Intelligent Analysis of Big Data for the Preventing of External Force Destruction on High-voltage Transmission Lines

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Abstract. By constructing an intelligent analysis network, we can analyze autonomously and at the same time interact with the data. It makes the analysis more accurate, and it can construct a systematic model of the results. It can share to each smart terminal through the collation and analysis of the cloud computing library. The process will be transmitted to the background. Through the integration of big data the background collates a model of analysis and share to all the terminals. This will upgrade the ability of thinking on the terminals.

1. Introduction
The power transmission and distribution network passes through the city and the countryside in large numbers. It is disturbed by people's various production and life, and it often appearing some artificial external force destruction events. In particular, the annual average rate of external force damage caused by construction machinery is as high as 55.1% , which causes the trip of transmission and distribution lines and damages the related facilities of transmission lines. Not only bringing losses of life and property to the units and individuals concerned, it also has a serious impact on the safety production of the power supply sector. Due to the frequent, hidden and sudden occurrence of these external destructive events, it is difficult for the power supply department to achieve the ideal prevention and control effect by routine patrol management and traditional video monitoring.

Figure 1. Statistical data
The particularity of "many points, long line and wide area" of transmission line requires a certain scale of devices to have practical significance. Traditional line video monitoring devices generally use video monitoring. It can not find and manage hidden trouble information from the huge data flow and redundant information. At the same time, there are many defects, such as large volume, inconvenient installation and maintenance, high cost, etc.

There are many transmission line monitoring devices on the market. Most of them have the ability to monitor the channel environment, but there are also many problems about them. The monitoring is useless data monitoring for a long period of time, such as the event screen without any potential danger. So it can bring a lot of redundant data and cause passive image analysis. And it also can bring huge pressure to the background.

Therefore, it is of great significance to develop a monitoring system which can capture effective information of hidden danger, and it has low cost, convenient installation, low operation and maintenance cost, long service life and suitable for large-scale deployment.

2. Technical Aspect
In recent years, intelligent video analysis technology has become a hot product in the video surveillance market in China. It has been widely used in urban management, public safety, banking, transportation and other industries. And it has achieved very good social and economic benefits. So it becomes a security enterprise a new technical commanding high point and Development Direction. With the popularization and use of intelligent technology, the market is no longer satisfied with the existing kinds of intelligent technology. And it seeks newer algorithms, richer business applications and more integrated system applications, strive to achieve in the application of the breadth and depth of the breakthrough. Of course, there are some shortcomings.

Most of the current domestic research is in the industry application. These fields generally exist "should" and "answer" mode. We will input the instruction into computer and the computer will give us the corresponding answer. For example, intelligent transportation contains many elements, such as vehicle type, license plate, color, brand and etc. These are the main elements of video analysis. The current recognition analysis ability has been able to accurately analyze the results. By using the software's fixed calculations, we can also figure out if the vehicle is illegal. The computer can't perceive the device's presence or make judgments about what's in the scene. So we have more room to imagine the future.

In the future, the development trend of video surveillance will change from "passive" to "adaptive" mode. It will iteratively upgrade from the results of big data analysis, and optimize more deficiencies. This mainly focuses on the following aspects:
(1) Improve visual sensory experience technology, including image enhancement, video image stabilization and other video processing technologies;
(2) Improve the accuracy of recognition and increase the algorithm to close to 100%;
(3) Improve system application technology, including multi-point video linkage analysis, etc.;
(4) Technologies for post-mortem analysis, including image restoration, image retrieval, etc.

3. Characteristic Analysis
The research aims to use all the collecting terminals as an intelligent terminal, that is, it has the ability of intelligent analysis, and it also has the characteristics of low power consumption, small size and easy installation in the special application scene (no electricity in the field). The multi-dimensional interaction of multiple terminals in a local scene speeds up the results of the computation. It is building an intelligent analysis network that can autonomously analyze and interact with data at the same time, to make the analysis more accurate. The results of analysis builds a systematic model. Through the collation of the cloud computing library it can be shared in each intelligent terminal. So that the intelligent terminal has the ability to learn. Cloud data can be copied out of n intelligent analysis of the terminal, in the "thinking" fixed premise, improve the accuracy rate of thinking oriented. In this way,
we can analyze the external force damage more accurately, and we can have the initiative at the same time. So we can have analysis in advance warning before the external force destruction.

