Scholar Publishing Group
International Journal of Multimedia Computing
https://doi.org/10.38007/IJMC.2022.030402
ISSN 2789-7168 Vol. 3, Issue 4: 16-28

Computer Monitoring System Based on 5G Internet of Things in Service Period of Tunnel Lining

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Keywords: 5G Technology, Internet of Things Technology, Computer Monitoring, Monitoring System

Abstract: The rapid development of information technology has accelerated the rise of the Internet of Things, and with the application and popularization of the Internet of Things, it has gradually achieved good development momentum in various fields. How to further exert the maximum value of the Internet of Things, and combine the data it monitors with the computer network to form a comprehensive control of the computer monitoring system has become an important issue to be solved in the current related fields. The rapid development of technology, the rise of 5G technology, the application of 5G technology to the Internet of Things technology, the computer monitoring system based on 5G Internet of Things technology is more intelligent in the actual operation. Tunnel lining is a permanent structure that supports and maintains the long-term stability and durability of the tunnel. Its role is to: support and maintain the stability of the tunnel; maintain the space required for the train to run; prevent the weathering of the surrounding rock; remove the impact of groundwater, etc., apply the 5G IOT computer monitoring system to the tunnel lining, which can be effectively used by the monitoring system. Observing the situation of the tunnel helps the relevant personnel to make predictions and maintenance. In this paper, the 5G IOT computer monitoring system is designed to monitor the tunnel lining, and the tunnel lining is analyzed by the data observed by the monitoring system to realize prediction and maintenance. Through system monitoring, we found that the computer monitoring system based on 5G Internet of Things is about 50% higher in data monitoring than the traditional monitoring system, the feedback speed is about 36% higher, and the protection monitoring capability is higher. It will be based on 5G Internet of Things. The monitoring system is applied in the tunnel lining, which helps to collect the actual situation of the tunnel lining faster and more convenient for prediction and maintenance.

1. Introduction

As an important part of modern network information technology, the application scope of the

Internet of Things is more and more extensive. The Internet of Things has effectively improved people's daily production and living conditions, and thus has strong development potential [1-2]. Under this situation, China's information technology enterprises have begun to focus on the in-depth development and exploration of Internet of Things technology, and many companies have successively developed new products based on Internet of Things technology [3-4]. At present, in the smart home field, the application of Internet of Things technology is the most mature, and smart home products have gradually penetrated into people's daily lives, and have greatly improved people's living standards and quality. In the era of Internet of Things, the corresponding data information will be generated at all stages of daily production and life, which requires that the transmission efficiency and speed of communication technology must be fully optimized and improved [5-6]. 5G technology is the abbreviation of the fifth generation mobile communication network technology. At the 3GPP RAN plenary meeting of the International Telecommunication Standards Organization, the 5GNR first release was officially released, which is the world's first 5G standard for commercial deployment. In 2018, various equipment manufacturers have launched 5G equipment, and various operators have conducted 5G commercial pilots in individual regions. It is expected that by 2020, the 5G network will officially commercialize the monitoring system running with automation technology and IOT technology to implement effective real-time monitoring [7-8].

Monitoring systems that operate using automation technology and IOT technology enable effective real-time monitoring. After sensing the terminal information of the computer monitoring system, the *Internet* of Things transmits the collected data information to the user end, achieving the connection of "people and things"—the combination of service and operation. The office model under the information age has been inseparable from the technical support of the Internet, and the computer monitoring system has also entered many industries. The Internet of Things technology that connects the physical object with the computer monitoring system realizes the exchange of "things to things" and "people to things" to a certain extent, and better helps the computer monitoring system to carry out actual comprehensive monitoring [9-10]. In order to improve the overall level of computer monitoring systems, we should give full play to the technological advantages of the Internet of Things. Overall, the Internet of Things is changing our lives. Both computer technology and Internet of Things technologies have encountered the process of reading, transmitting and processing data. The monitoring objects are quantized in various ways, and the processed data is transmitted to the application part for processing by certain means. However, computer monitoring systems are more similar to a small feature of the Internet of Things than IOT technology. Therefore, from the similarity of the information reading, transmission and processing process, the possibility of the application of the Internet of Things technology to the computing monitoring system is increased, so as to better expand the application range of the computer monitoring technology [11-12]. The IOT data collection and monitoring system designed in the context of the 5G era has achieved remarkable results in terms of device dynamic joining, device protocol analysis, and real-time data dynamic adjustment. In addition, the designed system can significantly reduce the workload of R&D personnel and shorten the execution cycle of the entire project, thereby improving overall work efficiency and improving project quality. It has certain application value and guiding significance for the research of data acquisition and monitoring platform. Therefore, it is feasible and necessary to design and develop a computer monitoring system based on 5G Internet of Things. Applying such a system to a tunnel lining can better predict and maintain the tunnel lining.

