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Retraction

Retracted: The Construction of a Smart City Energy Efficiency Management System Oriented to the Mobile Data Aggregation of the Internet of Things

Complexity

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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. Chen and P. Han, "The Construction of a Smart City Energy Efficiency Management System Oriented to the Mobile Data Aggregation of the Internet of Things," *Complexity*, vol. 2021, Article ID 9988282, 13 pages, 2021.

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Research Article

The Construction of a Smart City Energy Efficiency Management System Oriented to the Mobile Data Aggregation of the Internet of Things

Longxing Chen[1] **and Ping Han** [2]

[1]*Luohu District People's Government of Shenzhen, Guangdong, Shenzhen 518001, China*
[2]*School of Management, Xi'an Jiaotong University, Shanxi, Xian 710049, China*

Correspondence should be addressed to Ping Han; hpca@mail.xjtu.edu.cn

Aiming at the current situation of complicated energy-consuming equipment and large energy consumption in the current enterprise, a reference model scheme of an enterprise energy efficiency management platform based on the Internet of Things is analyzed and the dynamically collected energy consumption information is analyzed using the Internet of Things technology and data mining technology. They provide decision-making support for enterprise energy efficiency management decisions and formulation of energy-saving and emission reduction plans. This article analyzes the current status of energy efficiency management in buildings and points out several pain points in energy efficiency management, including installation difficulties, high software development costs, upgrade difficulties, long debugging cycles, and closed systems, and introduces intelligent power distribution monitoring based on the Internet of Things technology to solve these difficulties. In the system, we analyze the actual value brought by energy efficiency management technology through case studies. It can collect scattered information through the Internet of Things, gather it together to form massive data, and obtain the corresponding information through data analysis and processing. The design is reasonable, the practicality is strong, the use effect is good, and it is easy to promote and use.

1. Introduction

The Internet of Things is an Internet that was proposed at the end of the twentieth century to represent the connection of things. The Internet of Things is an extended and expanded network based on the Internet. Its user end can extend to any object and between objects to carry out information exchange and communication [1]; smart city is to make full use of modern information and communication technology to gather people's wisdom and give things intelligence so that people who gather wisdom and things with intelligence can interact, complement, and promote each other, so as to realize economic and social activities. With the emergence of new models and new forms of optimized urban development [2] and the development of Internet technology, various data are rapidly increasing and expanding. These huge amounts

of data pose new challenges to human data control ability, and also for people's ability to gain more profound and comprehensive insights and provides unprecedented space and potential [3]; however, to realize the application of data systems formed by large amounts of data in smart cities, a large amount of data must be collected and processed reliably. The dispersion of data increases the difficulty of data collection and further increases the obstacles to data analysis and processing [4].

At present, the construction of the energy efficiency management system of smart cities under the Internet of Things is an important issue, making energy conservation and emission reduction an inevitable trend for the green and sustainable development of enterprises [5]. Electric energy efficiency management is an important part of the energy-saving strategy. With the substantial increase in enterprise

power consumption and the task of optimizing power quality, improving traditional power usage, and improving power utilization is imminent [6], at present, many enterprises are gradually increasing investment in energy consumption management but still lack a unified enterprise energy consumption monitoring index and energy consumption evaluation system; they overemphasize energy-saving goals and lack corresponding technical support in energy consumption management [7]. Although some energy consumption monitoring systems play a certain role in enterprise energy consumption statistics, the large amount of distributed energy consumption data cannot be effectively collected, stored, analyzed, and predicted when the electrical equipment is widely distributed and classified. It is imperative to implement efficient and intelligent energy saving and consumption-reducing management for enterprises [8].

The technical solution adopted in this article is a smart city data system based on the Internet of Things. Its content includes a data storage system capable of storing large amounts of data and a data analysis and processing system capable of analyzing and processing large amounts of data. The data storage system and data analysis and processing system are connected. The Internet of Things system communicates with the data storage system through an information network. The Internet of Things system includes an auditory system that can collect, convert, and transmit sound signals from an audio information collection device and collect video; a visual system that can receive the converted and transmitted video signal by the device; a sensory system that can receive the information that is detected, converted, and transmitted by the air sensor, the water sensor, and the soil moisture sensor; the sensor that can collect information on office equipment, household equipment, and production equipment. Motion control system and the data storage system are connected to a data analysis and processing system capable of analyzing and processing information transmitted by the data storage system through an operating system and an application software system; the data analysis and processing system is connected to the mobile terminal via the Internet. Moreover, the mobile terminal includes a notebook computer, a desktop computer, and a mobile phone.

2. Related Work

In order to solve some of the problems in common energy efficiency management systems, relevant researchers have discussed different aspects. Park et al. [9] believed that the research on the application of big data in the construction of smart cities involves the construction of a technical framework for smart city development from the perspectives of data trajectory mining, management, analysis, and application. Research on data fusion includes data fusion model design, data fusion framework construction, and information fusion framework construction. Talari et al. [10] analyzed and found that although the research angles are diverse, these researches based on Web API information integration, metadata, semantic aggregation, and knowledge graph technology only stay at the theoretical framework level, and how to make good use of big data technology still needs to be clarified. The

theoretical basis of new smart city construction, the correlation effect of big data and smart city, and the logic of smart city construction should be explored. The research of Ejaz et al. [11] showed that the debugging process needs to go through many steps such as single point debugging, line debugging, and system debugging. The debugging time varies from several days to several months, depending on the size of the project. Simon et al. [12] discussed that if a larger system needs to retrieve data from the energy efficiency management platform in the later stage, this is often impossible to be achieved. Even if feasible, it is necessary to customize the development of corresponding interfaces and transmission protocols, which is time-consuming and costly.

