Hindawi
Advances in Materials Science and Engineering
Volume 2023, Article ID 9815070, 1 page
https://doi.org/10.1155/2023/9815070

Retraction

Retracted: Design of Remote Monitoring Iot System Based on 5G and New Optical Fiber Intelligent Structure

Advances in Materials Science and Engineering

Received 26 December 2023; Accepted 26 December 2023; Published 29 December 2023

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] L. Hu, "Design of Remote Monitoring Iot System Based on 5G and New Optical Fiber Intelligent Structure," *Advances in Materials Science and Engineering*, vol. 2022, Article ID 1536839, 12 pages, 2022.

Hindawi
Advances in Materials Science and Engineering
Volume 2022, Article ID 1536839, 12 pages
https://doi.org/10.1155/2022/1536839

Research Article

Design of Remote Monitoring Iot System Based on 5G and New Optical Fiber Intelligent Structure

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Received 11 May 2022; Revised 16 June 2022; Accepted 17 June 2022; Published 9 July 2022

Academic Editor: Haichang Zhang

In recent years, with the progress and development of social science and technology, remote monitoring of Internet of Things systems has attracted more and more attention. The remote monitoring system is mainly a network system with convenient layout, simple maintenance, and high security performance built on the basis of the wireless network, which can realize real-time monitoring, and collects transmit information. It is mostly used in remote monitoring of room temperature, remote monitoring of intelligent furniture, engineering construction, and teaching. Communication technology dominates the operation of remote monitoring systems. With the introduction of 5G technology, mobile Internet technology has been pushed to the top of technology again. Using 5G mobile communication technology in the monitoring system, people can observe or operate the monitored things at any time. The sensor is an indispensable component of the remote monitoring system, and a new type of optical fiber is added to the sensor to make the system function more complete. However, the related technology is not very mature, and the research on remote monitoring system is relatively backward in China. Relevant studies have found that when the remaining energy of the information node in the remote monitoring system reaches 10%, the information node will die and the speed of information transmission will decrease. Therefore, adding new technologies is conducive to improving the performance of remote monitoring systems.

1. Introduction

The remote monitoring system has made the application of intelligent programs more and more widely in various fields. Compared with the wired transmission method, the introduction of wireless sensors into the monitoring system can improve network flexibility and reduce costs. With the support of 5G communication technology, using new optical fiber sensors, ZigBee wireless technology, and routing algorithms, the embedded system is added to the remote monitoring system to optimize the transmission belt, improve transmission efficiency, reduce transmission costs, and extend the effect of network life cycle, which makes the remote monitoring system more perfect. With the improvement of living standards, remote monitoring systems are more and more widely used, and people's demand for electronic equipment with remote monitoring systems in their life and work also increases.

The author understands the performance structure of the whole system by analyzing the components of the remote monitoring system. In the analysis process, the use of embedded systems in 5G technology with wide information coverage and low energy consumption, combined with new optical fiber sensors, and the use of the characteristics of LEACH routing algorithm are of great significance for designing a remote monitoring system with good performance and high transmission speed.

With the continuous development of Internet technology, there are more and more researches on remote monitoring systems in the industry. Wang et al. reviewed existing

OPM methods, focusing on spectral analysis-based OPM methods. He proposed a feasible solution for a universal OPM based on a double homodyne scheme with all low-cost components. Optical performance monitoring (OPM) played a vital role in smart fiber-optic communication networks. It performs dynamic network planning and service deployment based on real-time knowledge of optical layer conditions. Common parameters for OPM estimation include optical power, optical signal-to-noise ratio, dispersion, and polarization mode dispersion. For cost-effectiveness and integration, it is highly desirable to implement a generic OPM for multiple parameters on a single hardware platform. Although the sources of different lesions are independent, the induced aberrations on the signal are mixed together, thus posing a challenge to the realization of a universal OPM [1]. Molina-Masegosa and Gozalvez provided an overview of technological developments in wireless communications, especially automotive communications. The development of vehicular communication networks has created a variety of emergency services and applications. Vehicle access networks are usually divided into vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications [2]. Chai et al. reviewed the key technologies of fiber sensing in the past 20 years, including fiber Bragg gratings, fiber interferometers, optical time domain reflectometers, and their applications in four main parts: power grids, transformers, transmission towers, and overhead transmission lines. In particular, the application of fiber-optic composite overhead ground wires and fiber-optic phase conductors in power grids is a promising field. He discussed the development prospects of intelligent fault diagnosis subsystems for power grids based on optical fiber sensor networks and described the related work in progress. This review will benefit engineers and researchers in the field of grid and fiber-optic sensing [3]. Wang proposed a routing algorithm based on fuzzy logic for routing delay problem. The algorithm can comprehensively consider the three factors of node location, mobility, and signal strength, which greatly reduces the complexity of the algorithm. He gave a detailed definition of the reliability of Ethernet Passive Optical Network (EPON) systems for distribution network communications. And the reliability parameters of the system are obtained based on Monte Carlo simulation. Then, the reliability under different networking modes is simulated, and the influence of parameters such as network scale, component failure rate, and component repair time on the reliability of EPON networking is analyzed. Fuzzy probit analysis methods are usually used to deal with end-to-end reliability analysis problems, but they have certain limitations. Profust reliability analysis regards the system as a whole and is more suitable for the reliability of complex end-to-multi-end systems [4]. Liu et al. discussed how to change the existing warehousing model of Yonghui supermarket and solve the problems existing in Yonghui supermarket's warehousing management. He proposed the construction of warehousing center based on radio frequency identification (RFID) and sensor technology, and designed the model of receiving, storage, operation management, distribution, and outbound to solve the problems existing in Yonghui supermarket warehouse management. The study found that building a warehouse center based on RFID and sensor technology is a good solution. Taking Yonghui supermarket as an example, the problems in warehouse management are analyzed in detail, and a warehouse center based on RFID and sensor technology is designed. His research discussed the location and distribution of warehouse centers, hardware and software selection, benefit evaluation, significance, and return on investment, making the warehouse center model universal, technically feasible, and economical [5]. Filipovic and Lahlalia studied semiconductor metal oxide sensors, which have the potential to become a general purpose sensor. He described the state-of-the-art capabilities in modeling relevant materials and processed for these emerging devices and proposes optimal designs based on these analyses. He discussed modeling of sensor fabrication, followed by electro-thermo-mechanical analysis, which is critical for estimating stress build-up and sensor lifetime. He later discussed further recent advances in understanding metal oxide layers, which can be processed similarly to semiconductor transistors. In semiconductor transistors, the ionic adsorption of gas ions generates surface potential, which changes the conductive behavior of the film [6]. Kuroda et al. introduced a CMOS proximity capacitive image sensor technology for industrial, life science, and biometric applications. Its detection accuracy is 0.1aF, its spatial resolution is high, and it has real-time imaging capabilities. He proposed the image sensor circuit, working principle, and structure of the device and discussed the foreseeable technical route. There are 16 chips manufactured. Due to noise reduction technology, the m-pitch pixel achieves a detection accuracy of 0.1aF at an input voltage of 20 V. He also gave an example of capacitive imaging using the prepared CMOS proximity capacitive image sensor [7]. These documents are very detailed for the introduction of remote monitoring and optical fiber sensor networks, and have good guidance for the research of this paper.

