Application of Computer Technology and Virtual Synchronous Machine Technology in New Energy

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Abstract. In modern society, with the emergence of computer technology, the world has entered the global information age of computer technology, and the industrial revolution is in full swing. Energy is the most important material basis in human society. How to use, how to manage the conversion mode of use efficiency, etc. lag far behind the development of other industries. For the development of the entire society, it is often inevitable to seek new forms of energy development and use. The purpose of this paper is to analyze and research the application of computer technology and virtual synchronous machine technology in new energy. Combining computer technology and virtual synchronous machine technology, analyze all aspects of renewable energy applications, collect and analyze energy information, establish mathematical models for system configuration, establish operation adjustment control models, and adopt particle swarm optimization algorithm multi-objective decision-making algorithm, System judgment and adjustment models, etc., to optimize the overall comprehensive energy, provide integrated, shared, virtualized, and intelligent processing tools for new energy production, and further improve the efficiency of mechanical energy production by 15%.

Keywords: Computer Technology, Virtual Synchronous Machine Technology, Control Mode, Simulation Comparison

1. Introduction

1.1. Background and Significance
China's new energy is developing rapidly, and wind energy is the third largest energy source after coal and hydropower [1]. The proportion of new energy in the regional power grid in China's "Three Norths" area is also increasing, and the high utilization of new energy will become an important feature of the future power grid [2]. The higher the ratio, the higher the ratio, and the new power plant does not have inertial support and basic frequency modulation function, which depends on the system frequency changes, safety and stable operation level of the power system [3]. Using computer technology and virtual synchronous machine technology, energy development technology, the energy consumption measurement function of the building equipment monitoring system optimizes factory
operations through management and control, and improves energy efficiency and avoids capital duplication. This proposed building energy management. By connecting the energy management system of smart buildings with the design plan, large-scale buildings can be constructed to realize the development of Internet of Things (IoT) energy management application services in various environments to the Internet of Things platform. Realize government macro energy management through dynamic monitoring. Strengthen the management of energy-saving measures for national energy consumption, promote economic and social development, and effectively strengthen the sustainable development of resources and the environment [4-5].

1.2. Related Work
Bindra A believes that the use of computer technology and virtual synchronous machine technology to develop advanced energy management application services is necessary to improve the existing smart building energy management system. This is because if the bottom layer does not exist, the top layer cannot develop applications [6]. It is currently at the stage of theoretical maturity and social practice. Through computer technology and virtual synchronous machine technology, research effective operation mode, and analyze and study new energy applications, computer technology and virtual synchronous machine technology can make more effective use of human value [7]. Personnel of computer technology and virtual synchronous machine technology choose computer technology and virtual synchronous machine technology. There are many value boundaries between computer technology and virtual synchronous machine technology, the interaction between rich computer technology and virtual synchronous machine technology and other problems [8]. For example, the recent new energy management system sets the timing of electric meters, most of which do not meet the requirements of sub-project classification and measurement, and the new energy use system is not integrated with the management system. Energy management can provide complex and comprehensive energy on the platform [9]. Liao S believes that as the three-tier structure of the new energy management system, it needs to be integrated with the Internet of Things, and it is necessary to apply the Internet of Things technology. The field layer adds various smart devices that use the Internet of Things technology, and the network layer can transform wired and wireless data networks into remote monitoring and management of the new power system [10]. Administrators can use the Internet of Things cloud computing technology to process large amounts of data, and the new energy management system already has the structure of the Internet of Things [11-12]. But their research is not entirely accurate. The analysis and research on the application of computer technology and virtual synchronous machine technology in new energy in this paper is more comprehensive and accurate.

1.3. Main Content
By learning human computer technology and virtual synchronous machine technology, and analyzing the current development history of new energy applications based on computer technology and virtual synchronous machine technology, based on consulting a large number of literature materials, this paper has carried out the following aspects Research:

The first chapter mainly introduces the development and status quo of the application of computer technology and virtual synchronous machine technology in new energy in this paper, as well as the research purpose, significance and related work of the paper.

The second chapter introduces the use of data collection method, expert interview method and horizontal processing method to study the application of computer technology and virtual synchronous machine technology in new energy.