At present, the development and construction of smart cities at home and abroad are in the development and exploration stage, but different cities have different priorities when developing smart cities. The research of Farhan et al. [13] found that Singapore mainly focuses on the application of transportation, education, and medical systems. It is intended to build an electronic system for the cooperation of citizens, enterprises, and the government so that citizens can become participants in urban construction, for example, the construction of Seoul, the capital of South Korea. The focus of smart cities is on the four major aspects of city safety, facility management, smart transportation, and the environment; New York, the United States, mainly implements electronic health records and services in the process of smart city construction, launches the New York City IT infrastructure service action plan, and upgrades the government's E-mail system, and establishes intelligent parking system. Many cities at home and abroad focus on "low carbon" when building smart cities. Smart buildings, smart transportation, smart medical care, smart education, and smart tourism have greatly reduced labor, material, and financial costs. Jiang et al. [14] believed that building energy efficiency is the use of building intelligent technology to realize building energy consumption measurement and equipment energy efficiency analysis, adopting system integration methods to build energy consumption measurement and management platforms, and through building energy efficiency comprehensive management in hot water supply, lighting, home appliances, and other aspects to achieve better energy-saving effects. At present, the building energy consumption monitoring system based on the Internet of Things is still in the development stage. However, building energy saving is a hot spot in the application of Internet of Things technology and is the main force in the future Internet of Things application market, which will promote energy saving in industries, buildings, and other fields. The realization of goals such as improving product quality and improving enterprise benefits has played a very good role in promoting energy saving [15].

In existing research, scholars often define smart cities from the perspective of urban function and technological level. Samih [16] believed that the development of smart cities is related to the level of intelligence, coordination, and mutual promotion of elements such as urban economy, government, people, transportation, environment, and life. Only when these elements achieve coupled and coordinated development can they effectively promote smart cities

construction. Hossein [17] believed that the development of smart cities is the combination of advanced information technologies, such as information storage, data circulation, and information utilization in the inherent urban part. In fact, the concepts from the above two perspectives are closely related, and the information technology application and storage mentioned in the latter will eventually be implemented on the specific functions of various elements involved in urban development. The development of smart cities is supported by big data, and cloud computing is the support of specific application scenarios of smart cities [18]. In the process of building a smart city, data sources are diverse. Various types of online and offline data coexist, and real-time and non-real-time data coexist. This makes the acquisition of urban data present more and more obvious multimodal attributes, which provides urban data mining rich material [19]. However, the data acquisition methods are different, the system source is different, and the storage format is also different. This makes the data composition structure and model structure heterogeneous. In addition to the real-time change characteristics of the data, the city data have a high degree of complexity, and the data description involves multiple dimensions, which increases the difficulty of smart city construction [20–24]. Therefore, a smart city can be summarized as follows: on the basis of the rapid development of big data, with the assistance of advanced information technology, the data circulation and information storage are realized among various elements such as urban economy, government, people, transportation, environment, and life. Moreover, information is used to solve various problems faced in the process of urbanization so as to achieve the goal of rapid, convenient, and intelligent urban development [25, 26].

3. Mobile Data Management Based on the Internet of Things

3.1. Principles of Mobile Data under the Internet of Things. With the vigorous development of the Internet of Things technology, a large number of research results have been achieved in the fields of chips, sensors, smart terminals, middleware, architecture, and standard setting, and the era of the Internet of Everything has begun. Due to the different development situations of each country, the Internet of Things has different concepts in different countries and regions. Define the data activation expression as follows:

$$g(x) = \frac{1 - e^x}{1 + e^x}, \tag{1}$$

$$
\begin{aligned}
a_1 &= \int_0^1 g\left(\theta_{10_{x_0}} + \theta_{11_{x_1}} + \theta_{12_{x_2}} + \theta_{13_{x_3}}\right) dx, \\
a_2 &= \int_0^1 g\left(\theta_{20_{x_0}} + \theta_{21_{x_1}} + \theta_{22_{x_2}} + \theta_{23_{x_3}}\right) dx, \\
a_3 &= a_1 = \int_0^1 g\left(\theta_{30_{x_0}} + \theta_{31_{x_1}} + \theta_{32_{x_2}} + \theta_{33_{x_3}}\right) dx.
\end{aligned}
\tag{2}
$$

In combination with the definition of the Internet of Things, the so-called Internet of Things refers to the application of Internet technology between different physical objects. In formula (2), θ represents the matrix element in the layer number matrix of the Internet of Things. The Internet of Things technology is an electronic new way of the interconnection of control equipment, sensors, and communication equipment. Through the Internet, the connection between different resources and the relationship between objects can be realized. Therefore, the direction of computerization is intelligence and remote control. The second layer in the expression is the hidden layer, and its data elements are shown as follows:

$$
\begin{aligned}
a &= \begin{bmatrix} a0 \\ a1 \\ a2 \end{bmatrix}, \\
x &= \begin{bmatrix} x0 \\ x1 \\ x2 \end{bmatrix}.
\end{aligned}
\tag{3}
$$

Computer network usually includes application layer, network layer, and perception layer. The application layer includes communication platforms and data storage technologies. The network layer includes cloud computing, smart technology, satellite communications, and other information and data transmission technologies. A deeper understanding is that the use of Internet of Things technology can perceive the information of many physical objects and then use modern information technology to connect and manage different objects and finally realize the function of long-distance transmission of object information so that the physical system can be realized. Self-management is an interconnected network that realizes people's intelligent perception, management, and monitoring of physical objects. During the operation of the Internet of Things, the support of NB-IoT, LTE-M, GPRS, and other information technologies is usually required to provide guarantee for the effective development of functions such as information and data transmission. In a matrix, a certain value we require is obtained by multiplying the values at the corresponding positions of the rows and columns and then adding them together. From all the data elements of the previous layer l-1 layer, after combining with the corresponding weights, they are obtained through the activation function:

$$y^l = w^l a^{l-1} - \frac{1}{2} a^l, \tag{4}$$

$$y_i^l = \sum_t w_{tk}^l a_t^{l-1} - \frac{1}{2} a_i^l. \tag{5}$$

In the Internet of Things, its main objects include people and various physical objects, and information transmission and information connections can be formed between people and objects and between objects and objects. In formulas (4) and (5), y represents the application interfaces of different network layers in the matrix of the number of layers of the

Internet of Things, w represents the corresponding weight coefficient, and a represents the node position. In the Internet, its main body is mainly people, and the main body of the connected objects is also people. Therefore, to a certain extent, we can say that the connected objects of the Internet of Things are more extensive than those of the Internet. Therefore, in the application of the Internet of Things technology information, the mobile space of nodes is also more extensive. In general, the items spread in the Internet of Things are privately or collectively owned, so the item information cannot be arbitrarily leaked. This places high requirements on the security of the information transmission function in the Internet of Things technology The theoretical basis of new smart city construction, the correlation effect of big data and smart city, and the logic of smart city construction should be explored. In addition, people often carry out remote monitoring of related items during the operation of the Internet to ensure that people can obtain real information about items under any circumstances. Based on this, the reliability and security of the Internet of Things must improve.