The characteristics and advantages of the Intelligent analysis NPU mainly in three aspects.

3.1. Edge Computing Self-learning
It has the function with edge computing self-learning. For example, when we need to implement image recognition, we must input the result of many different image template and corresponding recognition into NPU. The software will learn to recognize similar images through self-learning function. Self-learning function is particularly important for prediction. Big Data can be used to predict future events and provide guidance.

3.2. Big Data Association and Integration
It has the ability of Big Data association and Integration. The data that be calculated by the intelligent analysis NPU is transferred to the background. And the data of all the terminals are corrected and integrated by the powerful analysis chip in the background, so that the accuracy of iterative analysis can be improved and the data can be integrated to get the best result.

3.3. Searching Optimization Solution at High Speed
It has the ability of searching optimization solution at high speed. In order to find an optimal solution to a complex problem, a large amount of computation is often needed. By using a feedback intelligent analysis network designed for a problem, the high-speed computing ability of the computer can be used to find an optimal solution quickly.

Intelligent analysis is a system that combines hardware and software. The software is mainly used for learning, creating, judging, and the construction of multi-point linkage networks. When we need human intervention during the learning phase, the neural network can still be self-defeating during continuous calculations. And it can improve and enhance the capabilities of each intelligent terminal. Hardware is the carrier of software. And the computing speed of hardware NPU, FPGA, and ASIC also plays a vital role in the efficiency of the conclusion. The intelligent terminal is upgraded through the interactive calculation and sharing of various terminals on the network, and the results obtained will guide our decision-making.

4. Intelligent Analysis of Big Data
The intelligent early-warning terminal for large-scale data of transmission lines is developed, and the intelligent data model is built. Using the model data to draw conclusions to improve the speed of operation, in turn, the model calculation results are accurate.

Interactive operations between intelligent analysis terminals. The amount of information obtained by each neuron is different, so the computing speed is different. How to make the other terminals distribute the computing through the fast transmission of wireless network?

The Algorithms generated between the smart analysis units can be transferred to the big data cloud. We can use the clustering management of the big data to improve the intelligent computing capability of each terminal.

The model by the intelligent analysis algorithm can be used to realize the multi-point interactive transmission of wireless communication and the interactive learning and sharing among the edge computing terminals. So it has the implementation of cluster management in big data cloud.

4.1. The Construction of Neural Network.
Professionally speaking, the work is divided into two large processes. One is called Training and the other is called Inference. The training process needs to have a lot of "good" data, and a Neural network structure that fits your application scenario. The process of training is actually the process of acquiring information features. Every detail of information and the relationship between the details are recorded. It will bring a model with various Weight parameters. The trained model is then deployed to the reasoning device. The reasoning process is to receive new information and then run the reasoning algorithm to get the result. The training recognition analysis process, as shown in the figure 2.
4.2. Distributed Operation of Intelligent Analysis
The 4G /5G network cloud is used to increase the speed and the interaction between the intelligent analysis terminal, which solves the judgment of the result.

4.3. The analytics Sharing Capabilities of Big Data Cloud
The communication transmission in the cloud can make the computing results among the terminals more instructive, thus the pattern of this algorithm is copied, and the computing power of the intelligent terminals is enhanced through the fusion of big data.

![Figure 2. The training recognition analysis process](image)

5. Conclusion
At present, the power transmission tower monitoring on the market is only limited to the passive execution of a single task. It is unable to reach the computing capacity. It can complete the specified operation through a single instruction. And it can not meet the intellectual needs we needed. The real demand of customers is to have intelligent terminals for the power transmission towers. It can be able to achieve multi-point linkage and cooperation to accomplish the task at the terminal scope. The improved algorithm by using replication over the big data cloud increases the computing power of all the smart terminals.

In the future, our intelligent terminal products will be widely used in more fields. All the terminals have the ability of intelligent analysis to realize the technological future of artificial intelligence.

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7. References
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