologies, and improves the overall level of building electrical engineering.

Key words: Electrical Engineering, Automatic intelligent technology, Building Electricity

At this stage, with the advent of the "Internet plus" era, most industries in society have entered the road of information and intelligent reform and development. Electrical engineering has strong systematicness and specialty, and is one of the key links in construction engineering. The application of intelligent technology improves the overall automation and intelligence level of the construction electrical industry. Combining the theory and practice of intelligent technology, the construction quality and efficiency of building electrical engineering will be promoted, and a solid foundation for the future development of the construction electrical industry will be laid.

1. Electrical engineering and automation intelligent technology

(1) Electrical engineering

The so-called "building electrical engineering" refers to the project which is carried out around the power resources, electrical equipment and electrical technology to create, maintain and improve the sound, light, heat and other building environment. Generally speaking, the construction system of building electrical engineering includes three parts: power equipment, power line, control and protection device. Each system has division of labor and forms a whole, and supports the supply, transmission, distribution, utilization, monitoring and guarantee of power resources in the process of building operation and utilization.

(2) Intelligent technology

In the application field of building electrical engineering, intelligent technology can also be called "artificial intelligence technology" or "automation technology". It mainly uses modern technology support such as high-precision sensor and big data algorithms to realize recognition and acquisition of language, image, temperature and other real-world elements information, and then dynamically control the operation state of the building electrical system. The optimal solution of the adjustment of the power equipment, the power line and the control and protection device is found.

2. Advantages and characteristics of electrical engineering and automation intelligent technology in building electrical applications

(1) Improve the whole process of building electrical monitoring management

Once the electrical system of a building fails, it will not only affect the operation and service quality of the building, but also cause serious disaster accidents, which will cause huge safety threats and economic loss to construction users. Therefore, it is necessary to supervise and control the performance of various equipment, lines and devices. But in the traditional period, architectural electrical engineering has strong artificial characteristics in design, construction and maintenance. On the one hand, the internal quality of relevant personnel, such as working status, technical level and responsibility consciousness, will be directly linked with the quality of building electrical system, which is not conducive to the accurate and scientific implementation of relevant control behaviors. On the other hand, due to the limited number and energy of relevant personnel, the risk investigation, maintenance, equipment adjustment and other control work of building electrical system are carried out according to specific cycle. At this time, once the electrical failure occurs in the "blank period" between the two cycle activities, it will be difficult to deal with it in a timely and comprehensive way, which is not conducive to the overall operation safety of the building. After the application of intelligent technology of electrical engineering automation, the above negative situation can be effectively contained. In intelligent building electrical systems, a large number of current, voltage, temperature, image, voice and other sensor equipment are arranged. Under the application background of continuous supply of power resources, it can collect information all day and dynamically, and transmit the collected equipment, lines, devices and other information to the control platform through wireless communication and optical fiber communication. It provides the basis for the following automation and intelligent control behavior. In this way, the "blank period" influence under the traditional artificial mode can be effectively eliminated and the whole process supervision of the building electrical system can be realized. On this basis, the control platform system located in the control center layer can analyze the electrical information returned by the sensor based on modern science and technology such as big data mining technology, big data prediction technology, neural convolution network technology, and compare the analysis results with the preset standard value. After that, if the actual value reaches or exceeds the limit, the system will quickly formulate the adjustment scheme of equipment, line and device, and send feedback signal to control the building electrical system to return to a stable and reliable state.

(2) Improve the accuracy of electrical monitoring management in building

In the construction engineering system, the electrical engineering of building has strong concealment characteristics. On the one hand, most of the power supply and distribution lines and electrical equipment are not directly exposed to the external environment, which makes it difficult for relevant personnel to find the abnormality in time in the process of building use or management; On the other hand, many important parameters in the building electrical system are invisible, such as current, voltage, line load, resistance value, etc. When collecting and analyzing such parameter information, relevant personnel must carry out work practice with the help of multimeter, ammeter and other professional testing equipment. Under the influence of these two aspects, the traditional manual control mode of building electrical systems is difficult to ensure accuracy. At this time, through the construction of intelligent and automatic building electrical control system, the information collected by the sensor, such as current, voltage, resistance and load, can be converted into digital signal through scientific signal conversion technology, and quantified in the corresponding platform interface for relevant personnel to directly view. At the same time, the intelligent characteristics of the automation intelligent technology of building electrical engineering are also reflected in its integration of existing information resources and prediction of future information trends. In the visual interface of the management platform, the relevant personnel can see the change curves of power supply and distribution trend, equipment parameter fluctuation and so on in the electrical links of the building in the past period, so as to form a comprehensive understanding of the operation state of the building electrical system combining macro and micro. In addition, combined with the big data algorithm, the law analysis of various change curves can be carried out. The intelligent system and

related personnel can also predict the parameter trend of the building electrical system in the future period, so as to realize the scientific consideration of the probability of equipment failure and electrical disaster, and formulate effective fault avoidance and disaster prevention scheme. Thus, even if the building electrical system is abnormal under the condition of no control, the intelligent control center can quickly complete the actions of closing the electrical valve and breaking the electrical line according to the pre-determined risk response procedure, control the failure impact at a lower level and send corresponding alarm signals to the staff.