The third chapter introduces the use of virtual synchronous generator technical route comparative analysis experiment and resource load feature extraction experiment to conduct in-depth research on this article.

The fourth chapter introduces the comparative analysis experiment of the virtual synchronous generator technical route and the cloud computing resource load feature extraction experiment, and the data is introduced and analyzed in detail.
The fifth chapter summarizes the specific work of this thesis on the application of computer technology and virtual synchronous machine technology in new energy, and prospects for the next step.

The innovation of this article is to describe the value of analysis and research on the application of computer technology and virtual synchronous machine technology in new energy, which are explained from the macro and micro perspectives. Reverse thinking, namely the limitations of computer technology and virtual synchronous machine technology, and new energy sources, illustrate that a good combination of the two cannot develop and mature in a short period of time. It expounds that computer technology and virtual synchronous machine technology are in new energy. Trends in development, more angles are summarized and judged based on the author's research.

2. Methods of Computer Technology and Virtual Synchronous Machine Technology in New Energy Applications

2.1. Data Collection Method
This article obtains the current situation, shortcomings and future development trends of computer vision media simulation technology in the application of distance education in our country by going to the library to check related journals and magazines through the Internet to check CNK journals and searching Baidu Encyclopedia resources. To understand the development and use of computer vision media simulation technology in distance education and teaching.

2.2. Expert Interview Method
According to the requirements of this topic, interview and interview relevant professionals, academics and sports workers via email or telephone. With the development of network technology applications, listen to the opinions of experts on some of the issues and opinions discussed in this article. This article listened to the opinions of university sports experts and teachers, and provided a basis for summarizing the main problems of using network technology in university sports. Understand the reality of establishing a national sports university network, establishing a national sports school network and developing university sports network courses.

2.3. Horizontal Treatment Method
In the cloud computing resource load system, the load at adjacent time points will not have a large sudden change. Therefore, compare the current time point with the data at two adjacent time points. If the difference exceeds the given threshold, it is considered that the data at this point is deviated and needs to be adjusted to make the data smoother. The processing method is as follows:

If |L(t)-(t-1)|>α is satisfied, and |L(t)-(t+1)|>α, adjust L(t) according to the following formula:

\[ L(t) = \frac{L(t-1) + L(t+1)}{2} \]  

(1)

In the formula, L(t) represents the load value at time t, and α represents the threshold.

3. Experiment on the Application of Computer Technology and Virtual Synchronous Machine Technology in New Energy

3.1. Comparative Analysis Experiment of Virtual Synchronous Machine Technical Route
The virtual synchronous generator is divided into two control structures, voltage control type and current control type. The control structure of voltage-controlled VSG is a typical dual-loop control, in which the outer loop is divided into active power control and reactive power control. The outer loop control output is the phase \( \theta \) and amplitude \( e \) of the VSG output voltage, and the inner loop control is a dual-loop control of voltage and current. The virtual synchronization function is realized through external loop control. Different from the voltage-controlled VSG, the current-controlled VSG is
widely used in new energy power generation equipment. It is based on vector control and adds grid frequency \( \dot{f} \) and voltage control variables to the control loop of the d-axis and q-axis current components \( i_d \) and \( i_q \). Provide effective frequency and voltage regulation control. The active frequency modulation support characteristics of the voltage-controlled and current-controlled VSG systems are shown in Figure 1 and Figure 2.

![Frequency comparison](image)

**Figure 1.** Frequency comparison
Figure 2. Power comparison

It can be seen from Figure 1 and Figure 2 that the voltage-controlled and current-controlled virtual synchronous generators with the same inertia time constant and active power frequency modulation coefficient have basically the same external characteristics of active frequency modulation, and both can provide the grid with the same magnitude of active power when the grid frequency is disturbed. Power support.