New smart sensors have inherent advantages in anti-interference, information transmission, and cost. ZigBee wireless technology has the characteristics of low energy consumption, low cost, high sensitivity, and large information capacity. As a wireless communication technology, it is widely used in sensors and wireless monitoring. LEACH routing algorithm has the characteristics of improving network communication efficiency and prolonging network cycle. This paper is based on the application of 5G technology and new light system in remote monitoring system, and the system function is more perfect under LEACH routing algorithm, which confirms the feasibility of using these technologies in remote monitoring system.

2. Design Method of Remote Monitoring Iot System Based on 5G and New Optical Fiber Intelligent Structure

A complete remote monitoring Internet of Things system is mainly composed of several parts including monitors, GPRS modules, ZigBee wireless sensor networks, and sensors, which eventually converge to become an Internet system [8]. In the 5G era, information technology is developing rapidly, and new smart optical fibers are also developing rapidly [9, 10]. The application of 5G and new intelligent optical fibers to Internet remote monitoring will make the remote monitoring system more complete [11–13]. The structure of the remote monitoring system is shown in Figure 1.

2.1. New Intelligent Optical Fiber Sensor Technology. Sensors are important devices that can truly possess "smartness" in IoT systems [14]. The sensor can sense and measure the peripheral environment, collect, and transmit information of the peripheral environment, and is mainly composed of a sensing element and a single-chip processing unit [15, 16]. With the progress and development of social information, intelligent optical fiber sensors, as a new type of sensing technology, have been widely used in Internet remote monitoring systems [17–19]. Intelligent optical fiber sensing has the advantages of high electromagnetic interference resistance, insulation, light guide, and fast speed and is suitable for network health assessment [20].

The general optical fiber sensing system includes three parts: the transmitting part, the transmitting part, and the receiving part [21].

The transmitting part is the beginning of the sensing system, converting electrical signals into optical signals. The receiving part is the opposite. The transmitting part connects the transmitting and receiving parts, and transmits the signal of the transmitting part to the receiving part, which is the link of the whole system. Using the sensing element and its own characteristics, the fiber-optic sensor can sense the parameter change of the external signal, transmit the external signal to the photodetector, and then detect the signal.

If light is regarded as an electromagnetic wave with simple harmonic oscillation, the state of polarization refers to the law of the trajectory of electric vector vibration in light wave. Its electric field component can be expressed as follows:

$$K = K_0 \sin(\partial t + \delta). \tag{1}$$

Among them, δ represents the phase; K represents the polarization state; and ∂ represents the frequency of the electromagnetic wave.

Smart fiber-optic sensors can be divided into functional and nonfunctional fiber-optic sensors according to their functions [16, 22, 23]. The main difference between the two is that the functional optical fiber sensor itself can be used as a sensing element, which has a stronger ability to perceive light and has high requirements for optical fibers. In general, special optical fibers are used for light transmission processing, and the sensitivity and resolution are higher. The structure of the nonfunctional fiber-optic sensor is simpler, and the light transmission and modulation are used outside the fiber, which is easy to lose at home [24]. In the single-chip processing, since all need to observe the external environment, there is no big difference, and the selection is mainly based on different needs. When the data are very large, a single-chip microcomputer with strong execution capability is required, which can achieve good effects while reducing costs. Single-chip microcomputer system is composed of arithmetic unit, controller, memory, input, and output equipment, which is equivalent to a microcomputer. Compared with general purpose microprocessors used in personal computers, it emphasizes self-supply (without external hardware) and cost saving. Figure 2 is the connection diagram of the single-chip microcomputer system.

The application of intelligent optical fiber technology to the remote monitoring system can enable the system to better transmit information, reduce a series of disturbances in the process of information transmission, reduce production costs, and improve information transmission speed [25].

2.2. ZigBee Wireless Technology. ZigBee wireless technology is a new wireless communication technology with low energy consumption, low cost, high sensitivity, and large information capacity and is often used in wireless monitoring systems. Because of these advantages, it has been widely used in remote monitoring systems [26]. In ZigBee wireless network, information is mainly transmitted between the main centralized controller and the centralized controller. ZigBee technology is developed and researched according to the IEEE 802.15.4 standard, including the protocol stack, which also simply considers the composition of the networking, security, and application levels. In practical applications, ZigBee technology has a relatively simple structure and low requirements [27]. ZigBee has the characteristics of small size, low energy consumption, short delay, large network capacity, and strong stability. It is easy to integrate into various devices and is suitable for various intelligent control places. The whole structure includes physical layer, media access control layer, network security layer, and application framework layer. Figure 3 is a schematic diagram of the ZigBee wireless technology protocol.

The basic ZigBee wireless technology occurs synergistically under the overall framework [28]. The main work of the physical layer is to disperse signals, dividing a signal into multiple pieces and then transmitting them out. It is both the access point of data and the transmission point of data. The main function of the network security layer is to confirm the normal operation of the media access control layer, to provide a suitable interface for subsequent work, and to provide a security method for information transmission for the entire structure. The application layer provides a service interface for other layers and is the highest layer in the ZigBee protocol structure. The media access layer is composed of two layers of service entities, which realize the sharing of physical channel information and ensure the safe and reliable transmission of channel information. The management layer mainly plays the role of management service and helps maintain network information and data.

