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模块化多电平变换器

行波理论支持下多电源配电网故障定位系统

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Fault Location System for Multi-power Distribution Network Based on Travelling Wave Theory

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摘要

由于传统配电网故障定位方法缺少对多个Agent之间的通信协调,导致定位精准度低、可靠性差等问题,为此研究并提出基于行波理论设计多电源配电网故障定位系统。采用.NET平台三层B/S结构体系设计故障行波定位信息处理子系统,通过数据处理模块处理获取数据信息,筛选多电源配电网故障信息,并在.NET平台上发布多电源配电网故障信息。当故障行波定位子系统发出调用数据命令时,故障行波定位信息处理子系统将故障信息传输到故障行波定位子系统中。通过多个Agent之间的通信协作调用故障数据,同时利用多端行波故障定位方法对故障数据进行定位,实现多电源配电网的故障定位。经过实验证明,与其他两种系统相比,所设计系统故障定位精准度在90%以上,系统故障定位精准度高。

Abstract

Due to the lack of communication and coordination between multiple agents in the traditional fault location method for distribution network, the positioning accuracy is low and the reliability is poor. To solve this problem, a fault location system for multi-power distribution network based on the travelling wave theory is designed in this paper. A three-layer B/S structure system on the.net platform is adopted to design a fault travelling wave positioning information processing subsystem. The data information is obtained through a data processing module, the fault information of multi-power distribution network is screened, and the fault information of multi-power distribution network is published on the.net platform. When the fault travelling wave positioning subsystem issues a call data command, the fault travelling wave positioning information processing subsystem will transmit the fault information to the fault travelling wave positioning subsystem. The fault data is invoked through the communication and coordination between multiple agents. Meanwhile, the fault data is located using the multi-terminal travelling wave fault location method, so as to realize the fault location of multi-power distribution network. Experimental results show that compared with two comparison systems, the designed system has a high fault location accuracy, which is more than 90%.

关键词

行波理论;多电源配电网;故障定位;行波定位;Agent

Key words

travelling wave theory;multi-power distribution network;fault location;travelling wave positioning;Agent