The Internet of Things is a promising technology that is revolutionarily connected to the world through seamless connectivity through heterogeneous smart devices. The current demand for machine-based communication has led to a variety of communication technologies and different service requirements to realize the vision of the modern Internet of Things. Newer cellular

standards, such as Long Term Evolution, have been introduced into mobile devices, but are not well suited for low power and low data rate devices such as IOT devices. In order to solve this problem, Akpakwu G A has studied the development of IOT application requirements and related communication technologies. In addition, Akpakwu GA has also discussed in detail the third-generation partner project's cellular-based low-power wide-area solution to support and implement new service requirements for large-scale to critical IOT use cases, including IOT mobile communication extensions covering the globe. System, enhanced machine type communication, and narrowband Internet of Things. And for the new service requirements and enabling technologies of the Internet of Things, 5G new radio enhancements have been introduced. Akpakwu G A has conducted a comprehensive review of emerging and enabling technologies, focusing on 5G mobile networks, which are designed to support the exponential traffic growth of the Internet of Things. When Akpakwu G A proposed an effective context-aware congestion control mechanism, it also proposed challenges and open research directions related to large-scale deployment of key IOT applications [13-14]. Mobile data traffic has grown dramatically due to the widespread use of data-hungry devices such as smartphones and laptops. This encourages researchers and system designers to develop more efficient network designs. Alfalahy N has summarized technologies that support multi-Gbps speeds in future fifth-generation (5G) networks, and has studied many of the challenges, problems, and problems that arise during the research and design phases, and concludes that IOT and machine-to-machine communication are generated. The expected high traffic demand and low latency requirements can only be met by fundamental changes to the network model. This includes the dense deployment of small batteries in the millimeter band. Future wireless systems will include countless intelligent functions and applications, making 5G the smartest and most important wireless technology to date [15-16]. In order to realize the remote automatic measurement and control of all oil well pumps in different regions of crude oil production enterprises, Zhao-Hui W U has discussed and designed a well control and control system based on the Internet of Things technology. The measurement and control system uses the three layers of the IOT structure (sensing layer, network layer and application control layer) to analyze the functions and features of each layer. The hardware composition and control principle of sensor instrument nodes and aggregation instrument nodes existing in the measurement and control system are introduced and discussed. Finally, the programming flow chart of the node microcontroller and the main design software module contents of the IOT central computer are given. The test results of the enterprise show that the system has the advantages of convenient operation and maintenance, low labor intensity, high efficiency of measurement and control, high precision, etc., compared with the traditional manual detection method of oil well fuel pump [17-18]. Remote monitoring is a fascinating research direction in mobile computing technology. Arora A has studied the personal computer remote monitoring system. One of the challenging tasks of this research is the security of sharing data across PCs or handheld devices over Wi-Fi, 3G and Bluetooth. Arora A proposed an application model of a secure personal computer network monitoring system. The application model proposed by him can effectively utilize the handheld device to communicate and monitor the communication between the handheld device and the personal computer through WIFI, which can be used in the android mobile phone. Get the current state of the machine and monitor the current state of any machine on the network. In the application model proposed by Arora A, mobile devices can monitor the operation of personal computers [19-20].

This paper compares the 5G IOT computer monitoring system with the traditional computer monitoring system, compares the data collection quantity, data acquisition feedback speed and prevention and control monitoring ability, and finds that the 5G IOT computer monitoring system has greater data collection. Volume, faster data acquisition feedback speed and better control and monitoring capabilities, the 5G IOT based computer monitoring system is applied in the tunnel

lining, which helps to collect the actual situation of the tunnel lining faster and more convenient for prediction and maintenance.