ZigBee wireless technology mainly consists of three devices. The first is the coordinator. As the first startup device of the network, it contains all network messages. It

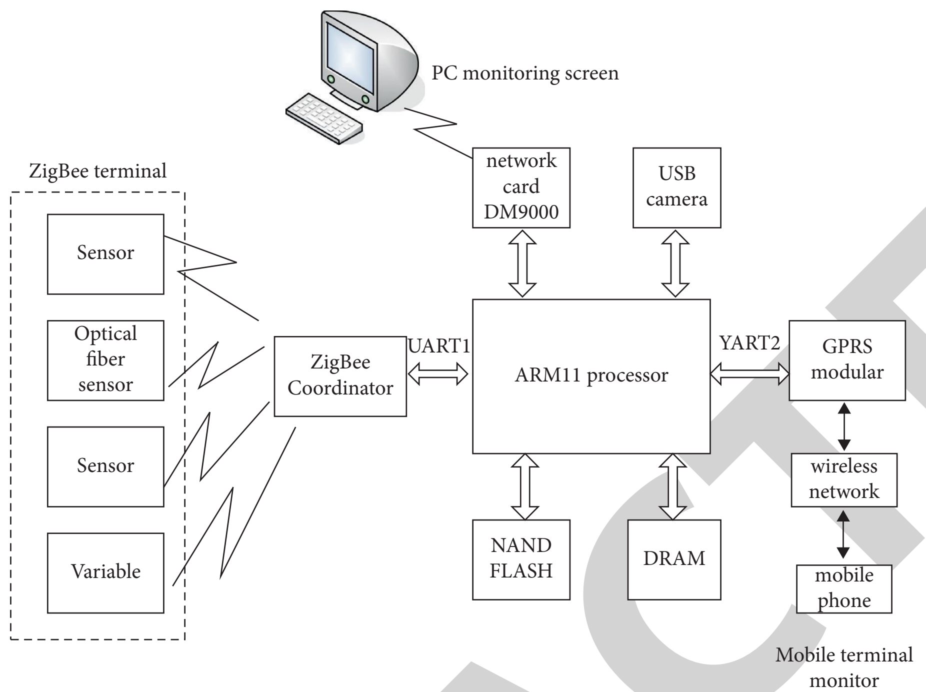

Figure 1: Structure diagram of remote monitoring system.

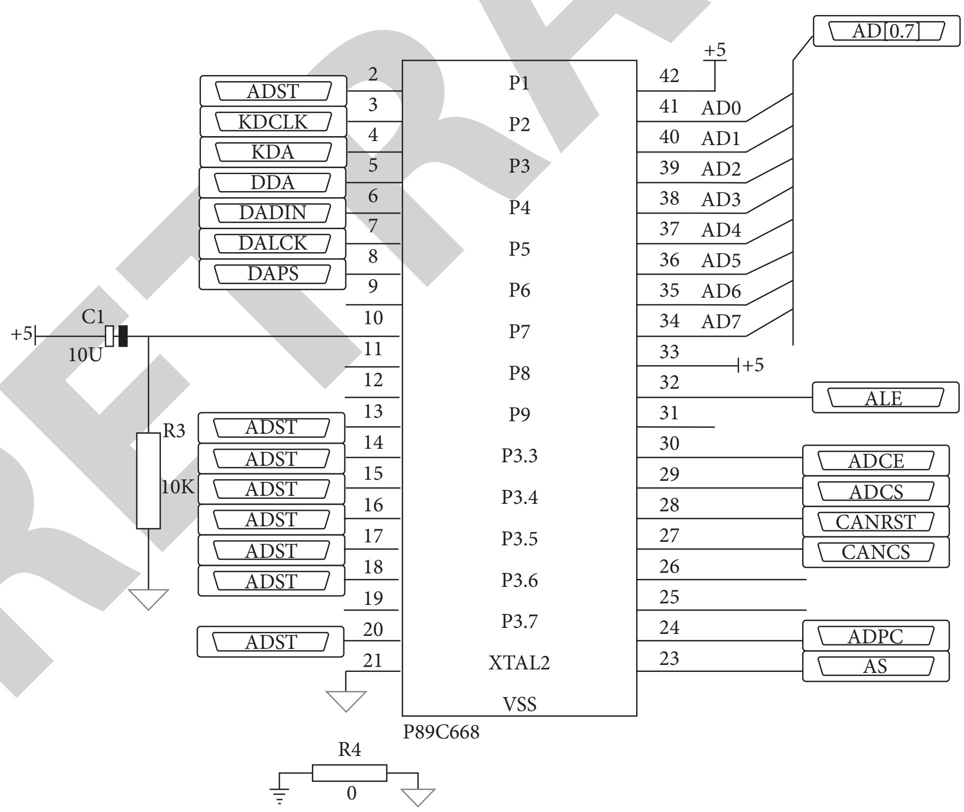

Figure 2: The connection diagram of the single-chip microcomputer system.

will select a signal channel and a network number to start the work of this network. After the startup work is over, it can also stop working. So even if the coordinator does not exist, the entire network can still operate as usual. The second is the router. The function of the router is mainly to realize data transmission and power supply for the battery. Therefore, the router is always in an active state. The third is the terminal node. The terminal node device does not need to

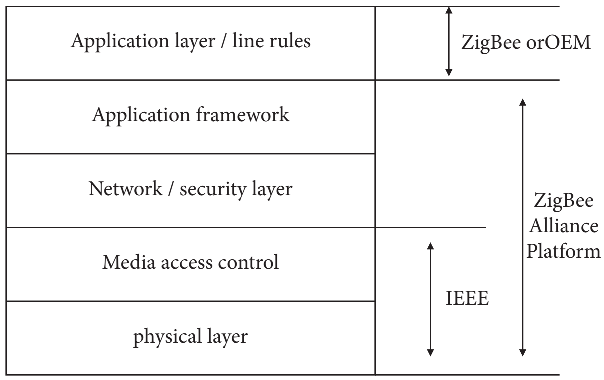

Figure 3: ZigBee protocol stack structure.

maintain the network structure. It is powered by the battery and can switch between the sleep state and the active state.

