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Research on Transmission Fault Location Based on Scanning Data

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Abstract: *Aiming at the problem that the conventional transmission line fault location method has a delay in positioning and cannot be timely feedback, a method for fault location of transmission lines based on 3D scan data matching is proposed. 2D feature points are used to obtain three-dimensional point pairs. Structured light projectors and 3D scanning technology are applied to match image feature points and generate mapping relationships with reconstructed 3D space points. Then use point cloud computing to solve three-dimensional coordinates and use features. Click the interpolation result to complete the data matching process. The simulation experiment applies the 3D scanning data matching technology to the operation process of transmission line fault location. The experimental results show that compared with other methods, the method of this paper has the highest detection stability and the advantage of high accuracy of intelligent fault diagnosis, and can give feedback on transmission line faults in time.*

Keywords: *data scan; data matching; transmission line; fault location;*

1. Introduction

Three-dimensional scanning is a composite high-tech,including optical technology,electromechanical technology, and computer technology. It has fast measurement speed, high accuracy, and easy use. It is mainly used to scan the spatial shape, structure and color of objects to obtain The spatial coordinates of the surface of the object to help locate faults on transmission lines. For the lack of research on transmission line fault location based on three-dimensional scanning data matching method, a research on transmission line fault location method based on three-dimensional scanning data matching is proposed. The innovative point of this research is to detect the main features in the original image after obtaining the basic data information of the transmission line, and match the feature points in the image to be matched[1-2]. Finally, a simulation experiment is designed and the validity conclusion is drawn.

2. Design of Fault Location Method for Transmission Line

Since it is impossible to directly contact the measured line during the fault location process of the transmission line, it is necessary to apply three-dimensional scanning technology to calculate the feature information and perform matching, and use the existing two-dimensional feature points to obtain sufficient three-dimensional point pairs[3-4]. In order to protect the transmission line when a fault occurs, it can be detected and repaired in time, and the three-dimensional scanning data can be matched and applied to the fault location of the transmission line. The structured light projector is used to project the defined light spot, light strip or smooth surface onto the surface of the line to be tested, and the image sensor collects the structure of the transmission line.

The light composition image is used to obtain the three-dimensional coordinates of the transmission line surface using the principle of triangle [5-6]. The actual physical image of the image sensor is shown in Figure 1.

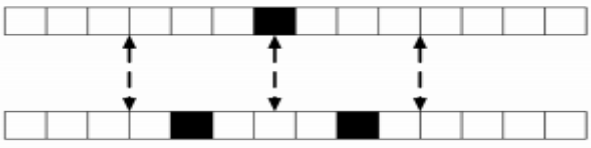

Figure 1. Image feature point difference

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When locating, the main line and branch line must be distinguished first, and some false fault points should be eliminated, so that the calculated fault location can be more accurate [7-9]. If the location of the fault area can be reduced to between two adjacent nodes equipped with power management units, it is impossible to identify whether the fault circuit is on the main line or branch line [10-11], and the power supply at both ends of the transmission line needs to be used. The number of management units is used to identify the specific branch where the fault occurred. The specific situation is shown in Figure 2.

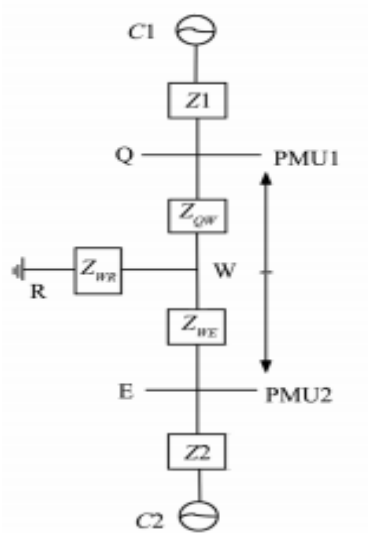

Figure 2. Basic unit diagram of fault section

3. Simulation

In order to verify the effectiveness and feasibility of the proposed transmission line fault location method based on three-dimensional scanning data matching, a simulation experiment was designed to simulate the fault location process, and the obtained results were compared with the original location results, and compared with the literature [3] The method is compared with the method in literature and the experiment is completed. Since the operation status of the transmission line needs to be tested in the experiment, but the actual operation is difficult and there is a certain degree of danger, for this reason, the PSCAD electromagnetic transient simulation software is used to establish a power system fault model, and the simulation experiment is designed with the aid of the model. PSCAD can get

Take the intuitive waveform output curve and use the computer program to complete the subsequent calculations. Select the transmission line power supply model 1AA-120-0500-A as the experimental model.

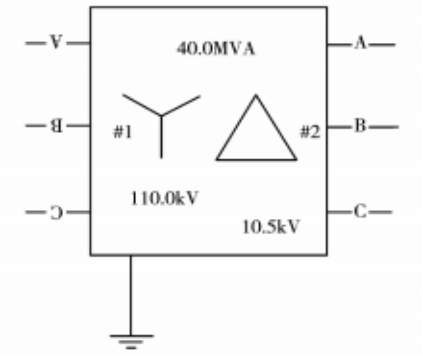

Figure 3. Transformer model diagram

In order to ensure the smooth completion of the experiment, the experimental parameters in Table 1 are used to locate and detect the fault of the transmission line. Select a suitable step-down transformer to ensure the safe operation of the transmission line. The YD11 connection group is used, and its rated capacity is 40MVA. The specific model is shown in Figure 3.