2. Proposed Method

2.1. Internet of Things Technology

IOT technology refers to the use of information-sensing devices such as radio frequency identification infrared sensors, global control systems and laser scanners, and associates any item with the Internet in accordance with the agreed agreement, on the basis of which information is exchanged, the purpose of which is to achieve Intelligent network planning for positioning and tracking. But the core of IOT technology is also Internet technology, but a new type of technology that is extended on the basis of Internet technology. The Internet of Things is the information transmission control between objects and objects, and the current application of the Internet of Things has three key technologies, namely sensor technology, RFID tags, and embedded technologies.

In general, the Internet of Things connects the networks between things and things. From a technical point of view, the micro-inductive chip is added to the object, so that the intelligent level of the Internet can be improved, and the communication between the object and the person, the object and the object can be realized by using the network. The Internet of Things is based on the application of sensing devices, based on strict protocols, connecting different types of networks together, enabling information to interact with each other, making communication more stable, enabling accurate positioning and tracking of information. .

At present, the application of Internet of Things technology is very wide, and it has strong adaptability, which is involved in all aspects of social development, such as intelligent transportation, smart city and so on. Due to the advancement of urbanization, the application scope of the Internet of Things will continue to increase. At the same time, the emergence of 5G networks will also promote the development of the Internet of Things.

2.2. 5G Technology

(1)Overview of 5G Technology

5G, which is what we call the fifth generation of mobile communication technology, will be available in 2020. The International Telecommunications Union calls 5G IMT-2020, which means that 5G standardization work will be realized in 2020. Compared with 4G, the change of 5G technology is mainly based on the change of capability index, which is what we call the GBPS user experience rate. With this technology, the data transmission speed can reach one second in the ultra-high frequency band of 28 GHz. Above 1Gbp, its transfer speed is very fast. In addition, there is a great improvement in the transmission distance, which can transmit data within 2km, so that the space constraint of data transmission can be effectively broken. Currently, one of the most advanced communication technologies in the world is 5G technology, and the world is very concerned about this technology. Based on the application of 5G communication technology, the traditional speed of data can be greatly improved, and the traditional space limitation can be effectively eliminated. For 5G communication technology, its research and development mainly has three stages: The first stage is the test of key technologies; The second stage is the verification of technical solutions; the third stage is system verification.

(2) Characteristics of 5G technology

1) High transmission rate

This is the basic feature of 5G technology. As the next-generation mobile communication

network, the highest theoretical transmission rate of 5G networks can reach tens of GBPS, and the entire ultra-high-definition movie can be downloaded within 1 second. With the commercialization of 5G technology, it is possible for users to quickly transmit massive amounts of video information through the mobile Internet.

2) High compatibility, high capacity

5G networks have the flexibility to support a wide range of different devices. In addition to supporting mobile phones and tablets, 5G networks also support any other device that complies with 5G technology specifications, such as fitness trackers, smart watches, smart home devices, and more. In addition, 5G networks support one million devices per square kilometer, which is 100 times or even 1000 times higher than 4G networks. This feature of 5G technology can be said to truly provide access to everything.

3) Stable access

The 5G technical specification requires that 5G networks can provide stable, high-speed access services for high-speed mobile devices, and the phenomenon of poor network connectivity will be eliminated. In the future, even when users play online video, browse the web, send pictures or video information while riding the high-speed rail, there will be no more stagnation or even stagnation.

4) Low latency and high reliability

In a 3G network, the delay is about 100 milliseconds, the delay of the 4G network is 20 to 30 milliseconds, and the delay of the 5G network can be shortened to 1 millisecond, and the service reliability is close to 100%. To put it bluntly, if people control the car remotely through a 5G network, the response speed is basically the same as sitting in the car cab for control.

5) Low power consumption

There are many terminal devices that access the mobile internet network from time to time to exchange data with the server, such as: various types of monitoring equipment, timely communication applications, etc. In this regard, 5G technical specifications require 5G networks to ensure that such terminals consume ultra-low power. The consumption can complete the transmission of related data.