ZigBee technology is mainly composed of three network topologies: star, tree, and mesh [29].

The first is the simplest star network structure. The connection to each wireless network node is realized by a central point. The central point is the coordinator of the entire network. The routers and terminal nodes are distributed around and connected with the coordinator to form a star-shaped graph, as shown in Figure 4. As can be seen from the figure, the whole structure is divided into two main bodies, and each node communicates directly with the coordinator, which is easy to be centrally managed, and has the characteristics of good network real-time performance, small delay, high stability, and easy deployment.

The second is a tree structure, also known as a cluster structure. It consists of a coordinator and multiple routers, a collection of multiple star network structures. The structure keeps the star structure simple, and the superstructure information is less, so there is not too much storage space. The data transmission is progressive layer by layer, and the data information between adjacent nodes cannot be transmitted without connection calibration, as shown in Figure 5.

The third is the reticular structure. There is a single coordinator and multiple routers and terminal nodes in the mesh structure, and the routers and routers can be connected to each other. Information transmission between some terminal nodes and routers can also be carried out without going through the coordinator. Some terminal nodes can also reach the coordinator without going through a router and can realize information transfer independently. There can be various methods of information transfer as shown in Figure 6. Therefore, the network structure can transmit information stably, but the structure is complex, the management is difficult, the cost is relatively high, and the network structure is not easy to maintain.

2.3. Real-Time Embedded System. The embedded grid is the center of the entire remote monitoring system. At present, there is no specific elaboration on the definition of embedded system. The more general statement is a computer system with actual performance developed to solve a

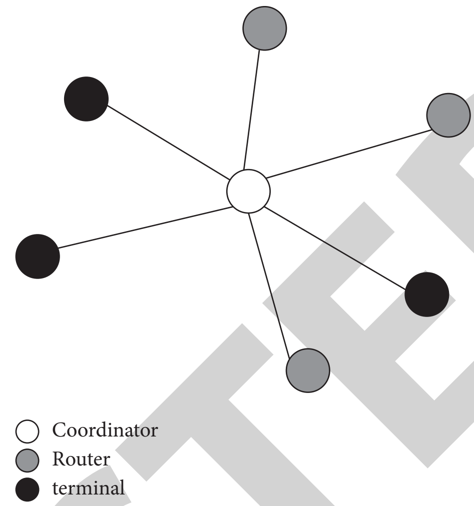

Figure 4: Star topology.

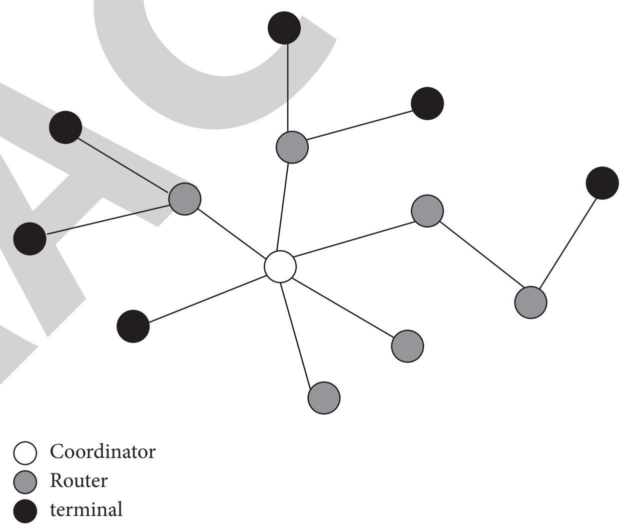

Figure 5: Tree topology.

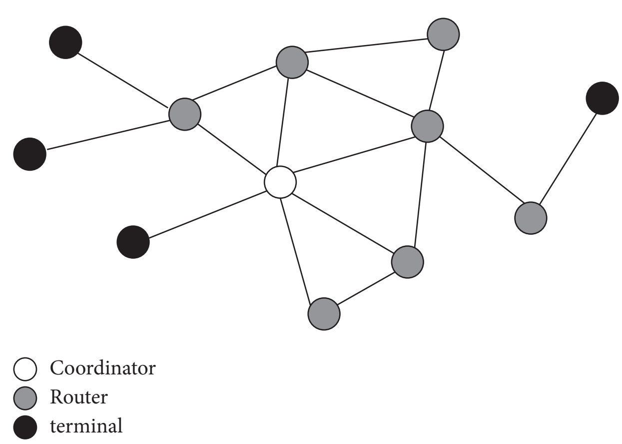

Figure 6: Mesh topology.

problem specially. According to the different needs of users, embedded systems need to be used in combination with specific application places and require high professional skills. The system needs to be updated frequently, and the design field is also wide [30]. Its processor has the characteristics of high cost performance, low energy consumption, and small size. The development of embedded system mainly includes establishing ARM development environment, transplanting BootLoader, and transplanting the kernel to Linux.

Building a cross-compilation environment is the primary task of an embedded system. Building cross-compilation is application-centered and based on computer technology. The software and hardware can be tailored. It is suitable for the strict requirements of the system on function, cost, power consumption, reliability, etc. Cross-decoding refers to the compilation of code on one platform into executable code on another platform. The main tools for building a cross-compilation environment are the host machine and the target machine, as shown in Figure 7. The host machine is generally a PC with Linux, which improves the development efficiency. The target machine is generally an ARM development board that executes the program, and its resources are often limited.

BootLoader is a hardware system of system processor, memory, and serial port, which affects the hardware environment of embedded system [31]. BootLoader will actively allocate system memory, which is conducive to better system startup. Transplanting BootLoader is mainly divided into two stages, as shown in Figure 8.

The Linux kernel is the core of the entire embedded system. The Linux system can meet the needs of different users and play the role of coordinating hardware resources, driving devices, and switching tasks in the system. The inside of the system is modularized management, with great flexibility [32]. However, for unnecessary content, the system will trim it on its own, increasing the system storage space and reducing the efficiency of the system in dealing with problems. When this process is completed, the embedded system is built. The performance and mobility of traditional embedded systems are not very good. With the advancement of the 5G Internet era, the combination of embedded systems and 5G technology realizes network resource sharing and information exchange to achieve mutual benefit and win-win results, and is increasingly used in remote monitoring.

