Design of automatic generation system of equipment protection common sense pocket book content based on power big data

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Abstract. In order to improve the power system and process, strengthen personnel training and guidance, this paper proposes a new automatic generation system of equipment protection knowledge pocket book content based on power big data. Firstly, the architecture of each level of the system is designed. Secondly, according to the architecture design results, the main hardware and software of the system are designed. The hardware mainly includes pocket book content naming module, user management module and pocket book content automatic generation module. In the software part, K-mean clustering algorithm is used to cluster the power big data, and the main content of equipment protection knowledge in power big data is extracted. The above hardware and software are combined to complete the design of automatic generation system for the contents of power equipment protection pocket book. The experimental results show that the performance of the system is greatly improved.

1. Introduction
Power equipment safety knowledge book is very important for the use of equipment. No matter what the educational level of equipment users is, they can use power equipment effectively and safely through power equipment safety knowledge [1-3]. According to the requirements of propaganda and promotion of common sense of power equipment use, the traditional common sense book of power equipment safety has the reasons of large volume and inconvenient carrying, so the pocket book system of equipment protection came into being [4]. With the continuous updating of the knowledge content of power equipment protection, the content of equipment protection common sense pocket book system also needs to be updated. Therefore, it is very necessary to design an effective and accurate automatic updating system of equipment protection common sense pocket book content [5].

In the related research, reference [6] proposes an automatic power data backup system based on deep learning, The system uses deep learning network to design power equipment knowledge processing module, build bad data acquisition model of power equipment, collect all kinds of bad problem data in the process of using power equipment, and generate online data backup mode. According to the deep learning theory, the common sense of power equipment safety is backed up and updated. However, the content update efficiency of the system still needs to be further improved. In reference [7], an automatic test data generation system for power equipment based on Bayesian network is proposed, which is based on the fault data in the use of power equipment, constructs the fault event structure tree. According to the probability distribution characteristics of fault tree, the Bayesian network generation model is constructed to generate common sense data of power protection with real data characteristics,
which is uploaded to the content display interface, but the coverage of the generated content of the system is low. Reference [8] proposes a data generation system based on network data analysis. The system uses kam4000 collector to analyze the data used by power equipment, and designs the system data transmission link through network switch. The obtained data of power equipment use is analyzed to obtain the data of power equipment protection content, and the data is automatically generated by PCM frame configuration scheme, but the operation security of the system still needs to be further improved.

In order to solve the problems of the traditional system, this paper proposes an automatic generation system based on power big data to improve the performance of the system from both hardware and software.

2. Automatic generation system of wallet content for power equipment protection

The safe operation of power equipment is very important to ensure the safety and normal production of various power parts. Power equipment is an important part of China's economic development, so in all aspects of social production, the dependence on power equipment is strong [9]. The power equipment operator is the main factor affecting the safety of power equipment, so the design of power equipment safety protection wallet content automatic update system should meet the requirements of fast and comprehensive content update. In order to meet the above requirements, the overall architecture of the system is designed

2.1. System architecture design

The frame structure of wallet content automatic generation system is shown in Figure 1.

![System architecture diagram](image.png)

**Fig. 1 System architecture**

The system framework includes the content display layer, core business layer, basic service layer and software service layer.

2.2. System hardware

(1) Wallet content naming module

In order to accurately generate the content of the wallet, we need to name the related content of the wallet, so we designed the wallet content naming module [10]. The module uses bilstm + CRF to name the wallet content, but there is no effective existing data set in the naming process, so the migration learning method is introduced in the naming process to train a large number of wallet data of power equipment protection, form a character set language model, and then
quantify the character content to be generated. Finally, the quantized data are input into bilstm + CRF model to complete the naming of pocket book content. The structure of pocket book content naming module is shown in Figure 2.

(2) User management module
The important function of pocket book content automatic generation system is user management, in the system, the power equipment operation user can usually directly access the required power equipment protection knowledge pocket book content, and other general users need to verify the user login, this form can effectively improve the security of the system. And protect the core pocket book content of the system, reduce the operation risk of the system, and effectively distinguish the identity of system users. Different identities correspond to the business functions of the system.