3.2. Mobile Data Information System Structure Level.

(1) Information perception and control part. As shown in Figure 1, the information perception and control part belongs to the bottom layer of the Internet of Things structure and is also the part that contacts various objects between the Internet of Things. CNN is a front-collapse neural network, which can extract its topological structure from a two-dimensional image, use a backpropagation algorithm to optimize the network structure, and solve the unknown parameters in the network. This part is composed of various controllers and sensors. During the operation of the information perception control structure, the required function is to perceive and understand the relevant information of the object and to transmit it to the information network in a certain format according to the information it knows. The main function of the control part is to receive control information from the information transmission network in the Internet of Things so that the object can meet the state required by people. Information basic support includes sensing facilities, network transmission, data warehouse, application support, high-performance computing, mass storage, and information security. Here, a-i is one of the neurons, which is located in the j layer of the lth layer, and is given by the following formula:

$$a_i^l = \sigma\left(\sum_k w_{ik}^l a_k^{l-1} - \frac{1}{2}a_i^{l-1}\right). \quad (6)$$

(2) Information transmission network part. In the Internet of Things structure, the information transmission network part belongs to the middle layer of

the structure. The physical composition of this structure is composed of various information transmission networks, such as computer Internet, wireless local area network, and mobile network. Its main function is to control different nodes and information perception can be connected to each other into a network. The main function of this structure is not only to interconnect different control nodes and information perception into a network but also to carry out information security management and transmission management. At the same time, it also needs to provide safe and reliable information for the upper-level information application of the Internet of Things. The data element cost equation in the system has the following form:

$$C = \frac{1}{2n}\sum_i \left(y_i - a_i^l\right)^2,$$

$$C = \frac{1}{2n}\sum_t \left\| f(t) - a^l(t) \right\|^2. \quad (7)$$

Among them, n is the number of samples, i is the input sample point, y is its expected output value, and a is the output value of our neural network.

(3) Information application part. In the Internet of Things, the information application part is at its highest level. The existence of this structure is to realize the management function and the monitoring and positioning function, and it is composed of various application systems and application levels. Due to the massive amount of information involved in the Internet of Things, the Internet of Things must be able to manage and apply data through cloud computing and other technologies. In other words, the entire mobile data cost function can be obtained by averaging the cost of each sample. We know that for a data sample point, the value of x is fixed. Therefore, we can temporarily omit x in the expression $C(t)$ and write it in the form of C. In fact, the formula should be understood as changing the weight and bias, which in turn affects the result of the cost function. In fact, it is the process of finding the values of w and b. In the process of solving, firstly define each intermediate variable j and then the error value of the neuron in the k layer. Smart industries include emerging technology industries such as the Internet of Things manufacturing industry and the Internet of Things service industry and the information transformation of traditional industries such as the primary industry, the secondary industry, and the tertiary industry. In CNN, small areas in the image (also called "local perception areas") are regarded as the input data at the bottom of the hierarchy. The information is propagated forward through various layers in the network, and each layer filtered by the device is constructed to be able to obtain some salient features of the observation data.
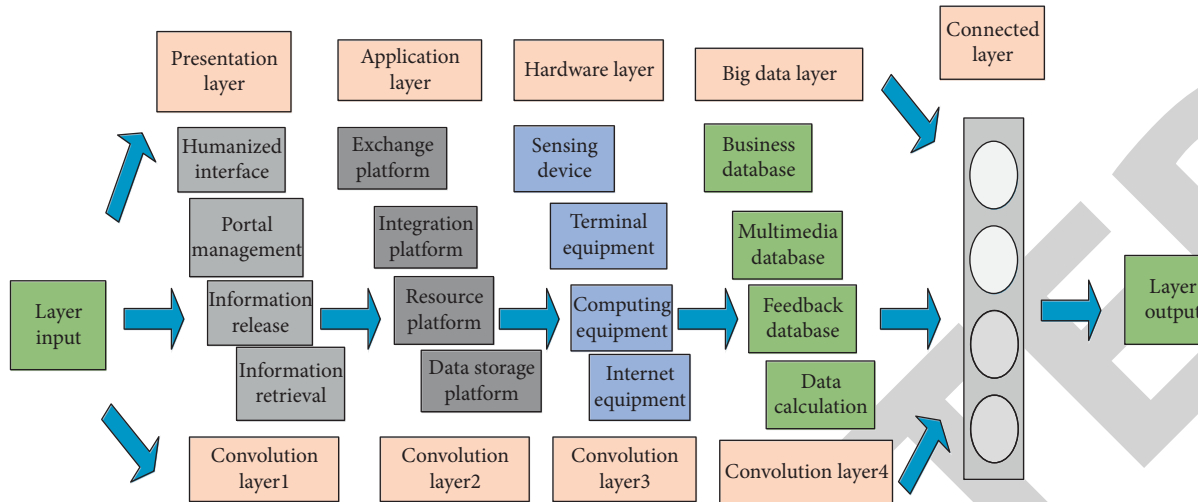
Figure 1: Mobile data information system structure hierarchy diagram.

For the Internet of Things, the information application part is the main structure of people and the Internet of Things. This part can be used to query the information of objects or to monitor and locate objects.