6) High base station construction requirements

The high transmission rate, high compatibility, high capacity, high reliability, low latency, stable access, and low power consumption of the 5G network are based on the ultra-high frequency band adopted by the 5G network. Another feature of the ultra-high frequency band is that the transmission distance is easily limited. In order to ensure stable and continuous transmission of information, 5G networks require more (distributed) base stations than 4G. According to the characteristics of 5G technology, whether it is high transmission rate, high compatibility, high capacity, high reliability, low latency, stable access, low power consumption, etc., 5G network is tailor-made for the Internet of Things. Therefore, the integration of the Internet of Things and 5G technology has enabled the Internet of Things to truly spur development.

2.3. Application of 5G Communication Technology under the Internet of Things

(1)High frequency transmission technology

In the IOT situation, the development of all walks of life must have sufficient network capacity and transmission rate support. In the current mobile communication system, the system frequency band is basically within 3 GHz, and the daily simple needs can be met. If there is a large range of online activities, the number of users will increase rapidly in a short period of time, and the frequency band resources will be insufficient. The network is crowded, which affects the user's use. However, in the high-frequency transmission technology, the broadband can reach 284.7 GHz, which is twelve times the total bandwidth of the microwave. That is to say, although the microwave

and the milliwave are called similarly, the range is quite different. The milliwave is compared with the microwave, which is smaller. The millimeter wave frequency is generally 27.3 to 350 GHz. Because of its small size, it can be miniaturized, so that smaller and less consumable devices can be produced. In addition, ultra-high-speed short-range communication can be realized, and at the same time combined with 5G, the compatibility is also very good.

(2) Dense network technology

For 5G communication technology, the traffic it provides is compared with 4G networks, which is more than a thousand times that of the latter. 5G communication technology is a combination of multiple wireless access technologies, and the coverage is small. It is unrealistic to want to achieve smaller segmentation. Therefore, under this condition, the application of dense network technology is Very critical. For dense network technology, there are two main aspects: outside the macro base station, a large number of antennas are set, in this way, the outdoor space is widened, and at the same time, the purpose of increasing the system capacity is achieved. More importantly, it can greatly improve the flexibility of the system. In the outdoor, many dense networks are set up, which can promote the coordination and cooperation between different network nodes, so that the accuracy of adjacent nodes can be greatly improved, and the signal-to-noise ratio gain is also greatly improved. It can be seen that in the 5G communication technology, the use of dense network technology can increase the network space, realize the dynamic change of time, and increase the network coverage area, so that the network advantage can be fully exerted.

(3) Intelligent technology

In the future, 5G communication technology will inevitably need to provide diversified services, and there will be a lot of complicated data transmission to the central network. In essence, the central network of 5G communication technology is a cloud computing platform, which is composed of large servers, and its computing power is very strong. This technology can be connected to other base stations by using the switch network and other devices. For more time-sensitive data and a large amount of data, it can also effectively respond to submit it to the cloud computing center. Network processing, which can refine the data and divide and archive it according to different categories. For the central network, there are many mid-range and base stations outside, and their existence is different. For the network center, different frequency bands can be selected in combination with different service types. In the process of user experience, the network connection is more diverse. In order to deal with such complex and large-scale business, it is necessary to improve the level of intelligence and improve the ability to identify, classify and select, because one of the most critical technologies in 5G communication technology is intelligent technology.

(4)SDN/NFV technology

Among the 5G communication technologies, the most important application technology is scalable technology. The generation of cloud computing services and the deepening of the triple-play convergence industry have improved the security of 5G communication networks, and the development of technologies for 5G communication technologies. For SDN/NFV technology, it is software-defined network/network function virtualization, especially in 5G mobile communication networks. Virtualization and software implementation are very effective in controlling data separation. This is 5G communication technology. The development has a huge role to play. For SDN/NFV technology, it is the basis of 5G communication technology. According to the network, the basic, control and application layers of communication can be constructed, so that the program call can be realized, and the manual configuration can be successfully replaced in 5G communication. The role of technical management is very prominent. In order to optimize the network system, the 5G communication network has to realize the function of forwarding separation. This function enables the 5G communication network to be controlled at runtime. Through the combination of SDN/NFV, the virtual network architecture can be effectively

established, so that the needs of different services to the network can be met.

