Safety Supervision Method of Power Work Site Based on Computer Machine Learning and Image Recognition

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Abstract. China's traditional power system has been unable to meet the needs of society and the development of The Times. Under the background of intelligence, it is necessary to reform the power industry and increase the application of mobile application technology in the power system, so as to realize the precise management of the power system. The application of mobile application technology in the field operation of electric power construction, based on computer machine learning and image recognition, is helpful to realize the sustainable development of electric power enterprises, improve the service level of electric power enterprises and promote the on-site safety supervision.

Keywords: Machine Learning, Image Recognition, Power Operation, Safety Supervision

1. Introduction
China's economy is in a period of rapid development, the demand for electricity is increasing. In the process of electric power production, site safety supervision is of great significance to ensure the safety of workers. Electric power production is a relatively complex process, which involves a lot of dangerous processes. For example, when conducting high-voltage tests on electrical equipment, the staff must keep a safe distance from the equipment [1]. At present, the field operation of electric power generally adopts manual safety monitoring, but the monitoring personnel are as susceptible to external factors as the operation personnel, and their attention may not be focused, which may lead to safety accidents. In addition, with the advent of the era of Internet economy, the safety supervision method based on computer machine learning and image recognition is a subject worth studying [2].

2. Research on core technologies

2.1. Overview of electric power operation site
With the continuous development of railway transportation production, electric locomotive has been widely used in railway transportation production because of its high energy conversion efficiency and large traction power [3]. So far, most of the busy main lines of railway transportation in China have adopted electric locomotives for traction operation. The number of railway electric locomotives has been increasing year by year, and it is becoming the mainstream traction power equipment of railway transportation.

The electrified section drawn by electric locomotives is equipped with high-voltage transmission lines that supply power to electric locomotives, with voltages up to 27 kV. In order to ensure the safety of personnel, not only various protective measures are set up on the equipment, but also many text warning messages are marked in the traction section [4]. However, due to the pantoscope, insulator and other parts on the top of the electric locomotive need frequent inspection and maintenance, after the locomotive traction operation of a road, maintenance and reconditioning personnel must go on the top of the electric locomotive for operation, close contact with the high-voltage network wire, there are high safety risks. Therefore, it is very necessary to set up a complete set of safety protection equipment and take extremely high safety protection measures for each step of the operation of the climbers [5].

2.2. Introduction to SVM algorithm

SVM is a machine learning method based on statistical learning theory. In the process of classification, the linear separability of some low-dimensional space is achieved by finding a suitable kernel function to transform it into a high-dimensional space. Then the optimal hyperplane of the feature space is found to achieve the purpose of dichotomy [6]. The general form of the linear equation dividing the hyperplane is

\[ f(x) = \omega^T x + b \]  

(1)

In the formula: \( \omega = (\omega_1, \omega_2, \ldots, \omega_d) \) is the normal vector, which determines the direction of the hyperplane; \( B \) is the displacement term, which determines the distance between the hyperplane and the origin [7]. Figure 2 shows an example of linear classification.
As can be seen from Figure 2, H represents the classification interval. The geometric interval represents the Euclidean distance between a point and the hyperplane. L1 and L2 represent the limiting position and L represents the decision surface. The limiting position and the decision surface are always parallel [8]. The location of the decision surface is determined by the direction of the decision surface and the location of several sample points closest to the decision surface. If the maximum classification interval is found, the optimal decision surface is obtained, that is, the optimal superflat force j, that is, the optimal solution of SVM. And the sample points that cross the limit are called support vectors. As shown in Figure 2, the limit position of L1 has 1 support vector, and the limit position of L2 has 2 support vectors.

Generally speaking, the selection of kernel function directly affects the final classification result [9]. The commonly used kernel functions are linear kernel, polynomial kernel, Gaussian kernel, Laplace kernel and Sigmoid kernel. Linear kernel function is chosen this time.