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The simulation time of the transmission line fault location is set to 0. 09s. Assuming that a fault occurs, in order to be able to accurately detect the high-frequency traveling wave signal, the sampling frequency is set to 1Hz. After the original data setting is completed, the simulation of the transmission line In the running state, the fault location result is obtained and compared with the location result of the original method. The specific situation is shown in Figure 4. It can be seen from Figure 4 that in the detection of transmission line fault location stability, the method in this paper has the highest detection stability, while the detection stability of the method in literature [3] and the method in literature [4] cannot timely detect the fault section of the transmission line. Detect and report back to the staff in time. After applying the three-dimensional scanning data matching technology to the fault location of the transmission line, it can be known that the method in this paper is more effective than the method in the literature [3] and the method in the literature [4]. In order to further verify the feasibility of the method in this paper, three methods are used for transmission line fault diagnosis. Figure 4 Comparison of the accuracy of the three methods to detect fault location stability comparison results, the results are shown in Figure 4.

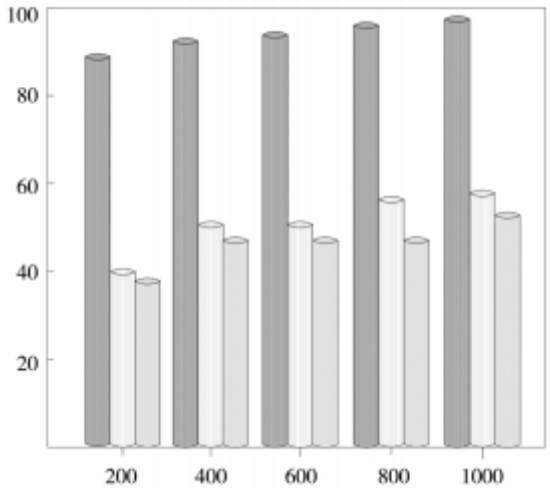

Figure 4. Transmission line data volume

4. Conclusion

The structure of the power system is complex, and it is often affected by natural or man-made factors, which causes the transmission line to fail. For this reason, it is necessary to accurately locate the faulty section. However, due to the many branches of the transmission line and the changeable operation mode, it is difficult to locate the fault. Therefore, a research on the transmission line fault location method based on three-dimensional scanning data matching is proposed, and the three-dimensional point cloud calculation is used to realize the matching processing of data information. The innovative point of the transmission line fault location method based on three-dimensional scanning data matching is to detect the main features in the original image after obtaining the basic data information, and match the feature points in the image to be matched. Experimental results show that this method can ensure the accuracy and rapidity of fault location, and has certain reference value to a certain extent.

References

[1] Fei Chunguo, Huo Hongshuang. Transmission line fault classification based on current amplitude and SVM[J]. Journal of Electric Power System and Automation, 2019, 31(4): 139-144.
[2] Liu Ruilin, Tai Nengling, Fan Chunju, et al. Research on accurate fault location of multi-terminal transmission lines based on positive sequence component[J]. Power System Technology, 2018, 42(9): 3033-3040.
[3] Zhou Hualiang, Rao Dan, Song Bin, et al. Information security protection design and application of the distributed fault diagnosis system for transmission lines[J]. Automation of Electric Power Systems, 2019, 43(15): 193-199.
[4] Jiao Zaibin, Song Xinyao, Li Bingxu, et al. A transmission line fault location method using 2-level back propagation neural network[J]. Journal of Xi'an Jiaotong University, 2019, 53(9):61-69.
[5] Kulikov A L, Anan'ev V V. An adaptive fault-location method for a power-transmission line using

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pulse registration on a high-frequency wave path[J].Russian Electrical Engineering, 2018, 89 (1): 26-31.

[6] Zhang Yanxia, Wang Haidong, Li Ting, et al. A combined single-ended fault location method for LCC-VSC hybrid DC transmission lines[J]. Automation of Electric Power Systems, 2019, 43(21): 187-199.

[7] Deng Yu-jia, He Zheng-you, Fu Ling, et al. Research on fault location scheme for inverter AC transmission line of AC-DC hybrid system[J]. IEEJ Transactions on Electrical & Electronic Engineering, 2018, 13(3): 455-462.

[8] Wang Mengke, Cai Fudong. SR-WT-based transmission line double-ended fault location method Method [J]. Hydropower Energy Science, 2019, 37(7): 154-156.

[9] Peng Nan, Yang Zhi, Liang Rui, et al. A distributed traveling wave ranging method for half-wavelength transmission lines[J]. Journal of Electrical Engineering and Control, 2019, 23(8): 35-42.

[10] Yu H, Ma C, Wang H. Transmission line fault location method based on compressed sensing estimation of traveling wave natural frequencies[J]. 2017, 32(23): 140-148.

[11] Yang An, Kong Chuixiang, Zhu Longji. A traveling wave fault location method for T-type transmission lines Method [J]. Chinese Science and Technology Papers, 2019, 14(7): 749-753.