3.3. Mobile Data Aggregation Based on the Internet of Things. The Internet of Things is the deployment of a variety of sensors in every corner of the city, which can collect a large amount of monitoring data. These data have time and space attributes, which can reflect the city's real activities on the virtual space of the network and then collect this information which, through data analysis, can tap new value. Compared with traditional data processing systems, mobile data processing systems under the Internet of Things have excellent accuracy and self-consistent performance, as shown in Figure 2. The power value-added business operation system can be decomposed into three levels as a whole, namely, the data layer, the system layer, and the service layer. Group 1 represents the Internet of Things data system, and group 2 represents the traditional data system.

(1) Extract the detected data. The HDH (big data platform) system was developed. In response to storage problems in big data processing, the HDH system adopts distributed storage and distributed database systems to increase the speed of reading and writing and expand the storage capacity. The first step in enabling smart services is to use the object awareness and information collection layer to collect contextual information. Sensors can monitor themselves in real-time and act intelligently on their own. They can be used to monitor public infrastructure and human physiological activities, collect data, and send it to a central information system with a network layer, where intelligent decisions can be made through the data. The sensor layer is composed of wireless sensor nodes, such as RFID tags, RFID readers, cameras, GPS, and QR code tags and readers, which are usually set up in a network, also called "wireless sensor network." The high fault tolerance of HDH improves the overall system reliability.

(2) "Visualize" the data analysis results. Through cluster application, grid technology, or distributed file system and other functions, the application of storage contextualization technology brings together a large number of different types of storage devices in the network through application software to work together and jointly provide external data storage and business access functions system. Use component-based technology and UML modeling language to design the system and implement iterative design and development. The Unified Modeling Language (UML) is intuitive and clear and is a general visual modeling language for building and documenting software system products. UML can be used with all development methods, life stages, application fields, and media.

(3) Optimize various activities based on data analysis. Intelligently analyze videos through behavior analysis technology, license plate recognition technology, face recognition technology, distributed computing technology, video splicing technology, etc. According to the application characteristics of each subfield, a video surveillance application management platform has been customized and developed for different industries. The platform is oriented to actual combat business applications and uses video image applications as a means to build a large security system architecture. The video surveillance application management platform adopts application technologies such as architecture and components, workflow, XML and Web Services, and platform integration. Obtain key data to provide data support for decision-making of relevant functional departments.
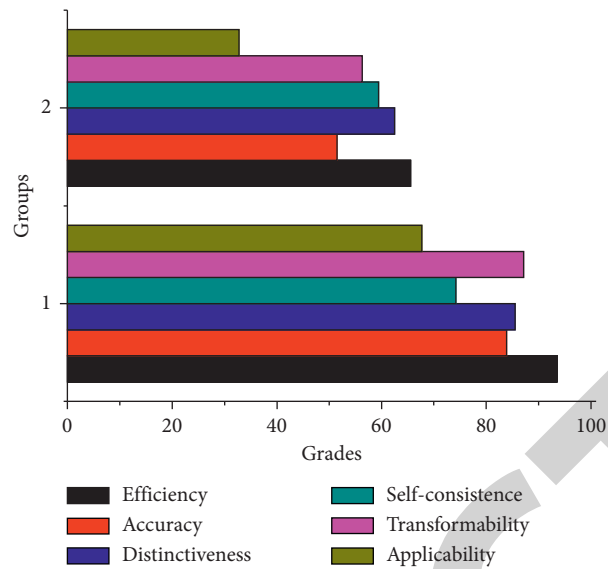
FIGURE 2: Mobile data processing system performance under the Internet of Things.

4. Energy Efficiency Management System Model Based on Smart City

4.1. Principles of Smart City Construction.

(1) *Basic Indicators.* Building networking is the foundation of smart cities. Smart communities and smart security in smart city planning are originally important components of building networking applications. To build a smart city, we must implement smart construction in various industries and the development of the chain. If the texture is correct, the model is black; in the file, you can change the three values of *k* or *d* (corresponding to Berg) or print out the model attributes and change the point color value or other attributes in material color. Among them, the data layer is mainly responsible for the storage and distribution of big data on the platform; the system layer is responsible for data management, including data acquisition and analysis plans to encapsulate data-based services and provide corresponding interfaces to the service layer. The guarantee system, standard system, and key technologies are the guarantee of construction, the information foundation and industrial system are the support of construction, the application system is the function of construction, and the evaluation system is the measurement standard of construction.

(2) *Protocol Support.* The application management platform in the "smart city" needs to provide services for public security prevention and control, traffic management, urban visualization management, and social services. At present, the industry is gradually adopting the enterprise service bus (ESB) IT architecture. The Internet of Things has two communication modes, B/S and C/S. In the field of mobile Internet, APP communicates with the server in the role of the client in C/S mode; and the smart city energy efficiency system is a super-APP, which allows users to program H5 through a built-in browser to control hardware devices ability, so the communication module of its hardware platform is in B/S mode. The browser in the Internet of Things protocol uses the HTML text markup language; that is, the browser initiates a request to the server through the HTTP protocol (the request content includes the URL, which is what we often say), and the server transmits the HTML content corresponding to the URL as a response through the HTTP protocol back to the browser. Use JSP/PHP and other technologies to develop and design front-end web pages and simple logic in the cloud.

4.2. Energy Efficiency Management System Algorithm.
In order to build an enterprise energy efficiency management platform based on the Internet of Things with high availability, security, reliability, scalability, and scalability, the master station software uses mature and standard J2EE (Java 2 Enterprise Edition) enterprise platform architecture to build multilayer distributed application model; component reuse, consistent security model, and flexible transaction control are adopted to make the system more portable and adapt to the complex application environment, changeable business rules, and information release of the enterprise energy efficiency management platform, the needs of the system, and the need for future expansion of the system. The experiment adopts the ModbusRTU protocol, and the expansion of the number of high-order bytes can flexibly realize the deletion, addition, and modification of sensor data. The intelligent energy efficiency monitoring system is an innovative energy efficiency management system. Users can log in via a mobile phone, tablet, or PC at any time and place through a web application interface to achieve

monitoring, optimization, forecasting, control, and other functions. The algorithm implementation is shown in Figure 3.