(3) Improve the linkage of building electrical monitoring management

The electrical system of building has a strong linkage operation characteristic. Once a certain electrical equipment, control protection device or a certain section of electrical circuit fails, it will easily cause domino effect, which will gradually cause the overall block or even paralysis of the electrical system, and then lead to power failure. Therefore, it is difficult to achieve the effective treatment effect if the single equipment or single section line is controlled and adjusted after the fault occurs. Under the background of the application of intelligent technology of electrical engineering automation, the building electrical system body, sensor equipment and intelligent control center can be connected into a collaborative operation and mutual influence of the Internet of things. In this way, once a system link has a running situation, while being controlled and adjusted, other related equipment, devices and lines will be transferred accordingly, so as to eliminate the influence of faults in multiple points and comprehensively, so as to ensure the safe and stable operation of the building electrical system. In addition, with the continuous development of modern construction industry and electrical intelligent technology, various intelligent equipment and control technologies with different functions emerge endlessly. It can be incorporated into the construction of the Internet of things system of building electrical engineering, which can trigger multiple linkage protection mechanisms at the emergency point, and avoid and deal with the hidden dangers for the first time. For example, intelligent fire spray system, smoke alarm system and high temperature alarm system can be designed in building electrical engineering, and the relevant sensing devices and security equipment can be arranged in the environment of distribution room and lighting area, so as to form a hidden protection network and achieve ideal electrical fire control effect.

3. Application analysis of electrical engineering and automation intelligent technology in building electrical

(1) Automatic control

With the increasing attention of people to construction engineering, building electrical engineering as an indispensable and important content has been paid great attention to. It is different from traditional architectural engineering design. In the process of modern construction engineering construction, it is necessary to combine the architectural electrical system to realize the mutual relationship between construction engineering and electrical engineering. That is, the common neural network control automation system. In the automatic control system, the system adjusts and optimizes itself according to the set parameter subsystem. The whole system enriches the form of automatic control by using intelligent technology. Taking the PID controller as an example, this controller replaces some control systems, which can assist other systems to develop specific equipment and simulate the process of automatic control. Taking residential buildings as an example, the electrical energy saving in the building is calculated in the network system by using the automation intelligent technology. Through the network evaluation simulation and result analysis, we take practical and reasonable electrical energy saving measures to formulate the electric energy saving scheme, so as to ensure the best effect of the electrical energy saving design applied to the building. In addition, the heating and air conditioning system in residential buildings can optimize the heating system and ensure good heating effect by means of automatic intelligent technology while providing normal heating service for people. Meanwhile, it emphasizes its energy saving, and finally achieves the energy saving purpose by adjusting frequency conversion through scientific calculation.

(2) Real time monitoring

The construction and construction of construction projects has the characteristics of long cycle and large-scale complex systems. The intelligent technology can be used in the real-time monitoring system to realize the continuous and non-dead angle monitoring of construction projects. With the advanced intelligent monitoring system, the construction site of the construction electrical engineering can be monitored in real time and the monitoring data can be transmitted to the project management personnel in real time. It broke the time and space restrictions. Judge the possible emergency and accident problems in time, and formulate effective solutions to avoid leakage, water leakage, stealing work and reducing materials. Intelligent monitoring systems are used in the buildings of parking lots and other places. On the basis of intelligent and automatic, each parking space can be monitored by light sensitivity. When there is a vehicle parked in the parking space, the automatic intelligent system can receive signals, automatically identify the vehicle information and transmit it to the interactive interface. Users can quickly find parking spaces through the interactive interface, to achieve the ultimate goal of reducing carbon emissions, saving gasoline resources and protecting the ecological environment. The intelligent electrical appliances can be applied to facilities such as natural gas valves and electric gates by using electrical engineering and automatic intelligent technology, and the functions of intelligent monitoring system can be improved. Through real-time monitoring and monitoring, natural gas leakage and electricity stealing can be avoided. When there is any abnormal problem, the system can alarm in time and take corresponding measures.

(3) Intelligent management of building power supply and distribution

As an important part of the construction project, the power supply and distribution system provide power support and power supply guarantee for the operation of various facilities and equipment. Intelligent technology can be used to monitor the power supply and distribution system of the building in real time, and the power consumption of each household in the area can be automatically counted and the adjustment work shall be carried out when appropriate. The intelligent distribution system has strong automatic detection function, can detect safety problems such as short circuit and leakage in time, and strengthen the security and stability of the building power supply system. The application of automation and intelligence technology provides perfect technical guarantee for the modernization of building electrical engineering, detects the fault problems quickly, reduces the time of putting into operation in the construction electrical engineering by manual means, reduces the economic loss and cost investment that may be generated by building electrical engineering, and uses the automation intelligent technology. It ensures that the construction project meets the requirements of relevant quality standards.

Concluding remarks

In a word, electrical engineering and automation technology have been widely used in building electrical, which makes building electrical more safe, reliable and can only improve the integration and efficiency of building electrical engineering systems.

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