With the support of the embedded system, it is of great significance to introduce multiple access technology and promote the application of 5G networks in remote monitoring systems. Multiple access technology is one of the key technologies of mobile communication. The 5G-based multiple access technology has the characteristics of higher spectrum utilization, large capacity, simplicity, and high performance and is more compatible with existing communication equipment. SCMA technology is a non-orthogonal multiple access technology that is more suitable for 5G diversification and has stronger advantages in various types of nonorthogonal multiple access technologies. It uses sparse spread spectrum and high-dimensional modulation technology to design better code words, and at the same time, the receiving end adopts an efficient multi-user detection and decoding algorithm. Sparse code division multiple access technology is the key technology in SCMA

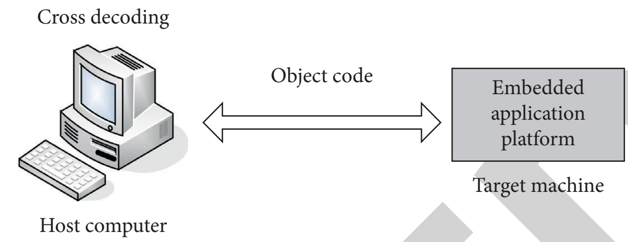

Figure 7: Tools for cross-decoding.

system. Figure 9 is a basic schematic diagram of sparse code division multiple access. The SCMA system is mainly divided into an uplink and a downlink. Information is transmitted through these two links. The information flows between the two links in opposite directions and is transmitted back and forth between the mobile terminal and the base station.

The definition formula of SCMA encoder is as follows:

$$h: F^{\log_2(R)} \longrightarrow x. \quad (2)$$

Among them, F represents the user bit stream; x is the K-dimensional sparse code word; R represents the size of the codebook.

The SCMA codebook structure is as follows:

$$W^*, X^* = \text{argmax}_{W,X} r(\partial(W, X, J, R, N, K)). \quad (3)$$

The E matrix indirectly determines the complexity of the decoding algorithm at the receiver. The rule description of the E matrix is as follows:

$$\begin{aligned} &i)\ E_j \in F^{K\times N},\\ &ii)\ E_i \neq E_j, \forall_i \neq j, \forall i \neq j,\\ &iii)\ E_j^{[\beta]} = I_N. \end{aligned} \quad (4)$$

According to the above rules, the following parameters are obtained:

$$\begin{aligned} &J = \left(\frac{R}{D}\right),\\ &f_{xi} = f_x = \left(\frac{R-1}{D-1}\right) = \frac{JD}{R}, \forall_j \forall j,\\ &\partial = \frac{J}{R} = \frac{f_x}{D},\\ &\max(0, 2D - R) \leq l \leq R - 1. \end{aligned} \quad (5)$$

Under the influence of the E matrix, the optimization problem of the SCMA codebook structure can be obtained as follows:

$$S^+ = \text{argmax}_s a(\partial(W^+, X, J, R, N, K)). \quad (6)$$

The key technology for the optimal code word in the SCMA codebook structure is to design the optimal constellation, use X to represent the size of the constellation, assume a space X for it, and get

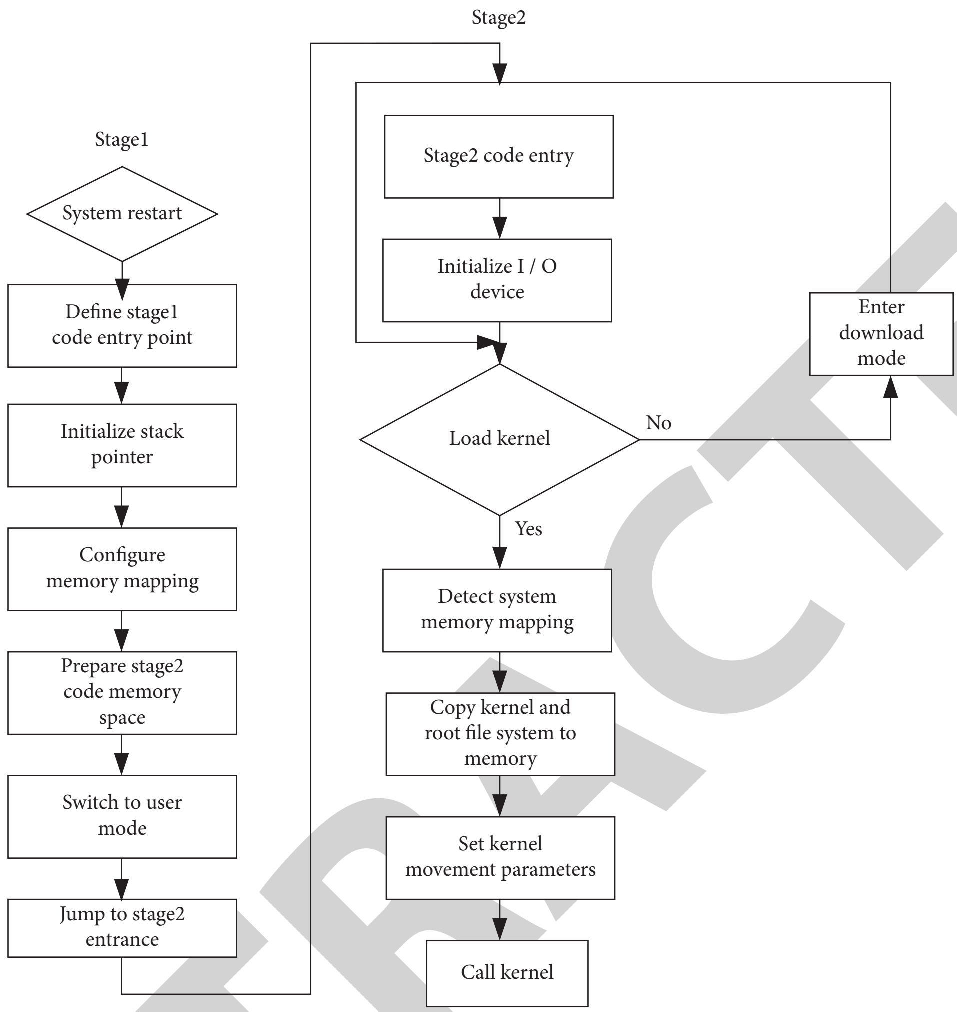

Figure 8: Workflow of BootLoader.