(5) Direct communication technology between devices

At this stage, the mobile communication system is able to construct the communication network using the distributed fixed stations. Most of them use the base station as the core to spread around, so that urban network coverage can be realized. When designing 5G network technology, it will fully consider the defects of 4G communication technology. For the construction of mobile network with base station as the core, it is impossible to correctly understand the situation that the user's needs are satisfied. Therefore, direct communication will be realized. The technology is established so that the mobile network receiving device can receive the network without the base station, so that the direct communication of the communication device can be realized, which is very suitable for the situation in which the number of Internet users suddenly increases. This technology can make access methods, network connections, etc., and the effectiveness of network communication will be more prominent.

3. Experiments

3.1. Experimental Design

Experiment with the traditional computer monitoring system and the computer monitoring system based on 5G Internet of Things. This paper designed 4 experiments, the experimental time is 40 hours, 50 hours, 45 hours, 55 hours, the data collected by each monitoring is recorded, the amount of data monitored from the monitoring system and the speed of monitoring, and Analysis and discussion on monitoring capabilities and other aspects.

3.2. Operation parameter Calculation and Statistics

The central control layer shall calculate the working conditions of the hub, establish the running files of the main and auxiliary equipment, and transmit all the data such as statistics and reports to the management information system. Obtain all the data monitored by the hub through the monitoring network, including real-time data, historical data, event records, etc. The data is stored in the data server for at least two years, and requires data interface with the management information system to provide all monitoring system history for all users of the information system. Real-time data, monitoring screens, and data import and export. (1)Start and stop time, running time, number of successes, number of failures, and number of trips of each unit. (2) Statistics of the normal and accidental outage time, number of inspections and time of the unit. (3) The actual execution time of each step of the specified unit flow is counted, and if it is significantly longer than the daily working condition, a prompt is issued. (4)Statistics of main transformer, 220kV GIS, 220kV cable, factory transformer, circuit breaker and other main equipment running time, number of actions, statistics of the number of fault currents and corresponding fault currents of each voltage level circuit breaker, when the limit number of times is exceeded, automatic alarm prompt.

3.3. System Network Security Factor Analysis

The security of the network has always been a concern of users. Although the monitoring private network system is not interconnected with the Internet, how to ensure its security is a problem that the monitoring solution must consider. The industrial control transmission system mainly guarantees the confidentiality, integrity and authenticity of the terminal equipment monitoring and control data in the process of transmission, storage and exchange. Although the engineering monitoring system is an independent network, unauthorized users cannot be illegally accessed

through the system's Ethernet port during system operation and maintenance. Since the data in the system is transmitted by the international standard IP method, the unauthorized user can easily perform network eavesdropping and obtain all the data information in the transmission network. More seriously, through the use of connection piracy and data tampering, unauthorized users can send tamper-evident data streams over the network, tamper with the monitoring information or transmit untrue information to the controllers of the control center and emergency center. If the data in the system is tampered with, it may cause the monitoring system to send an error message to the on-site information display. There are many factors affecting network security. Among them, human factors are harmful. In summary, there are mainly the following aspects that pose threats to the network: (1)Human error Some unintentional behaviors such as lost password, illegal operation, resource access control Unreasonable, improper administrator security configuration, etc. (2) Virus infection Virus has always been the most important reason for threatening the security of computer systems. The network provides a rapid way for viruses to spread. The system is not connected to the external network, but it is necessary to control the use of the floppy disk and the optical disk in the system, because the virus easily spreads through the above medium. (3)Illegal attacks inside and outside the network selectively destroy the validity and integrity of the network information; pretending to be legitimate users entering the network and occupying a large amount of resources; modifying network data, stealing, deciphering confidential information, and destroying software execution; Site interception and reading of information, etc. (4)The system's vulnerability operating system and network software cannot be 100% flawless and flawless. Once the security vulnerability is known to outsiders, it will become the preferred target and weak link for the entire network system to be attacked. (5)The information storage and transmission information is stored in the network system, and if it is not taken, it is easy to be stolen or tampered with. Similarly, information may be read during the transport process.