The intelligent energy efficiency monitoring system can implement algorithms including monitoring current, voltage, energy consumption, power factor, electricity bills, energy demand, and other electrical parameters in the office building power distribution system anytime and anywhere: customized interface and asset panorama, intuitive equipment distribution, or single-line diagram of the system to clearly understand the situation of the electrical system. The energy efficiency synergy algorithm includes subroutines based on energy output and subroutines based on energy consumption distribution. The principle of the subroutine based on energy consumption distribution is as follows: analyze the evaluation of each energy consumption on the item (by browsing records, usage records, etc.); calculate the similarity between all energy efficiencies based on the evaluation of energy efficiency on the item; select the current energy efficiency. N is the most similar energy efficiencies of the households; recommend the N items with the highest energy efficiency evaluation and the current energy efficiency that has not been browsed to the system. In addition, the intelligent energy efficiency monitoring system can also achieve the following advanced functions: full life cycle management of circuit breaker equipment, reminder of required operation and maintenance items at any time, reasonable arrangement of spare parts procurement, and saving operation and maintenance costs, which is the most simplified circuit breaker temperature monitoring program.

4.3. Optimization of the Energy Efficiency Management System in Smart Cities.
Compared with common energy efficiency management systems on the market, through technical optimization, energy efficiency management systems under smart cities can achieve more advantages:

(1) Data monitoring system is set up. The built-in metering module of the circuit breaker can collect common parameters without the need to install a test meter. The accuracy level of the metering module's electric energy measurement reaches 1.0, which can meet the requirements of most applications. Modbus can be used in the equipment room, TCP or Modbus RTU protocol for communication. In addition, the intelligent power distribution monitoring system supports multisite deployment. At any local gateway, it can be uploaded to the cloud platform via a wired network, WiFi, or GPRS, and there is no need to use a data cable to connect to each gateway for unified upload. Based on the above characteristics, the intelligent power distribution monitoring system can reduce the wiring by 60% and the connection by 25%, and only through simple settings, multiple site devices can be connected to the cloud within 10 minutes, as shown in Figure 4.

(2) Software upgrade and expansion. The intelligent energy efficiency management and monitoring system supports plug-and-play. The travel time between any two task points can be set as sequence-related preparation time. The input time promised for each energy consumption data, including reservation data and instant data, can be mapped to the early and late penalties in the pipeline scheduling problem. After doing such a modeling transformation, there are a large number of heuristic algorithms that can be used for reference in the energy efficiency data scheduling problem. The service layer is responsible for providing platform functions to users, including user interface display, interactive response, and the entrance to third-party value-added services. A classic heuristic algorithm based on problem features is appropriately adapted and improved, and very good results can be obtained. Compared with the previous algorithm, the time consumption is reduced by 70%, and the optimization effect is good. Because this is a deterministic algorithm, the result is the same how many times it is run. The optimized algorithm is run once. Compared with the optimal results of other algorithms running 10 times, the optimization effect is the same.

(3) Strengthen energy efficiency management methods. As an energy efficiency index layer number dimensionality reduction problem, dynamic optimization scenarios need to be considered, which involves a large number of estimation links. By estimating the completion time of each layer when there is only currently uncompleted input data, shortening the system delay time, quantifying business indicators and efficiency indicators, reinforcement learning can be carried out, and the decision space dimension needs to be calculated.. The intelligent power distribution monitoring system supports third-party platforms to call data from the cloud through API.

