Analysis and Research on Visualization Display Model of Power Network Planning Based on Big Data Analysis

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Abstract. With the development of information technology, the information process of power companies is accelerating. Power big data is the product of this information, and its related technologies play an increasingly important role. According to the power big data and related technologies, the visual display technology of power grid planning is also gradually developed. The application of power big data in power grid planning management is analysed and analysed. At the same time, the opportunities and challenges faced by power big data in the development process are analysed. Research provides ideas.

1. Introduction
With the rapid development of the big data industry on a global scale, China has gradually attached importance to the application of big data. In terms of energy, power big data plays an important role in people's re-recognition and transformation of the world. The emergence of information systems has realized the integration and analysis of data. Through the processing of massive data, it provides support for related businesses of power grid enterprises. This paper mainly studies the application of visual display model of power big data in power grid planning [1].

2. Overview of Power Big Data
2.1. Definition of power big data
Power big data has the characteristics of huge data volume, various data types, low value density, and fast processing speed. In the process of power planning, it involves power generation, transmission, substation, power distribution, power consumption, and dispatching. The development of power big data technology meets the rapid growth of power data, meets the needs of various professional work, meets the needs of improving the development of the power industry and the development of service economy, involving high-performance computing, data mining, statistical analysis, data visualization and so on. Applying big data analysis, machine learning and forecasting technology, it can integrate operational data, meteorological data, grid data, and electricity market data to perform load forecasting and power generation forecasting [2]. Fully explore customer behavior characteristics, and use the grid planning visual display model means to communicate and communicate information clearly and effectively, to facilitate the understanding and understanding of data by relevant personnel, to open up and optimize the operational efficiency of power production and power consumption, and to realize demand and supply [3]. Dynamic adjustment at any time to improve the accuracy of energy demand forecasting and
improve the efficiency of business operations. With the intelligent power generation, electricity, and storage equipment accessing the network, the information flow is used to form a virtuous cycle of self-optimization. With the help of big data technology, the deep mining of the value of power big data will bring good value to the profit and control level of power companies [4].

2.2. Power Big Data Technology Application Technology

2.2.1. Data fusion in power grid planning. Grid planning visualizes data fusion by processing data from different levels and levels of information sources. The process includes data detection, correlation analysis, estimation, and combination processing to complete the required decision and evaluation tasks. It is crucial for relevant departments to obtain useful information in an accurate and timely manner, to conduct timely and complete evaluation of market conditions, and to implement auxiliary decision-making [5].

The integration of power production and service data is the full use of power big data within the industry. In terms of production, power companies use computer technology to analyze the relevant feature quantities from multiple sensors and comprehensively process them to ensure safe and stable operation of the power production process. In terms of power services, it mainly involves the analysis of market data, including transaction price, demand side power consumption, power consumption trend and distribution, etc [6]. The analysis results of these data are shared among all units and departments. The process of data fusion requires data detection and correlation analysis. In the process of life cycle management, planning and distribution coordination management of power assets, the data sources are different, and they need to be integrated to realize the business. From the center to the data transformation, the value of the data is maximized [7].

2.2.2. Power grid planning data mining technology. As a technology, grid planning data mining finds valuable data in a large number of information sources, analyzes and summarizes relevant laws, and obtains corresponding output. With the continuous strengthening of information of power companies, the application of power data has gradually played a major role in power companies, providing strong support for corporate decision-making [8].
The specific process of data mining begins with data preparation, and evaluates the potential value of data through data mining and comprehensive analysis. For the power industry, data preparation is not aimed at all the data, but the part of the original data suitable for subsequent data mining, so this process is also a processing process, including the organization, screening, and conversion of data to ensure subsequent data mining\cite{9}. Quality and efficiency; data mining is a key link, aiming at analyzing the data obtained in the previous link and discovering the data law. The process needs to consider other factors to select the appropriate mining method. For the comprehensive analysis and evaluation, firstly, the previous link The established model evaluates whether it is reasonable, focuses on the results of the model output, considers whether it meets the initial business objectives, and interprets and analyzes the results to extract valuable information, which is presented in a visual form, such as reports, reports, Graphics, etc.

2.2.3. Statistical analysis of power grid planning. The statistical analysis of power grid planning is the process of sorting and categorizing the acquired massive data. Descriptive statistics and inferred statistics have different characteristics as different methods of statistical analysis. Descriptive statistics is the mining and analysis of power big data through a series of processes such as organization, screening, transformation, etc., and the results are expressed in a simplified form to describe and summarize the characteristics and laws of the data, including the concentrated trend and dispersion of these data. Degree
and correlation strength; inferred statistics refers to a kind of predictive analysis method that uses probability form to judge whether there is a certain relationship between data and unknown inferences. For example, when predicting grid supply and demand, it has a greater correlation with grid supply and demand. The influencing factors are used to predict supply and demand.