4. Discussion

4.1. System Parameter Configuration Interface

After the login system succeeds, the monitoring system must first query the relevant database content. If the database content is empty, it will prompt for parameter setting. According to the specific requirements of the tunnel lining observation field, the parameters to be set mainly include: serial port setting (serial port number, wave rate, check digit, stop bit), data acquisition type (voltage value, current value, switching amount, cumulative value).), EDA acquisition module parameter setting (serial port number, baud rate, check digit, stop bit, module type (voltage, current, switching amount, accumulated value), module communication protocol (ASCII, Mod bus, Hex), acquisition Frequency), self-developed module parameter setting (communication command, acquisition frequency, total number of bytes of communication, number of data included, number of bytes occupied by each data, starting address, number of loaded modules), alarm parameter information setting (alarm level, acquisition frequency, alarm mode), temperature control parameters (temperature upper limit, lower temperature limit), data pre-processing parameters (moisture data pre-processing), SMS alarm person in charge number, system operation parameters. EDA parameter setting interface is shown in Figure 1.

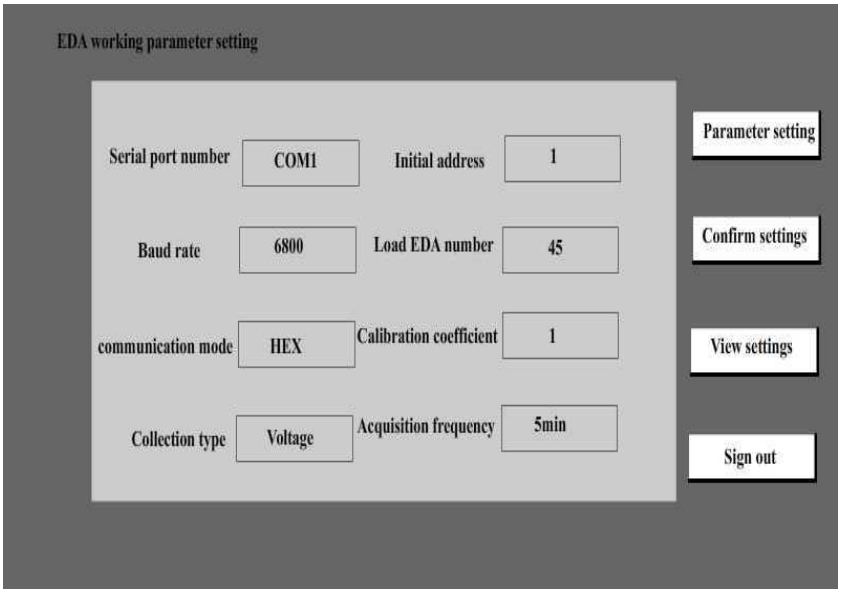

Figure 1. EDA parameter setting interface

4.2. Monitoring Information Analysis Discussion

Compared with the traditional computer monitoring system, the computer monitoring system based on 5G Internet of Things has the advantage of high capacity. This experiment sets 4 experiments. The first monitoring time is 40 hours, the second monitoring time is 50 hours, and the third time. The secondary monitoring time is 45 hours, and the fourth monitoring time is 55 hours. The number of faults monitored by the monitoring system is shown in Figure 2.