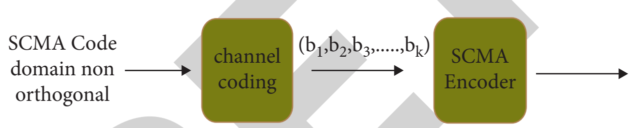

Figure 9: Basic principles of SCMA.

$$X = \left\{ (f_i, \ldots, f_x) \colon \left\| f_i - f_j \right\|^2 \geq d^2, 1 \leq i < j \leq X \right\}. \quad (7)$$

Obtained from the formula, Q is the smallest constellation of the SCMA codebook structure and is also a point in the space X. Then, its high-quality function can be got

$$g \colon X \longrightarrow Y and Q = \left\{ f_1, f_2, \ldots f_Q \right\} \mapsto g(Q),$$
$$g(Q) = \sum_{i=1}^{X} \left\| f_i \right\|^2. \quad (8)$$

Get the formula for the average symbolic energy

$$E_x = \frac{g(Q)}{X}. \quad (9)$$

2.4. Application of LEACH Routing Algorithm. The LEACH routing algorithm plays a decisive role in extending the life cycle of the network and improving the communication efficiency of the entire network [33]. It is also a clustering algorithm, which evenly distributes network information to each sensor, reduces energy consumption, improves network efficiency, and improves network life cycle. The LEACH routing algorithm is divided into two stages: the first is to establish a cluster stage, and the second is the data transmission stage. In practice, the stable phase of clustering is often much longer than the data transmission phase, which will reduce the additional energy consumed by clustering. In this algorithm, data are aggregated and information is forwarded, and the whole process is fast and consumes a lot of energy. In this first stage, it is assumed that all nodes are a random number between 0 and 1. When the data are less than the given threshold, the algorithm formula of the threshold is obtained as follows:

$$W_i(n) = \left\{ \frac{q}{1 - q * (r \bmod (1/q))}, \quad i \in E, 0, \text{otherwise}. \right. \quad (10)$$

In the formula, r represents the number of laps that the data run, and q represents the number of cluster heads and the proportion of nodes in the network. $r * \bmod (1/q)$ indicates the number of nodes that have been selected as cluster heads in the entire algorithm process, and E represents the set of nodes that have not been selected as cluster heads.

The above is a relatively classic LEACH routing algorithm, and the whole algorithm is relatively simple and clear, so there are many shortcomings in the process of network work. For example, the randomly selected nodes are uncertain and the number is not clear, resulting in increased energy consumption and decreased transmission efficiency. During the process, cluster head aggregation and transmission time are not equal, resulting in network segmentation and damage to network life. Cluster heads die prematurely due to excessive energy consumption, and the entire network life cycle declines. Aiming at this series of problems, experts put forward an improved method of LEACH routing algorithm. It was originally assumed that all nodes are a random number between 0 and 1, which is less than a given threshold. After the algorithm is improved, this node becomes a cluster head. This node cluster head can use the remaining energy of the node to improve the transmission efficiency of the node, reduce energy consumption and network damage, and ensure the normal operation of the network. The improved threshold algorithm is as follows:

$$W_i(n) = \begin{cases} \dfrac{q}{1 - q * (r \bmod (1/q))}\left(s\dfrac{W_a - W_b}{W_b} + (1-s)\dfrac{t_m - t}{t_m - t_s}\right), \\ i \in E, 0, \text{otherwise}. \end{cases} \tag{11}$$

In the formula, the same as the previous formula remains unchanged. W_a and W_b represent the sum of energy. $(W_a - W_b)/W_b$ means the average remaining energy of the entire network node. t is the distance from the node to the base station.

The improved algorithm increases the probability of each node becoming the cluster head. The closer the node is to the base station, the more likely it is to become the cluster head when the energy allows. The energy of the remaining nodes is not much different, and the greater the distance from the base station, the greater the probability of becoming a cluster head so that each node can be used effectively instead of dying prematurely.

In the process of this algorithm, there is a frequently used communication model, which is the first-order radio energy consumption model, and the radio energy consumption model is mainly composed of transmission circuit and power as shown in Figure 10.

In the energy consumption model, the energy required in the k bit transmission process can be expressed by the formula:

$$\begin{aligned} W_{\text{tx}}(h,l) &= W_{\text{ele}} \times g + \beta_{\text{amp}} \times g \times l^{\alpha}, \\ W_{\text{rx}}(h,l) &= W_{\text{ele}} \times g. \end{aligned} \tag{12}$$

In the formula, β_{amp} represents the magnification of the magnifying glass during the energy consumption process. W_{ele} refers to the total amount of energy consumption; generally, the same energy consumed in the process of sending and receiving. l is mainly the distance of energy transmission.

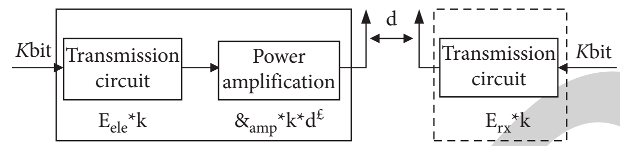

Figure 10: Energy consumption model.

Assuming that the cluster head needs $n - 1$ hops to reach the base station, let the distance between each hop be r, and they are all equal. When the value of α is 2, the formula for the total energy consumed by direct means is as follows:

$$W_{\text{dir}} = W_{\text{ele}} \times g + \beta_{\text{amp}} \times g \times (n \times s)^{\alpha}. \tag{13}$$

The formula for the total energy consumed by the multihop method is as follows:

$$W_{\text{mal}} = n \times W_{\text{ele}} \times g + \beta_{\text{amp}} \times g \times r^2 + (n-1) \times W_{\text{ele}} \times g. \tag{14}$$

Obtained from the formula, when $W_{\text{dir}} < W_{\text{mal}}$ is to be satisfied, it must be satisfied

$$\frac{W_{\text{ele}}}{\beta_{\text{map}}} > \frac{r^2 \times n}{2}. \tag{15}$$

In the process of information transmission, it is very important to choose the transmission method. Data are often transmitted directly between nodes and cluster heads, but this transmission method has certain limitations, and information will only be transmitted when nodes assign transmission tasks. The advantage of this transmission method is that during other times when no information is transmitted, the nodes will enter a sleep state, thereby reducing the unnecessary consumption of energy and increasing the retention of transmission energy at other times.

