A novel discrete wavelet transform-based graphical language classifier for identification of high-impedance fault in distribution power system

ABSTRACT

This paper proposes a discrete wavelet transform (DWT)-based Graphical Language classifier algorithm for identification of high-impedance fault (HIF) in medium voltage (MV) distribution network of 13.8 kV. The proposed method of classifier is developed using virtual instrumentation LabVIEW facility, for detection of various faults such as symmetrical, unsymmetrical, and HIF in the system. Initially, the MV distribution feeder network has been modeled in MATLAB/Simulink, and the DWT analysis has been carried out with the introduction of various faults in the network to extract the features. The extracted features such as SD and energy values from the fault current signals have been applied to the proposed classifier algorithm to identify the type of fault. The effectiveness of the presented method has been tested and compared with the similar conventional fuzzy-based approach. The results indicate that the proposed classifier algorithm outperforms to give 100% accuracy, while the fuzzy-based approach misclassifies the double line to ground fault (LLG), three-phase fault (LLLG), and HIF. Furthermore, the proposed algorithm with LabVIEW facility is more flexible and can be implemented in real time using data acquisition unit for obtaining fault current signal from power system.

Keyword: Discrete wavelet transform (DWT); Fuzzy inference system (FIS); Graphical language(GL) classifier; High-impedance fault (HIF); Medium voltage distribution network