

自动化

基于仙农模糊熵的融合故障选线方法

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摘要:

利用S变换对零序电流和零序电压进行分解, 提取S变换结果中的幅值和相角作为故障特征量。研究了仙农模糊熵的涵义, 通过模糊熵和不确定性的关系, 定义了信心度来刻画一个事件是否发生的确定性。介绍了2种基于S变换的故障选线方法(比相法和能量函数法)的基本原理, 基于定义的信心度对2种选线方法得到的选线结果进行了融合, 从而选定故障线路。该方法的最终结果不仅包括选定故障线路, 而且给出选定该线路发生故障的信心度(fault line identify confidence degree, FLICD)。在PSCAD/EMTDC中建立了4馈线的配电系统仿真模型, 通过仿真验证表明, 该方法的正确率高。对融合方法和单一方法在噪声环境下的表现进行了对比, 结果表明融合方法具有较强的抗噪性。

关键词: 小电流接地系统 故障选线 仙农模糊熵 选线信心度

A Shannon Fuzzy Entropy Based Approach to Merge Fault Line Selection Results

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Abstract:

Applying S-transform to the decomposition of zero-sequence current and voltage, the amplitudes and phases in the results of S-transform are chosen as fault characteristic quantities. The meaning of Shannon fuzzy entropy is researched and by means of the relation between fuzzy entropy and uncertainty the confidence degree is defined to depict the certainty whether the event occurs or not. The principles of two fault line selection methods based on S-transform, i.e., the phase comparison method and the energy function method, are presented, and based on the defined confidence level the fault line selection results from the two methods are merged, and then the fault line can be determined. The final results of the proposed method not only can determine the fault line, but also can give the fault line identify confidence degree by which the fault happens in the selected line. On PSCAD/EMTDC platform a simulation model for distribution system with four feeders is built, and simulation results show that fault line identification by the proposed method possesses high correct recognition rate. In noisy environment the behavior of merged fault line selection method is compared with that of single fault line selection method, and comparison result shows that the former possesses stronger anti-noise performance.

Keywords: small current neutral grounding system fault line selection Shannon fuzzy entropy confidence degree of fault line identification

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