(3) Pocket book content automatic generation module
The structure of the pocket book content automatic generation module is shown in Figure 3. The generated content storage is the main result of the module, and the tagged pocket book content is stored in mongodb dataset. When the system administrator selects the naming algorithm, the naming report generation service will build the corresponding naming classifier according to the requirements of power equipment protection, and complete the automatic generation of the content of power equipment protection common sense pocket book.

Fig. 2 Naming module structure

Fig. 3 Automatic generation module of pocket book content

2.3. System software
With the development of power informatization, the common sense of power equipment protection has been widely used in the information management of power equipment. Effective common sense of power equipment protection has gradually become the application scene of power big data. All aspects of power equipment application will produce big data related to power knowledge, so the sources of power big data are very wide. According to the type of data, power big data can be divided into audio data, graphic data and character data. According to the process of power equipment operation, power
big data can be divided into equipment detection data, equipment operation data and equipment management data.

In order to effectively generate the contents of power equipment protection knowledge pocket book, it is necessary to mine the power big data. The main steps of mining are the preparation of power big data. K-means clustering is used to mine the prepared data, and finally the power big data mining results are displayed. The general steps of power big data mining are shown in Figure 4.

K-means clustering algorithm is a typical data clustering algorithm, which can cluster power big data into different limited clusters. The data in each cluster has similar characteristics. According to the clustering requirements, different power big data clusters can be selected for targeted research. In this paper, the power equipment protection data in the power big data are clustered. The specific clustering process is shown in Figure 5.

The above process completes the power big data mining, combines the software mining results with hardware related equipment, and completes the design of automatic generation system of power equipment protection common sense pocket book content.

3. Experimental verification
The above process completes the research on the automatic generation system of common sense pocket book content of power equipment protection from the theoretical level, and this part verifies the application performance of the system. The experimental environment has a serious impact on the application performance of the system, so the environmental parameters of the experiment are strictly defined before the experiment. The experimental environment parameters are shown in Table 1.

| Project            | Parameter     |
|--------------------|---------------|
| Operating system   | Windows 10    |
In the above experimental environment, comparative verification experiments are carried out, and the overall experimental scheme is set as follows: Taking the generation efficiency and content coverage as the experimental comparison indicators, the designed system is compared with the reference [6] and reference [7] systems.

3.1. Generation efficiency
Taking the generation efficiency as the experimental comparison index, the operation efficiency of the designed system can be verified. The comparison results of the automatic generation efficiency of the three systems are shown in Figure 6.

![Generation efficiency comparison chart](image)

By analyzing the comparison results of content generation efficiency of power equipment protection common sense pocket book in Figure 7, it can be seen that the generation efficiency of the designed system is much higher than that of the two traditional literature comparison systems, and the generation efficiency of the designed system is maintained at more than 80%, up to 91%. However, the generation efficiency of reference [6] and reference [7] is less than 50%. Therefore, it fully shows that the designed system can effectively meet the requirements of content generation efficiency of power equipment protection.

3.2. Content coverage
The coverage of pocket book content has an extremely important impact on the application of common sense of power equipment protection. Therefore, taking the coverage of pocket book content as the experimental comparison index, the designed system is compared with the reference [6] and reference [7]. The content coverage comparison results of the three systems are shown in Figure 7.
From the content coverage comparison results in Figure 8, it can be seen that at the beginning of the experiment, the coverage of the three systems are at a low level, because at this time, the system begins to preprocess the common sense data of power equipment protection, resulting in a low coverage. However, with the increase of experimental time, the coverage results of the three systems are significantly different. The coverage of the designed system continued to rise, reaching 98%, while the coverage of the two literature comparison systems reached 85% and 76%, respectively. Therefore, it is fully proved that the designed system has high content coverage.

4. Conclusion
In order to improve the effectiveness of power equipment protection, this paper proposes and designs an automatic generation system of equipment protection common sense pocket book content based on power big data, and verifies the performance of the system from both theoretical and experimental aspects. The system has high generation efficiency and content coverage in the automatic generation of power equipment protection common sense pocket book content. Specifically, compared with the system based on deep learning, the generation efficiency of the designed system is significantly improved, and the highest generation efficiency can reach 91%; compared with the system based on Bayesian network, the content coverage of the designed system is greatly improved, and the highest content coverage is 98%. Therefore, it fully shows that the designed content generation system based on power big data can better meet the requirements of automatic generation of power equipment protection common sense pocket book content.

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