(4) Improved energy efficiency demanding side management. The enterprise energy efficiency management service cloud platform mainly provides external services in the form of contract energy management to promote the development of contract energy management. The article tries to use the idea of robust optimization or random data planning, based on random scene sampling, to calculate the output energy efficiency data of the Internet of Things. At the same time, combining real energy efficiency data and algorithm design process, design optimization algorithm learns and evolves on cloud platform. Internet channels are mainly used to realize the pairwise interconnection between the platform and users and third-party value-added service providers. The enterprise energy efficiency management service cloud platform can help enterprises establish a complete power consumption supervision system. Through data analysis, combined with their own conditions, they can customize energy-saving solutions to achieve energy-saving
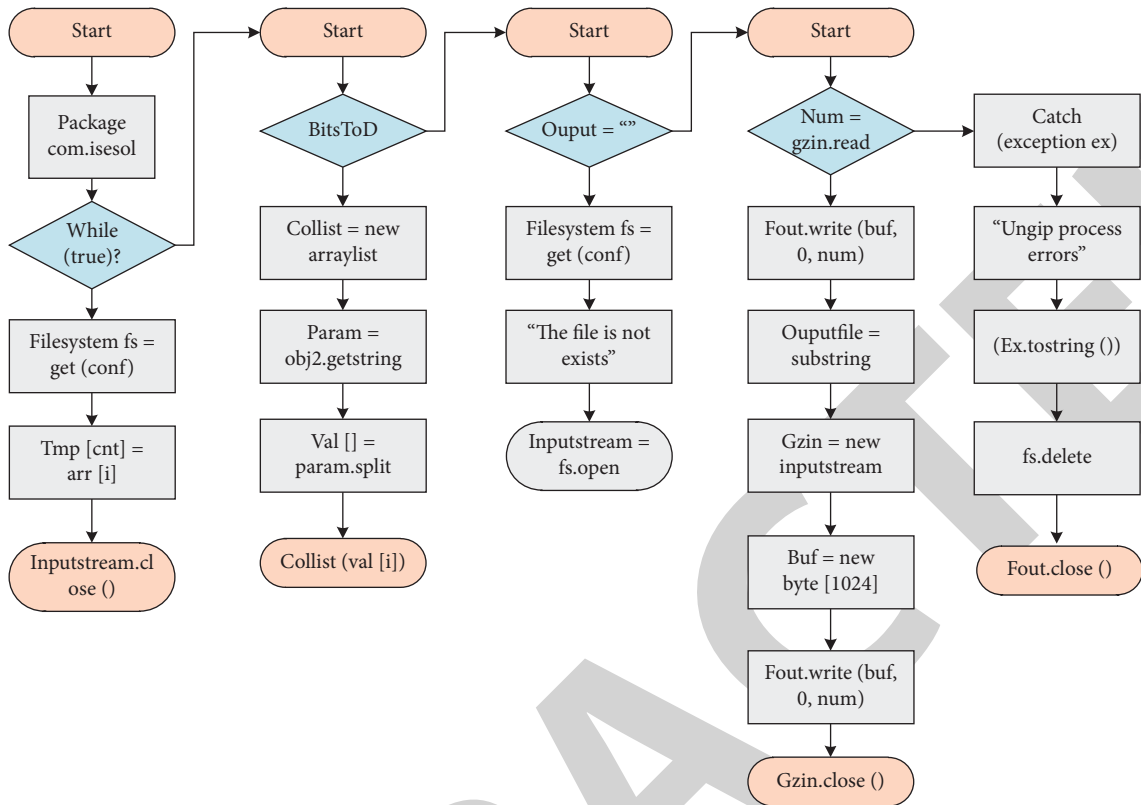
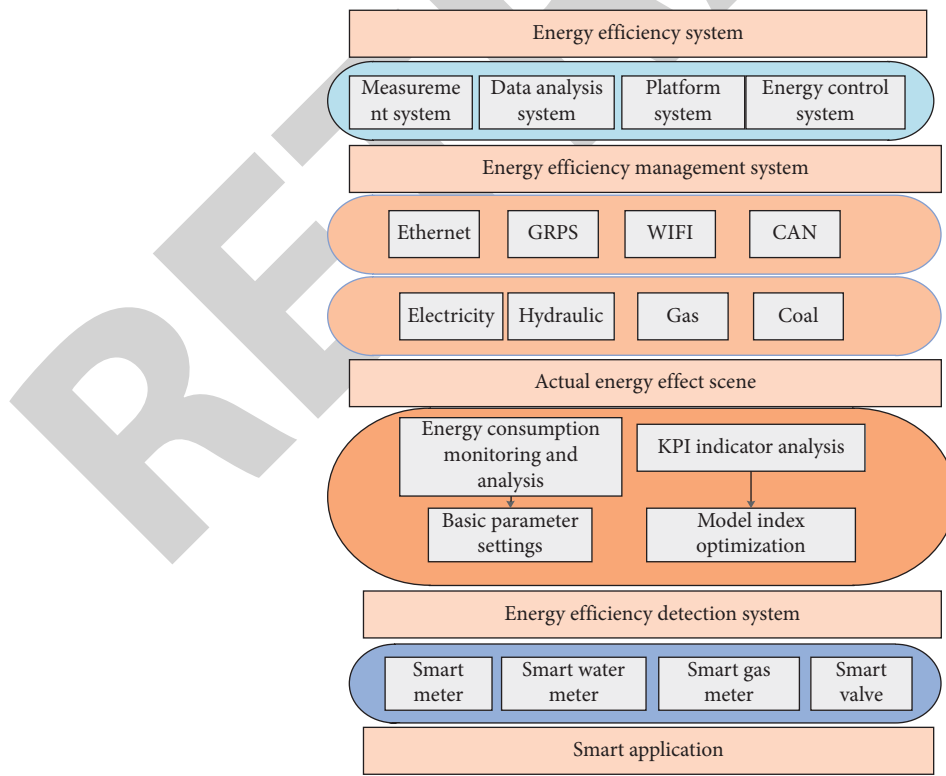Figure 3: Energy efficiency management system algorithm diagram.

Figure 4: Energy efficiency management system under smart city.

effects. In the implementation of the energy-saving plan, a series of markets such as energy-saving equipment manufacturers and project construction units will be stimulated.

5. Application and Analysis of the Smart City Energy Efficiency Management System

5.1. Database in the Energy Efficiency Management System. The platform adopts a distributed multilayer structure, and the typical software architecture is divided into a presentation layer, an application layer, a service layer, and a data layer. Data collection is divided into common data and video data. For video data, a Linux-compatible V4L2 interface is used to map the video signal to the memory expansion address. According to the business characteristics of this system, the application layer is further divided into collection sublayer, business sublayer, and external interface. The main station software interacts with external systems through external ports. Presentation layer: it provides a unified business application operation interface and information portal display window, which is the part of the system that directly faces operating users. Business layer: it implements specific business logic and is the core layer of the main station of the system. According to the application characteristics of the system, the business layer can be divided into collection sublayer, business sublayer, and external interface. The business sublayer is responsible for cleaning and mining on-site collected data, transforming detection data into decision-making knowledge, and integrating the intelligence of the expert group in the formation stage of decision-making knowledge. Service layer: it provides global general business services, security services, and other component service support, realizes the special business logic services of the system, and provides general technical support for the business layer. Data layer: it realizes the storage, access, and arrangement of massive information and provides data management support for the system. The data layer is implemented through a large relational database.

5.2. Experimental Results and Analysis. In a production area, there are two 10 kV incoming lines, one for use and the other for backup. 4 transformers: 1# and 2# transformers are located in the 1# power distribution room with a rated capacity of 630 kVA, and 3# and 4# transformers are located in the 2# power distribution room with a rated capacity of 1 000 kVA. All circuits in the power distribution room are required to measure and connect to the intelligent power distribution monitoring system. The original video data adopt the YUV color coding format and Y–U–V, respectively, which represent the grayness, brightness, and color pixels of the data. The data transmission of the mobile data collection and analysis system based on the Internet of Things is simulated, as shown in Figure 5. According to the conventional energy management system, it is necessary to install an electric meter on each circuit to measure power parameters. All circuit breakers in this project use circuit breakers with
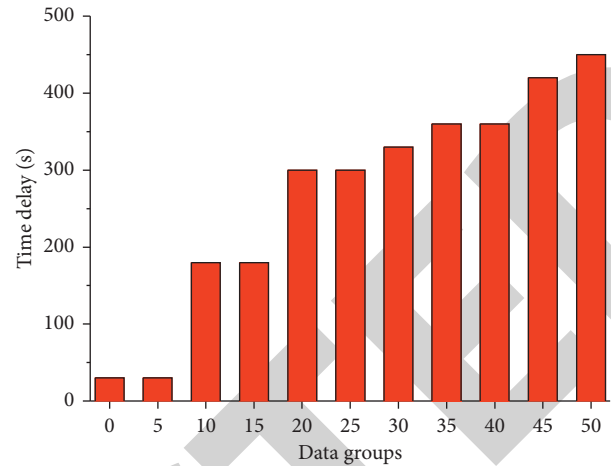