2.2.4. Grid planning visualization display model technology. Grid big data ultimately needs to be presented in an intuitive and easy-to-understand way for subsequent analysis and decision making. This process uses big data visualization technology. In the process of power production and operation management, the production data generated includes real-time data collected such as power generation and voltage stability. In addition, there are some business data, such as technologies such as Internet of Things, cloud computing, and new energy integration. Relevant data brought about by operation and management, mainly data on transaction price and electricity sales. Visualization technology is the rapid and efficient extraction of such huge data into useful information through a series of algorithms, enabling people to obtain information through their own visual system.

2.3. Significance of power grid planning
The grid planning integrates the resources of the whole network, real-time information sharing, and the cyclic value-added integrates the information resources of the whole network under the unified platform, which greatly improves the sharing of data in the whole network, and at the same time forms intangible empirical data and resource accumulation. Follow-up work provides reference and supports innovation. It integrates into the company's business process, complies with the unified authority management platform and integrates with the portal of large power companies, realizes integration with large power company portals, assigns authority according to the unified role authority configuration mechanism of large power companies, and integrates into the integrated management process of large power companies. Realize the transformation of data management model through the integrated integration of grid business data, the focus will be on intensive and standardized management of data under a unified platform, transition from approval management to authority management, and transition from node management to flattening. Mesh management. A new management model, establishing a new image of large-scale power companies to provide a high degree of integration of visual display and various business data, serving the entire process of Power Grid's main business, facing the rapid development of Power Grid and increasing power grid information, providing a new kind of management means and information support has also become a window to establish a new image of large power companies.

2.4. Application of Big Data Technology in Power Grid Planning
In the power grid planning stage, through the docking with the power Grid Company planning and dispatching system power grid planning, the platform uses the data and chart form to generate electricity information, grid power flow, regional load for query statistics, and utilizes the platform's rich power grid, power resources and various business departments. Professional data and geographic information data, planners can easily access various types of planning data, and through strong basic data support, can help planners to prepare planning reports and make planning decisions, thereby reducing staffing and reducing planning time. Improve work efficiency, further improve the scientific decision-making in the development and construction of power grids; in the stage of power grid construction, use the detailed data of the platform to let the staff clearly understand the various scenic spots, mining areas, pollution areas and other information that the line passes through. The use of high-definition visualization to display the topography allows the designer to understand the line channel without leaving the house. The preliminary line selection and optimization on the channel can greatly reduce the difficulty of the initial survey, reduce the initial workload, and speed up the initial Set speed and reduce electricity at the same time Unreasonable occupation of social resources such as farmland and forest land by network facilities, promoting the coordinated development of power grid and economy and society.
2.5. Implementation of grid planning in the context of big data technology

Power grid planning is an important part of power grid planning. As the complexity of the power grid continues to increase, the scale and automation continue to increase.

The society has put forward stricter requirements for the planning of the grid structure. The new data concept brought by big data provides new ideas for power grid planning. The planning of the power grid architecture relies on the analysis and forecast of the power market and the load forecasting of the end users in the planning area. The reliable forecast results provide the basis for the grid structure and equipment model selection, and ensure the rationality of the power grid planning. Based on the current situation of the power market and the reverse distribution of power demand, China State Grid Corporation put forward the strategic goal of “UHV grid as the backbone grid and coordinated development of all levels of power grids”. According to the plan, it implements long-distance, large-scale and high-scale efficient transmission, promotion of large-scale coal-fired power, large large nuclear power, large-scale renewable energy base intensive development, the realization of resource optimization configuration across the country. The realization of this strategic goal is hindered by many factors, in addition to solving the technical problems closely related to the transmission grid structure, such as magnetic ring network, short-circuit current exceeding standard, DC interference and large-scale transmission of renewable energy. In addition, the most basic is to adapt to the needs. China still has problems of imbalance between production and consumption. In some areas, the grid structure is weak, and the role of grid optimization resources is difficult to play. However, the country vigorously develops distributed power sources, and the dispersion at the end of the power system is in line with the introduction of power, which is not only beneficial. Solve the user's power supply problem or improve the power quality and power supply reliability of the user terminal, and can reduce the power loss of the distribution network, save power, and alleviate the power shortage. The development mode of power grids and distributed power sources is also the focus of power development in developed countries. The United States, the United Kingdom and other countries are carrying out research on future grid patterns and key technologies.