引用本文

参考文献

[1] 史帅彬,曾江,康文韬,等.具有谐波抑制功能的电网电能质量最优控制方法[J].电源学报, 2022, 20(1):158-164. Shi Shuaibin, Zeng Jiang, Kang Wentao, et al. Optimal control method for grid power quality with harmonic suppression function[J]. Journal of Power Supply, 2022, 20(1):158-164(in Chinese).
[2] 严凤,许海梅.基于神经网络的配电线路综合故障定位方法[J].电力系统及其自动化学报, 2015, 27(5):86-91. Yan Feng, Xu Haimei. Composite fault location method based on PNN for distribution lines[J]. Proceedings of the CSU-EPSA, 2015, 27(5):86-91(in Chinese).
[3] 孙广,王阳,薛枫,等.特高压直流输电线路改进双端行波故障定位方法研究[J].电力系统保护与控制, 2020, 48(14):8. Sun Guang, Wang Yang, Xue Feng, et al. Research on an im-proved double-terminal traveling wave fault location method for UHVDC project[J]. Power System Protection and Control, 2020, 48(14):8(in Chinese).
[4] 赵海龙,王鑫红,高昌龙.基于FIMD和Hilbert变换的高压输电线路行波故障定位方法[J].电测与仪表, 2020, 57(18):77-82+89. Zhao Hailong, Wang Xinhong, Gao Changlong. Traveling wave fault location method for high voltage transmission lines based on FIMD and Hilbert transform[J]. Electrical Measurement&Instrumentation, 2020, 57(18):77-82+89(in Chinese).
[5] 梅军,张丙天,朱鹏飞,等.基于故障电流主动控制的柔性直流配电网故障定位方法[J].电力系统自动化, 2021, 45(24):133-141. Mei Jun, Zhang Bingtian, Zhu Pengfei, et al. Fault Location Method of Flexible DC Distribution Network Based on Active Control of Fault Current[J]. Automation of Electric Power Systems, 2021, 45(24):133-141(in Chinese).
[6] 汪海宁,叶小凡,张长志,等.含分布式光伏及储能变流器的微网故障特征与保护[J].电源学报, 2020, 18(6):59-69. Wang Haining, Ye Xiaofan, Zhang Changzhi, et al. Fault characteristics and protection of micro-grid containing distributed photovoltaic and energy-storage converters[J]. Journal of Power Supply, 2020,18(6):59-69(in Chinese).
[7] 钟庆,熊能,王钢,等.基于电压暂降监测数据分析的配电网故障定位[J].电力电容器与无功补偿, 2021, 42(2):97-102. Zhong Qing, Xiong Neng, Wang Gang, et al. Fault Location of Distribution Network Based on Voltage Sag Monitoring Data Analysis[J]. Power Capacitor&Reactive Power Compensation, 2021, 42(2):97-102(in Chinese).
[8] 付华,范国霞.煤矿配电网电压暂降源辨识模型[J].电源学报, 2019, 17(1):159-164, 170. Fu Hua, Fan Guoxia. Voltage sag source identification model for distribution network of coal mine[J]. Journal of Power Supply, 019, 17(1):159-164, 170(in Chinese).
[9] 李培培,王湘女,汪波,等.基于电流相位变化的有源配电网故障区段定位[J].山东电力技术, 2019, 46(9):1-7. Li Peipei, Wang Xiangnv, Wang Bo, et al. Fault location in active distribution network based on the change of current phase[J]. Shandong Electric Power, 2019, 46(9):1-7(in Chinese).
[10] 高传新,陈皓,郑思琦,等.一种基于改进阻抗法的直流微网故障定位方法[J].电测与仪表, 2021, 58(5):151-158. Gao Chuanxin, Chen Hao, Zheng Siqi, et al. A fault location method for DC micro-grid based on the improved impedance method[J]. Electrical Measurement&Instrumentation, 2021, 58(5):151-158(in Chinese).
[11] Hamidi R J, Livani H. Traveling-wave-based fault-location algorithm for hybrid multiterminal circuits[J]. IEEE Transactions on Power Delivery, 2017, 32(1):135-144.
[12] 丁昱.基于B/S架构的带式输送机故障诊断系统的研究与实现[J].煤炭技术, 2020, 39(4):200-202. Ding Yu. Research and implementation of belt conveyor fault diagnosis system based on B/S architecture[J]. Coal Tec-hnology, 2020, 39(4):200-202(in Chinese).
[13] 陈君.基于B/S结构的异构数据库加密算法仿真[J].计算机仿真, 2021, 38(4):236-239, 262. Chen Jun. Simulation of Heterogeneous Database encryption algorithm based on B/S structure[J]. Computer Simulation, 2021, 38(4):236-239, 262(in Chinese).
[14] 赵思远,徐康泰,郎博宇,等.基于故障清除专用自阻模块的改进型MMC运行控制策略[J].电力自动化设备, 2021, 41(5):189-195. Zhao Siyuan, Xu Kangtai, Lang Boyu, et al. Operating control strategy of advanced MMC based on fault-clearing special self-resistance module[J]. Electric Power Automation Equipment, 2021, 41(5):189-195(in Chinese).
[15] 柳璐,李林芝,卢天琪,等.基于网页链接分析的电力系统连锁故障关键环节辨识方法[J].电力系统自动化, 2021, 45(10):25-33. Liu Lu, Li Linzhi, Lu Tianqi, et al. Critical Link Identification Method for Cascading Failure in Power Systems Based on Web Link Analysis[J]. Automation of Electric Power Systems, 2021, 45(10):25-33(in Chinese).
[16] 王辉,郝丽丽,黄梅,等.基于历史故障信息的配电网设备故障概率建模[J].电力自动化设备, 2020, 40(3):76-84. Wang Hui, Hao Lili, Huang Mei, et al. Failure probability model of distribution network equipment based on historical fault information[J]. Electric Power Automation Equipment, 2020, 40(3):76-84(in Chinese).

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