3.2. Load Feature Extraction Experiment

The existing clustering algorithms have obvious differences between clusters, and the results of clustering are decisive, that is, each object can only be divided into several categories based on specific attributes. However, the real problem is that the characteristics of certain data cannot be determined to be independent of each other, cannot be completely classified into a specific category, and can only provide other clusters with the possibility of elimination. The data is shown in Table 1:

| Center 1 | Center 2 |
|----------|----------|
| 0.2099   | 0.4372   |
| 0.1957   | 0.4244   |
| 0.2161   | 0.4603   |
| 0.1916   | 0.4584   |
| 0.1615   | 0.4220   |
| 0.1949   | 0.5051   |
| 0.1699   | 0.5043   |

After the load sequence is clustered, it is matched with the current load, and the optimal cluster is selected as the training sample of the neural network to increase the accuracy of network prediction.

4. Experimental Data Analysis
4.1. Comparative Analysis of Technical Route of Virtual Synchronous Machine and Experimental Data Analysis

Virtualization is the most important technology in the development and implementation of new energy systems. Virtualization can increase hardware utilization and reduce the amount of hardware purchased. This separates the applications and data required for operation and may involve different allocation strategies. By providing users with logical storage, application servers and storage servers can be balanced to monitor real-time data resource usage and increase data center usage. There are tens of millions of applications and users running new energy systems and other users who need to access relevant data. Therefore, to ensure the integrity and logical independence of user information, please use advanced application and data isolation techniques. Ensure that the dynamic link library and the application content of the application process run independently without affecting other servers or applications. In order to verify the effectiveness of the proposed control strategy, MATLAB simulation software is used to build a simulation model. The initial model is as follows:

\[ f(x) = \sum_{i=1}^{n} x_i C_{ij}^2 h_j \]  

(2)

The simulation data is shown in Table 2:

| Parameter    | Value | Parameter    | Value |
|--------------|-------|--------------|-------|
| \( U_g/V \)  | 380   | \( J \)      | 0.5   |
| \( U_{battery}/V \) | 400   | \( D \)      | 20    |
| \( U_{dc}/V \) | 750   | \( P_{ref}/kW \) | 2     |
| \( f/Hz \)   | 50    | \( R/\Omega \) | 0.032 |
| \( v/(m/s) \) | 10    | \( S/(w/m^2) \) | 1000  |

Check the router topology of the proposed energy, and analyze the load fluctuation on the DC side, the rapid increase/decrease of the frequency on the AC side and the single-phase drop of the grid voltage to understand the active power of the grid. The entire topology is located on the DC side and is used for power balance on the AC side. Even if the load changes, frequency changes and grid voltage drops, energy balance and bus voltage stability can be ensured.

4.2. Simulation Experiment

Figure 3 shows the simulation results of encryption work. The number of attributes deleted during simulation is expected to be fixed. As the number of cipher text attributes increases, this number again increases encryption overhead. The simulation results show that the solution will not re-encrypt attributes that have not been deleted. After revoking an authorized user, the system only updates the key material corresponding to the deleted attribute of the revoked user. This effectively improves the elimination efficiency. The overhead of the encryption process can also be reduced. The simulation results show that the scheme provides updated data encryption with lower overhead during the re-encryption stage, ensuring the security and practicability of the locking process. The data is shown in Figure 3:
Figure 3. Re-encryption overhead test

The simulation experiment results show that through computer technology and virtual synchronous machine technology, the methods of collecting and analyzing energy information, establishing a mathematical model of system configuration, establishing an operation adjustment control model, adopting particle swarm optimization algorithm multi-objective decision-making algorithm, system judgment adjustment model, etc. The overall optimization of comprehensive energy is relatively large, which proves the feasibility of computer technology and virtual synchronous machine technology in new energy applications.

5. Conclusions

There are many new energy production process related personnel, including designers, mapping personnel, prospectors and miners responsible for various tasks. The information sharing and processing process is also very complicated. Therefore, the application of computer technology and virtual synchronous machine technology in new energy supports the integrated system of computer technology, sensors, databases, software engineering, virtual synchronous system technology and other technologies, supports the production and manufacturing of new energy, and improves the new energy business process. Collaboration and data sharing functions provide a feasible development direction. The actual benefits generated will enable people to participate widely, give full play to the positive demonstration role brought by collective pressure, and ultimately promote the transition from traditional energy to new energy technology. The application of computer technology and virtual synchronous machine technology in new energy sources optimizes the energy consumption of daily life and reduces the energy crisis in society.

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