A Data-Mining Model for Protection of FACTS-Based Transmission Line

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Abstract : This paper presents a data-mining model for fault-zone identification of flexible AC transmission systems (FACTS)-based transmission line including a thyristor-controlled series compensator (TCSC) and unified power-flow controller (UPFC), using ensemble decision trees. Given the randomness in the ensemble of decision trees stacked inside the random forests model, it provides an effective decision on the fault-zone identification. Half-cycle post-fault current and voltage samples from the fault inception are used as an input vector against target output '1' for the fault after TCSC/UPFC and '1' for the fault before TCSC/UPFC for fault-zone identification. The algorithm is tested on simulated fault data with wide variations in operating parameters of the power system network, including noisy environment providing a reliability measure of 99% with faster response time (3/4th cycle from fault inception). The results of the presented approach using the RF model indicate the reliable identification of the fault zone in FACTS-based transmission lines.

Keywords : distance relaying, fault-zone identification, random forests, RFs, support vector machine, SVM, thyristor-controlled series compensator, TCSC, unified power-flow controller, UPFC

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