FIGURE 5: Time delay simulation diagram of energy efficiency system.

metering modules, which can directly measure power parameters, eliminating the need to install electric meters or tie secondary wires. This project directly installs transmission modules on the 1# and 3# two transformer master switch circuit breakers, which act as gateways between the two power distribution rooms and only need to connect the remaining circuit breakers to the circuit breakers acting as the gateway in the corresponding distribution room, saving the extra work of arranging the collection gateway. It can be seen that the number of layers of the energy efficiency system topology as a whole is increasing with the increase of the number of nodes, which is consistent with the prediction made. The original YUV format occupies a large storage space and has a high data redundancy. It needs to be compressed before transmission. However, at the same time, it can also be seen that as the number of nodes increases to a certain extent, the growth of the number of layers shows a slowdown, as shown in Figure 6.

The subsequent experimental structure of this article is based on the improved cyclic neural network classifier. In order to further discuss the effectiveness and stability of the classifier, three music test libraries A, B, and C, are formed after the integration of the music test library. We choose to use the RBF kernel function to perform classification tests on these three music libraries, and the average classification error is shown in Figure 7. In the sector graph, it can be seen that electricity energy consumption occupies most of the area, followed by hydraulic power, and coal and natural gas occupy about one-fifth of the area.

The 1# and 2# power distribution rooms are located at two corners of the factory and are far away from the monitoring center. According to the conventional energy management system, network cables are, respectively, laid out from the gateways of the two power distribution rooms, connected to the monitoring center, and monitored. The center is equipped with a server to process all the data. This project adopts an intelligent power distribution monitoring system and supports multisite cloud access. When there is no network, the two power distribution rooms are directly
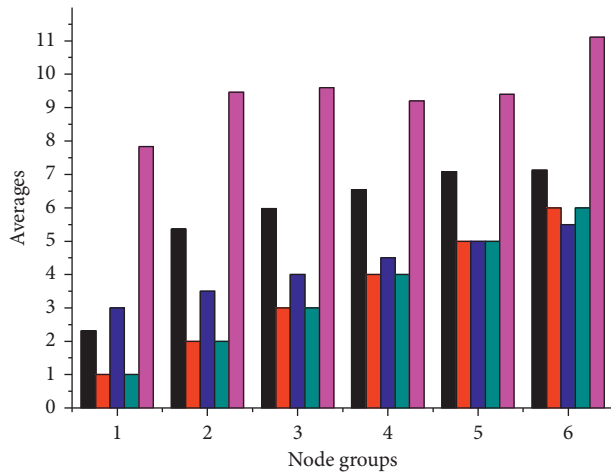
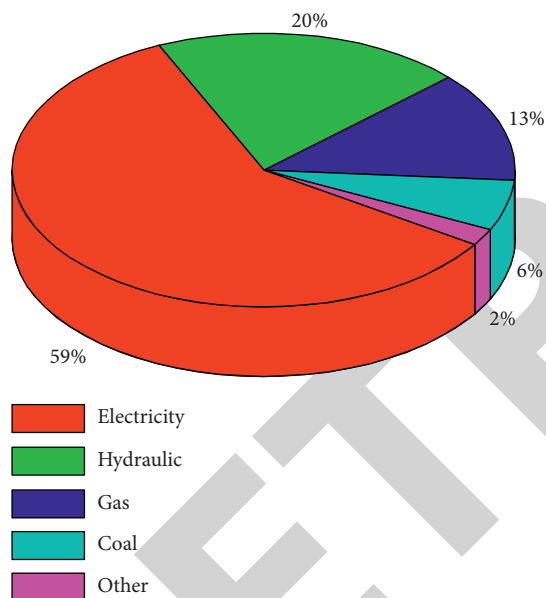FIGURE 6: The number of energy efficiency system layers varying with nodes.

FIGURE 7: Energy efficiency system energy distribution diagram.

connected to the cloud through GPRS signals, eliminating the need for laying network cables, and because the cloud platform is used, there is no need for local network. Equipped with a high-performance server, you only need an ordinary computer to connect to the Internet through the network port of the monitoring room. The platform system collects energy consumption data of home appliances through the energy efficiency management socket in the user's home, provides a variety of power value-added services and recommends appropriate third-party value-added services to users. The construction of the intelligent power distribution monitoring system also provides the plant with a wealth of energy efficiency value. After analyzing the energy consumption data of the intelligent power distribution monitoring system, we have proposed the plant from three aspects: power distribution optimization, electricity

bills, and equipment energy efficiency. Suggestions for energy efficiency improvement and optimizing energy efficiency allocation and data filtering are shown in Figures 8 and 9 .

Before the installation of the intelligent energy efficiency monitoring system, the basic electricity fee of the plant was charged according to the installed capacity. The total installed capacity of the 4 transformers in the plant was 3 260 kVA. According to local regulations, the unit price of the basic electricity fee charged by capacity was 23 yuan/(kVA × month) and the total monthly basic electricity bill is 74,980 yuan. According to the analysis of intelligent power distribution monitoring, the maximum monthly demand of the plant fluctuates between 1 300 and 1 900 kW. According to the local electricity price, the basic electricity charge based on the demand is 32 yuan/(kVA × month); monthly, the basic electricity fee is 41 600–60 800 yuan, which is less than the basic electricity fee calculated based on the installed capacity. The power module provides working power for the whole terminal equipment, the working voltage is AC 110–260 V, and the output voltage is DC 12 V. In view of the above situation, it is recommended that the plant adopts an energy storage system to achieve peak shaving and valley filling. On the one hand, the maximum energy demand can be reduced and the basic electricity bill can be reduced; on the other hand, the peak-hour electricity load can be shifted to the valley hour to reduce energy costs. Through calculations, the plant can be equipped with an energy storage system with a capacity of 1,200 kWh, using a maximum charging and discharging power of 200 kW, and shifting the load can save 315 thousand yuan in electricity costs per year, as shown in Figure 8.