3. Application strategy of safety supervision in power work site based on computer machine learning and image recognition

3.1. Taking risk control as the basis and solving problems as the fundamental

Formulate scientific and reasonable solutions and rectification plans for the sources of danger, from the planning and development, engineering construction, operation, management adjustment, and in the improvement of the organization and discussion, brainstorming, promote the problem to solve in time [10]. For major problems and potential safety hazards, formulate effective preventive measures and response plans and implement them to improve the ability of operators to deal with emergencies. In daily work, we must try our best to improve the safety system of work, make full use of the advanced science and technology of today's era for work assistance, put forward targeted solutions to the problems, and improve the safety management mode of electric power enterprises and the protection of electric power equipment, and get closer to the overall goal of work. Using all kinds of practical safety protection equipment, to provide protection for the personnel's personal safety.

3.2. Attach great importance to risk discrimination

Risk identification is a targeted work that must be carried out in the power production operation, and the risk assessment, according to the difference of risk assessment results and levels to formulate different response programs. Risk assessment is mainly carried out from the aspects of working environment, skills and quality, and operation standardization. For danger of the working environment, such as space is not reasonable, and there are flammable objects, the bad light, the operator can't normal work, working condition of equipment is not stable, etc. Must be strictly attaches importance
to the recognition of risk factors, and take reasonable control measures to prevent, in order to ensure that employees can carried out normally.

Operation, so as to prevent the accident risk caused by electric shock, the impact of the working environment, the harm of the surrounding goods, the hidden danger of the equipment. Based on the identification and assessment of risk factors during management and before operation, the operation links that are prone to problems can be prevented in advance according to the different risk factors and the experience of operators in practice, and the risk control of the unreasonable operation mode of power can be strengthened.

3.3. Strengthen the application of safety technology
The application of safety technology is a targeted measure for the electric power field, and also an effective security guarantee for the smooth progress of the electric power production. In the work, we must strictly request the standardization of our own work, carry out the actual incense exhaust on the site, and adopt different strategies according to the actual working environment on the site. Adopt scientific and normative measures. Carry out the implementation of the work, to ensure that every step of the work has scientific rationality. The management of the construction unit should supervise the operation of the employees, so that the work progress can be carried out steadily and each step of the work can be reasonably controlled. The construction personnel should strictly abide by the standardization of the operation, and have a clear understanding of the safety measures used in the implementation of the operation, so as to ensure that the operation error is minimized. Strengthen the inspection of the working conditions of the power equipment, ensure the safety and feasibility of the equipment, meet the requirements of the work, and provide further security for the operators;For power equipment old, need to be replaced in time, and the use of equipment safety inspection, to ensure that its quality reached the standard of electrical work, each work need to be responsible for confirmation, who is in charge of who is in charge of, ensure safety work can be found out, make the safety management work orderly implementation.

3.4. Promote Internet + power security
In order to improve the safety of power transmission and substation work, the power industry should carry out dynamic inspection on the relevant power equipment according to the actual situation, and master the surrounding environment technology, and kill the hidden danger in time. At the same time, but also to develop a detailed inspection and maintenance program, the fault found in accordance with the established program for maintenance, in order to improve the safety and stability of the power system. Timely optimize the business functions of the platform to achieve convenient operation. Using the Internet to introduce the platform browsing mode to further improve the safety performance of the power system.

3.5. Statistical analysis
The development of the power industry will produce a large number of important data, can apply big data technology to achieve data collection and analysis. Data statistics and data analysis in power system need the help of relevant calculation methods. The analysis of field operation data can provide a data basis for the safety of field operation, and then develop effective control measures to improve the safety and stability of field operation, as shown in Figure 3 below.
4. Conclusion
In a word, China's economy is in a good period of rapid development, the demand for electricity is very urgent. In the process of electric power production, whether the on-site operation meets the requirements of safety regulations will directly affect the probability of safety accidents. Problems in the process of electric power production will not only affect the economic benefits of electric power enterprises, but also bring a great impact on the social and economic development, and also have a great impact on people's lives.

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