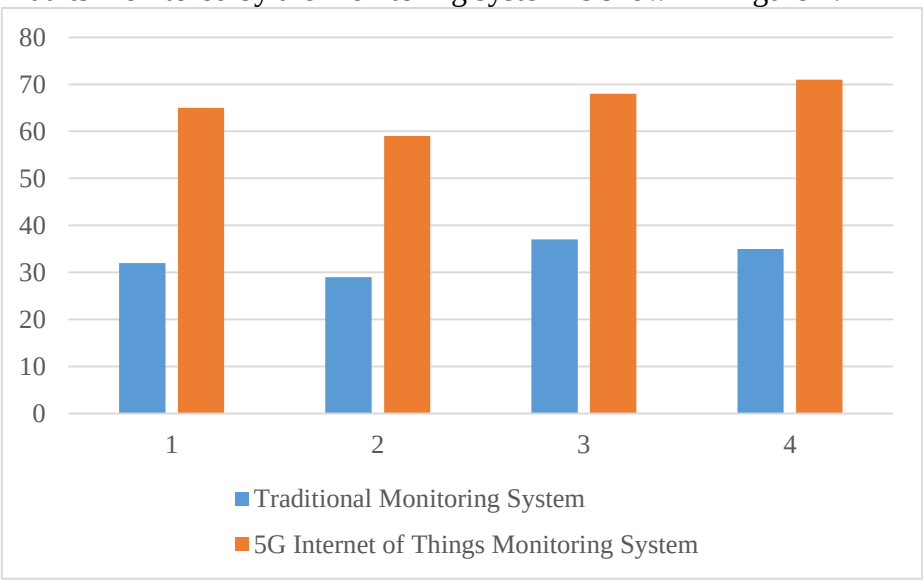

Figure 2. Comparison of monitoring failures

As can be seen from Figure 2, in the first experiment, the number of faults detected by the traditional computer monitoring system was 32, and the number of faults detected by the 5G IOT computer monitoring system was 65, which is more than the traditional computer monitoring system. 33. In the second experiment, the number of faults detected by the traditional computer monitoring system was 29, while the number of faults detected by the 5G IOT computer monitoring

system was 59, 30 more than the traditional computer monitoring system in the third time. In the experiment, the number of faults detected by the traditional computer monitoring system was 37, while the number of faults detected by the 5G IOT computer monitoring system was 68, 31 more than the traditional computer monitoring system. In the first experiment, the traditional computer The number of faults monitored by the monitoring system is 35, and the number of faults detected by the 5G IOT computer monitoring system is 71, 36 more than the traditional computer monitoring system. In general, the faults detected by the 5G-based IOT computer monitoring system The number of failures detected by the traditional computer monitoring system is 50%, and the monitoring system based on the 5G IOT computer has great advantages in collecting data.

4.3. Monitoring Feedback Speed Discussion

Based on the experimental results of this paper, the data records of the four experiments are analyzed and discussed. The comparison of the speed of data collection based on the 5G IOT computer monitoring system and the traditional computer monitoring system is compared. The results are shown in Figure 3.

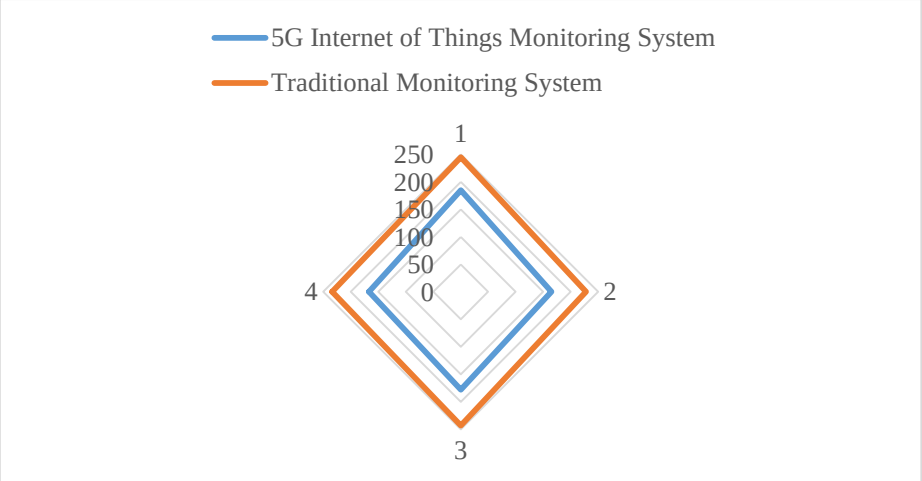

Figure 3. Comparison of monitoring feedback speed

From Figure 3, we can see that the monitoring feedback speed of the monitoring system is based on the monitoring feedback speed of the 5G IOT computer monitoring system. In the first experiment, the monitoring feedback speed of the 5G IOT computer monitoring system is 185, the monitoring and feedback speed of the traditional computer monitoring system is 245. In the second experiment, the monitoring feedback speed of the 5G IOT computer monitoring system is 165, and the monitoring feedback speed of the traditional computer monitoring system is 228. In the third experiment, the monitoring feedback speed of the 5G IOT computer monitoring system is 178, and the monitoring feedback speed of the traditional computer monitoring system is 243. In the fourth experiment, the monitoring feedback speed of the 5G IOT computer monitoring system is 167, the traditional computer monitoring system of the monitoring feedback speed is 234. Overall, the monitoring feedback speed based on the 5G IOT computer monitoring system is about 36% faster than the traditional computer monitoring system.