In this process, it is necessary to ensure the distance between the nodes in the cluster and the base station, so as to avoid a large amount of energy loss due to the long distance, and premature death of the cluster head with remaining energy. Therefore, in practical application, both single-hop and multihop methods will be used. Single-hop and multihop consume different energies. If direct transmission is adopted between nodes and base stations, the scale of the network will be limited to a certain extent. Combining the above, it can be known that when $\beta = 2$, the single-hop transmission mode is satisfied, and when $\beta = 4$, the multihop mode is satisfied, as shown in Figure 11.

3. Design Test and Analysis of Remote Monitoring Iot System Based on 5G and New Optical Fiber Intelligent Structure

In the range of $100\,\text{cm} \times 100\,\text{cm}$, we place 100 nodes to analyze the transmission results before and after the improvement of the LEACH routing algorithm, first exchange

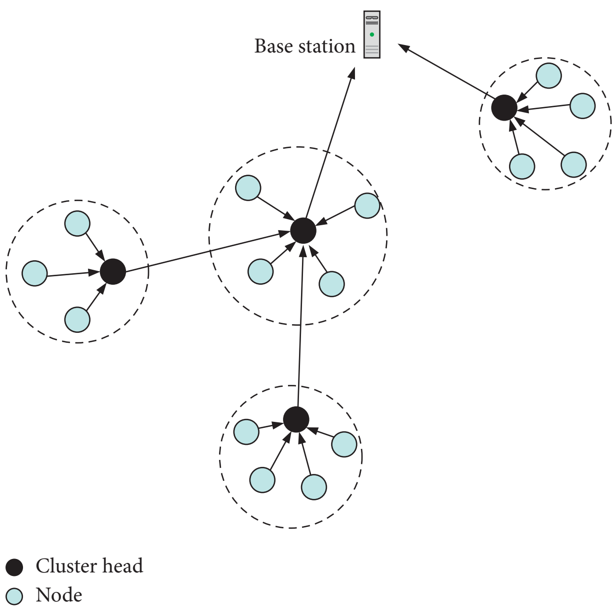

Figure 11: Data transmission multihop mode.

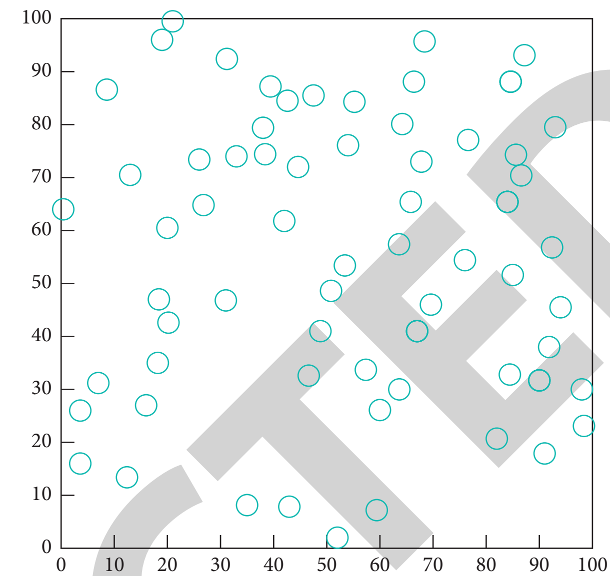

Figure 12: Node distribution diagram in the simulation environment.

the external messages of the edge and then normalize the exchanged information as shown in Figure 12. It is the distribution of nodes in the simulation environment. Table 1 shows the parameter settings in the simulation environment.

It can be seen from the figure that in the simulation case, the distribution of network nodes is relatively uniform, and there is no extreme dispersion. Figure 13 can be obtained by evaluating the performance of network data transmission according to the number of surviving nodes and the remaining energy of some nodes before and after the improvement of the routing algorithm. It can be seen from the figure that the nodes before and after the improvement start to die after 700 and 1100. In the case of the two algorithms, after reaching 1400 rounds, all the nodes die. When selecting the cluster head, the nodes with large residual energy are preferred, and the transmission mode combining single hop and multihop is adopted between the cluster head and the base station, which can not only reduce the energy consumption during transmission but also balance the loss of network energy, and effectively reduce the premature death of nodes far away from the base station. According to the residual energy result graph, we know that when the node residual energy reaches 10%, the number of rounds is about 1000 and 1400. After the node dies, the remaining energy does not completely disappear, thus prolonging the life cycle of the network, and the premature mortality of the node can be effectively controlled under the improved algorithm.

Convergence on the data is an important metric for evaluating this method. It can be seen from Figure 14 that, on the basis of information iteration, the SCMA system tends to converge in the end when the number of iterations is the same and the algorithms are different. When SCMA involves a large number of nonlinear indices, multiplication and division operations are complex. As the number of users

Table 1: Simulation parameter settings.

Parameter	Description	Numeric value
$M \times M$	Scope of monitoring	100 cm ∗ 100 cm
n	Number of nodes	100
W_o	Initial energy	0.5 J
W_{fs}	Free space channel signal amplification factor	10 pJ/bit/m^2
W_{amp}	Multipath fading channel signal amplification factor	0.0013 pJ/bit/m^4
W_{ele}	Energy consumption of transmit and receive circuits	50 nJ/bit
q	The probability that the cluster header is generated	0.1
g	Packets	4000 bits

increases, the complexity of operations also increases, increasing the difficulty of operations. It can be seen from this that when the data tend to converge, the transmission update is between the information variable node and the network function node. The information of the initialization calculation will be passed to the remote monitoring system, and finally, the system will normalize the information obtained by the previous iterations. The faster the iteration time, the less time the monitoring system has to process the information.