Power distribution optimization only solves the problems of power distribution rationality and equipment safety, and the saving of electricity bills only reduces the unit price of energy consumption, which belongs to the category of saving money but not energy saving. To achieve energy saving in the true sense, it is necessary to start with the energy efficiency of the equipment. In addition, through the installation of an energy meter and the monitoring of the intelligent power distribution monitoring system, it was also found that the cooling efficiency of the refrigeration room of the plant was low. Terminal products rely on the two core capabilities of smart home control and home power control and communicate with home smart terminals through LAN, WiFi, ZigBee, and other methods. After professional analysis, the reason was that the load distribution of the host was unreasonable. In the experiment, the core computing equipment is set to a multiple of 8 to allocate the resources of the entire node. Each computing core initializes a local model learning task. Each task uses data containing 100 samples and performs 100 iterations of learning in batches. Obviously, increasing the number of cores can train the deep model faster. The host group control system was installed, greatly improving the energy efficiency of the host and reducing the energy consumption of the host by about 10%.
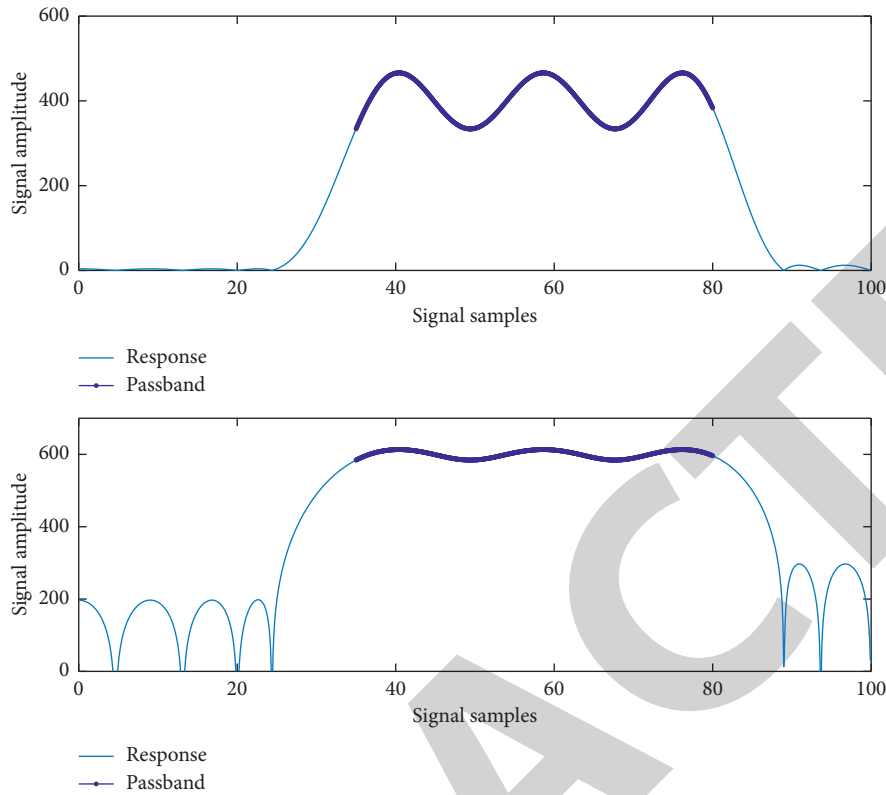
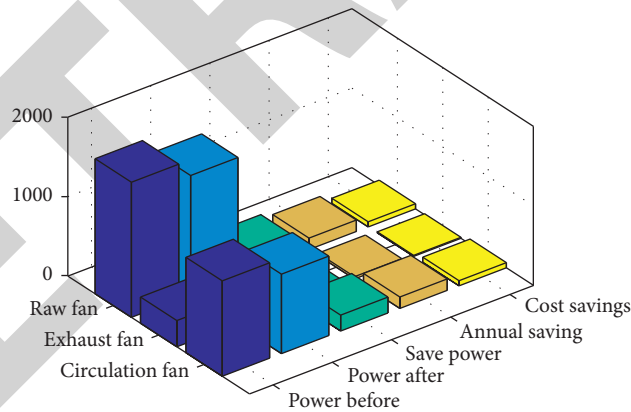FIGURE 8: Amplitude response after filtering of energy efficiency data.

FIGURE 9: Expected benefits of enterprise energy efficiency management system.

6. Conclusion

The Internet of Things has become a key research issue for many scholars in my country. In the rapid development of modern mobile communication technology, the good application of mobile data transmission technology in the Internet of Things has effectively improved the security and reliability of information transmitted by the Internet of Things. This article analyzes the many pain points of the energy management system and introduces in detail the energy efficiency value brought by the intelligent energy efficiency monitoring system from the perspective of

allocation optimization, energy consumption billing, and equipment energy efficiency through a case of a factory. It is hoped that it can provide for the application of energy efficiency management technology programs that can be used for reference. Aiming at the problems of huge capacity, complex operation, and high energy consumption in the current energy efficiency system, the article constructs the perception layer, network layer, and application layer suitable for energy efficiency control, establishes the Internet of Things system for energy efficiency control, and analyzes the line loss that affects energy efficiency. In addition to the line loss rate, design and optimize the corresponding data

algorithm for the line loss rate and conduct simulation experiments on the power grid energy efficiency management system. The results show that the efficient management of enterprise energy consumption is related to the operating costs of the enterprise. The research on the enterprise energy efficiency management platform based on the Internet of Things is optimizing energy consumption quality, improving energy efficiency, checking the energy saving and emission reduction effects for enterprise management, and formulating energy saving and emission reduction. Planning and reducing enterprise costs have important research significance and value.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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