4.4. Comparison of Prevention and Control Monitoring Capabilities

Based on the experimental results of this paper, the 5G IOT computer monitoring system is compared with the traditional computer monitoring system to compare their protection monitoring capabilities. The results are shown in Figure 4.

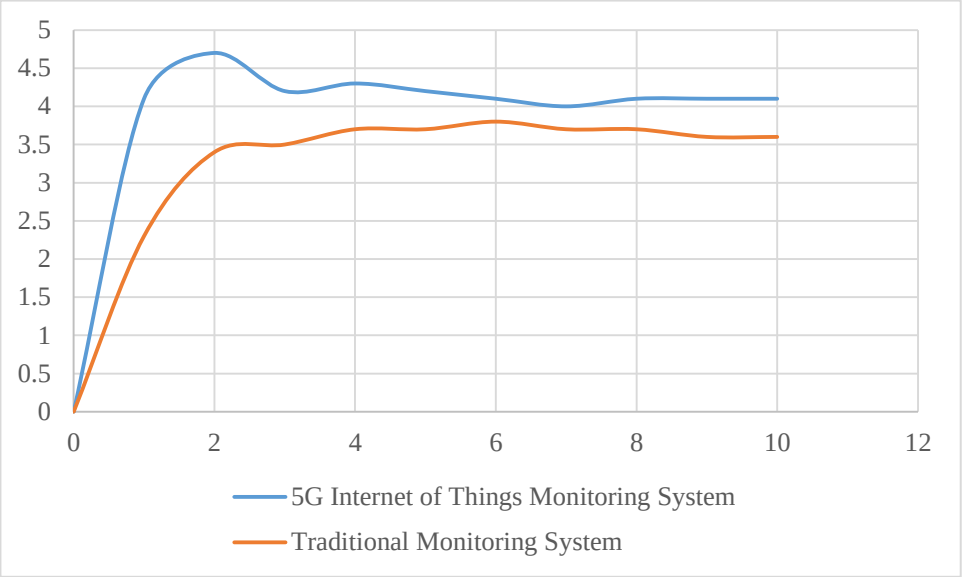

Figure 4. Comparison of protection monitoring capabilities

It can be seen from Figure 4 that although in the early stage, the monitoring effect of the protection monitoring system based on the 5G IOT computer monitoring system fluctuated greatly, but the overall trend was upward, and with the increase of time, the floating range gradually decreased and reached a certain level. After the time, the monitoring effect is stable at a certain level. In contrast, although the traditional computer monitoring system is not as large as the 5G IOT computer monitoring system, the monitoring ability of the traditional computer monitoring system is always lower than that of the 5G IOT computer monitoring. System, relatively speaking, the 5G IOT computer monitoring system's protection and monitoring system is more effective.

5. Conclusion

As a product based on automatic control technology and computer technology, computer monitoring technology has a wide application space, which can realize real-time detection and control of controlled objects. With the maturity of computer monitoring technology, the introduction of Internet of Things technology enriches the content of computer monitoring technology, uses intelligent terminals to sense information, and transmits data to industry-oriented and customer-oriented services, strengthening data coherence and breaking the gap. In the past, the dispersion state in the test data also improved the monitoring efficiency. In short, in order to further fully meet the diversified needs of the development of modern mobile Internet and IOT business, it is necessary to summarize and integrate the key points of various technical applications and build a sound network mechanism to provide users with more perfect and high-quality services.

With the advent of the 5G era, the Internet of Everything has a communication foundation, and the combination of the Internet of Things and 5G technology has entered a substantive phase. The 5G Internet of Things provides more powerful functions and more flexible applications for computer monitoring systems, providing new ideas for the development of computer monitoring systems. With the development of 5G Internet of Things, computer monitoring systems will also develop in a more efficient, smarter, and safer direction, eventually becoming part of the Internet of Everything, providing more convenience for people's lives.

Based on the 5G IOT computer monitoring system with many advantages such as high efficiency, high capacity, strong control and monitoring ability, the computer monitoring system based on 5G Internet of Things technology is applied in the tunnel lining service period to provide efficient and

timely monitoring data for the tunnel lining. Effectively improve the monitoring quality of tunnel lining, and play a vital role in the prediction and maintenance of tunnel lining.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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