3. Visualization of grid technology under the application of big data technology

3.1. Big Data Organization and Management

Big data mainly refers to high-resolution images and digital elevation models throughout the province. In visualizing the terrain scene rendering, in order to improve the rendering speed while ensuring the display precision, the pyramid hierarchy is used to layer the image and the DEM. The pyramid is a hierarchical model. When constructing the pyramid hierarchy, the original image or DEM is first used as the bottom layer of the pyramid, that is, the 0th layer, and is divided into blocks to form the hierarchical block matrix of the 0th layer. On the basis of the 0th layer, each 2×2 pixels are into 1 pixel, the first layer is generated, and the first layer is divided to form a first layer, thereby forming a pyramid of the entire hierarchy, so that From the bottom to the top of the pyramid, the resolution of the data is getting lower and lower, and the amount of data at the corresponding level is getting smaller and smaller. When the scene range is relatively large, the image with relatively low resolution is loaded. When the scene range is relatively small, the image with relatively high resolution is loaded to improve the rendering efficiency of the visual display scene.
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Figure 3. Pyramid big data structure analysis of electric power DEM

The pyramid and slice data of the image and DEM are stored in the file form on the server side, and the client accesses the data of the server through downloads it to the local cache. The target level is quickly searched using the viewpoint-related LOD (Level of Detail) technique. The use of LOD technology requires different regions to correspond to different resolutions of terrain data, so the resolution test is required during the search process of the hierarchical blocks. FIG. 3 is a schematic diagram of the terrain level block resolution requirement. In the figure, E is a viewpoint, and the white rectangular area represents the number of hierarchical blocks that intersect with the view body and need to participate in terrain drawing. The smaller the rectangle, the higher the resolution. The search uses a strategy that moves from course to fine and layers. This can not only satisfy the visual effect from far to near from blur to clear, but also greatly improve the efficiency of the system.

3.2. High-precision visual modelling of power grid equipment
In order to more accurately express the grid equipment through visual display visualization, it is necessary to perform 1:1 high-precision modeling according to the drawings related to the tower and substation equipment. Many equipments required for tower modeling and substation modeling include tower materials, basic configuration tables, and other materials and equipment, general layout drawings, electrical wiring diagrams, and so on. From the function of the tower query, it mainly includes online monitoring and early warning of the line; and query of the relevant information of the line. On-line monitoring and early warning of the line, through the line detection section, it is convenient for the majority of users to collect the front-end monitoring equipment of each manufacturer in time, and simultaneously transmit signals to the monitoring center through GPRS, and process corresponding video and image data. In addition, these data information can also be displayed in the form of charts or curves. Inquiries about line related information, this section mainly includes digital information file management, tower picture information query, and line equipment ledger and so on. Among them, the digital files contained in the line contain various drawings, charts, materials, data information, various photos, etc. of the construction; the main contents of the line equipment account include construction
and design units, production and operation manufacturers, etc.; Various real-life photos, etc. The above data information is entered into the database, loaded and displayed by the system.

Figure 4. Regionalized power planning diagram

3.3. Visualization display technology for power grid planning under big data analysis

From the perspective of visual display modeling format, DWG and 3D formats are usually used, and the format conversion is performed according to the actual situation of visual display grid technology, so as to adapt to the requirements of visual display modeling rendering, and make the three-dimensional mode more realistic.

Integrated application of power grid planning and construction As far as the current situation is concerned, there are very few visual display models used in smart grid planning and construction. It is more common to visualize the big data technology used in related power units. From the actual situation of transmission line management, its large amount of data and long distance between space, visual display of grid technology under the application of big data technology can intuitively reflect the location of space objects and related business information, through the establishment of corresponding “Visualize the digital work platform” to enable integrated management of power grid planning and construction.

Figure 5. Visualization demonstration model analysis of power grid planning under big data
In the data source, high-definition satellite imagery equipment can be purchased to construct corresponding visual display forms. Under the macro conditions, 110kV can be seen visually in the structure of the net rack; under the microscopic conditions, the substation or line above 500kV can be simulated in real time. In this way, the panoramic view of the power grid can be fully displayed. Using spatial information and data fusion technology, the corresponding power data can be effectively integrated through the platform to form an intuitive and three-dimensional business platform system, which plays a role in the construction and construction of the power grid. With the gradual increase of the scale of the power grid, it is especially important to do the daily operation and management of the power grid. How to face the damage caused by natural disasters to the grid structure and promote the safe operation of the grid, it is necessary to use the technology to display the data under the application of big data technology to monitor and manage the data information of the transmission line. The system is maintained and managed. The use of visual display technology in the application of big data technology in power grid planning and construction can improve the quality and efficiency of power grid planning and construction.

Figure 6. China’s planned grid design show by 2020

4. Conclusion
This paper introduces a design and implementation idea of the grid planning visualization platform based on visual display in the application of big data technology. Through analysis and application, the visualization of grid planning can effectively improve the efficiency and management level of grid planning and construction. And the level of decision making. With the development of China's smart grid, the information process of power system transmission, transmission, transformation, distribution, and power consumption has been continuously promoted. Enterprises have put forward higher requirements for the management and application of power grid planning, in addition to the visual display model. In addition to grid space visualization and business data fusion, how to use large data
analysis methods to conduct large-scale data analysis, and how to use big data analysis methods to conduct research on big data theory and key application technologies will be more. The application of internal and external data resources of many power companies to the planning and operation of smart distribution networks can play an important role in building a data-driven smart distribution network for big data.

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