4. Discussion

With the support of communication technology and new optical fiber sensing technology, the Internet remote monitoring system is more perfect. ZigBee technology consists of a coordinator, router, and terminal to form a communication network, plus embedded technology embedded in the server, to carry out web page design, and realize network remote monitoring. After the testing phase, a remote monitoring system that can meet the basic needs is

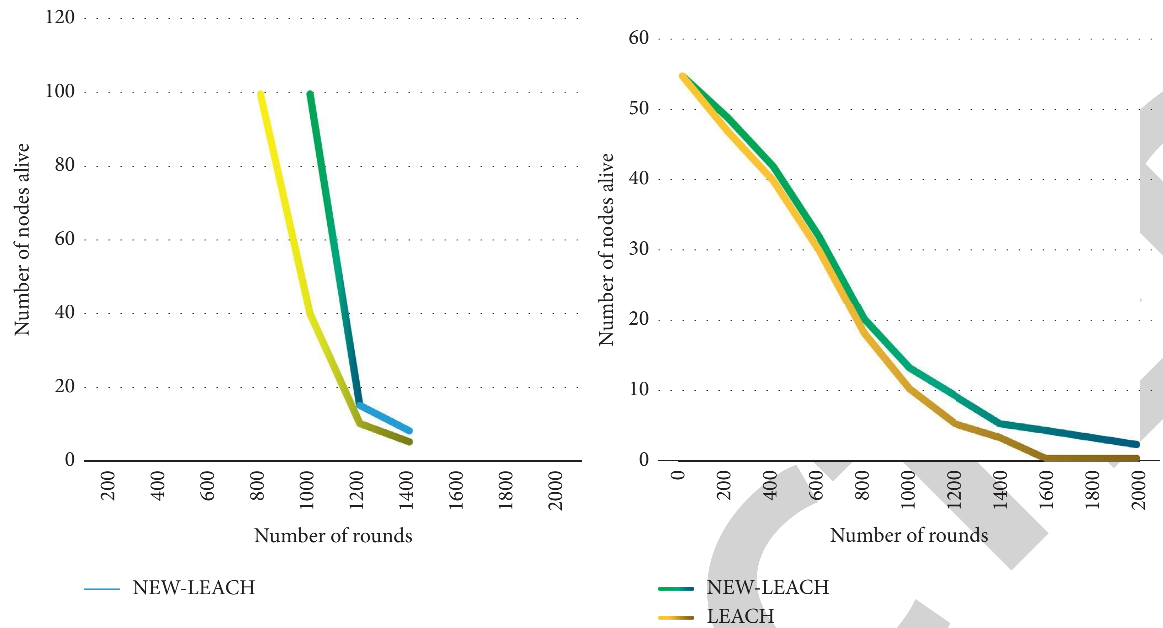

Figure 13: Network nodes and residual energy results.

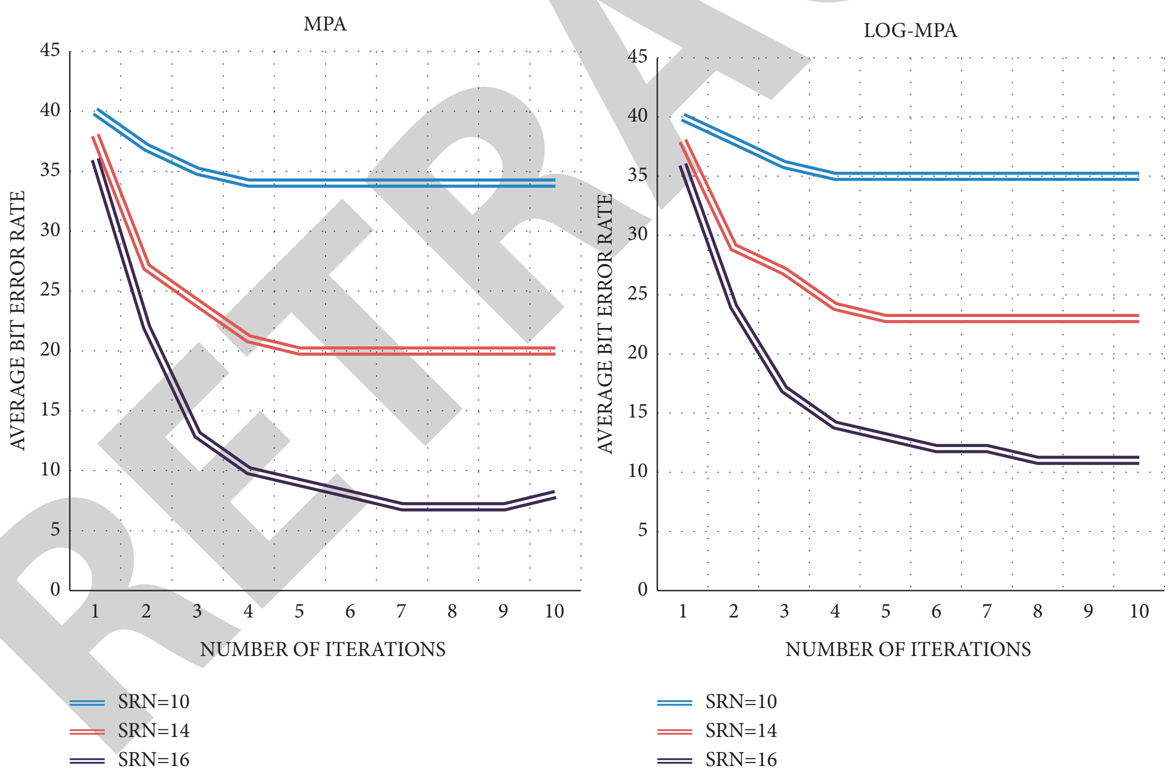

Figure 14: Comparison of convergence speed of different decoding algorithms under SCMA system.

designed. According to the routing algorithm, the transmission performance of the remote monitoring system is systematically tested, and it is found that in the process of information transmission, the information node is likely to die prematurely without being connected to the terminal, resulting in loss of energy consumption and a decrease in information transmission speed.

5. Conclusions

In this paper, by introducing a new type of optical fiber sensor into the remote monitoring system, the degree of information interference is reduced and the speed of information transmission is improved. And we use the LEACH routing algorithm to prolong the life cycle of the entire monitoring system network and improve the communication efficiency of the monitoring system network. Introducing the embedded system into the 5G communication network can improve the information compatibility of communication equipment and also achieve the effect of improving the speed of information transmission.

Data Availability

The data that support the findings of this study are available from the author upon reasonable request.

Conflicts of Interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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