Single Pole-To-Earth Fault Detection and Location on the Tehran Railway System Using ICA and PSO Trained Neural Network

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Abstract : Detecting the location of pole-to-earth faults is essential for the safe operation of the electrical system of the railroad. This paper aims to use a combination of evolutionary algorithms and neural networks to increase the accuracy of single pole-to-earth fault detection and location on the Tehran railroad power supply system. As a result, the Imperialist Competitive Algorithm (ICA) and Particle Swarm Optimization (PSO) are used to train the neural network to improve the accuracy and convergence of the learning process. Due to the system's nonlinearity, fault detection is an ideal application for the proposed method, where the 600 Hz harmonic ripple method is used in this paper for fault detection. The substations were simulated by considering various situations in feeding the circuit, the transformer, and typical Tehran metro parameters that have developed the silicon rectifier. Required data for the network learning process has been gathered from simulation results. The 600Hz component value will change with the change of the location of a single pole to the earth's fault. Therefore, 600Hz components are used as inputs of the neural network when fault location is the output of the network system. The simulation results show that the proposed methods can accurately predict the fault location.

Keywords : single pole-to-pole fault, Tehran railway, ICA, PSO, artificial neural network