UNIVERSITI PUTRA MALAYSIA

FAULT DIAGNOSIS IN UNBALANCED RADIAL DISTRIBUTION NETWORKS USING GENERALISED REGRESSION NEURAL NETWORK

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FAULT DIAGNOSIS IN UNBALANCED RADIAL DISTRIBUTION NETWORKS USING GENERALISED REGRESSION NEURAL NETWORK

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Faculty : Engineering

Fault location includes the determination of the physical location of the fault. Nowadays, about 80% of interruptions are caused by faults in distribution networks and the application of fault location algorithms developed for transmission system is not an easy task due to the topology and operating principles of the distribution networks. This thesis describes the technique of Probabilistic Neural Network (PNN) for fault type classification and Generalised Regression Neural Network (GRNN) for estimating the fault location. The results were compared with radial basic function neural network (RBFN) and feed forward neural network (FFNN).

The artificial intelligence (AI)-based fault locator has been implemented on a typical IEEE 13 node test feeder as short feeder with the feeder's nominal voltage is 4.16 kV. It is radial, unbalanced and includes both overhead line and underground cable and the 76-bus radial distribution system as a long feeder with two long main feeders

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63/20 kV and 76 buses 20 kV. The neural network used only the voltage and current measurements obtained at the substation. The training patterns used to train the ANN model for fault location in radial distribution system were obtained by short circuit analysis under various fault conditions and fault impedances. To achieve this goal, the initial or pre-fault condition of the system has to be computed. Using the proposed method, less learning time of PNN is required for classification. The GRNN results show the effectiveness of the proposed method with good accuracy, as the fault point location determination is very close to the actual point with acceptable convergence time and accuracy.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

DIAGNOSIS KEROSAKAN DALAM RANGUAIAN AGIHAN TAK SEIMBANG MENGGUNAKAN GENERALISED REGRESSION NEURAL NETWORK

Oleh

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Lokasi gangguan meliputi penentuan lokasi fizikal gangguan. Saat ini, sekitar 80% dari gangguan disebabkan oleh kesalahan dalam rangkaian pengagihan dan aplikasi algoritma lokasi gangguan yang dibangunkan untuk sistem penghantaran bukanlah tugas yang mudah kerana prinsip topologi dan operasi. Tesis ini menjelaskan teknik Probabilistic Neural Network (PNN) untuk klasifikasi jenis gangguan dan Generalised Regression Neural Network (GRNN) untuk menganggarkan lokasi gangguan. Hasilnya dibandingkan dengan Radial Basic Function Neural Network (RBFN) dan Feed Forward Neural Network (FFNN).

Penempat gangguan berasaskan kecerdasan buatan (AI) telah dilaksanakan pada IEEE 13 nod penyuap ujian yang biasa sebagai penyuap singkat dengan voltan nominal suapan adalah 4.16 kV. Ianya radial, tidak-seimbang dan merangkumi kedua-dua saluran udara dan kabel bawah tanah dan sistem pengagihan radial 76 bas

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sebagai penyuap panjang dengan dua penyuap panjang utama 63/20 kV dan 76 bas 20 kV. Rangkaian saraf hanya menggunakan pengukuran arus dan voltan yang diperolehi di pencawang. Pola-pola latihan yang digunakan untuk melatih model ANN untuk penempatan gangguan dalam sistem pengagihan radial diperolehi dengan analisis litar pintas di bawah keadaan gangguan pelbagai dan galangan gangguan. Untuk mencapai tujuan ini, keadaan awal atau pra-kesalahan sistem harus dikira. Dengan menggunakan kaedah yang dicadangkan, pengurangan waktu belajar PNN diperlukan untuk klasifikasi. Keputusan GRNN menunjukkan keberkesanan kaedah yang dicadangkan dengan ketepatan yang baik, di mana penentuan titik lokasi gangguan sangat dekat dengan titik yang sebenarnya dengan masa penemuan dan ketepatan yang boleh diterima.

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I certify that an examination committee met on month/date/year to conduct the final examination of Maryam Mirzaei on her Master of Science thesis entitled "Fault Location Determination in Unbalanced Radial Distribution Networks using Generalised Regression Neural Network (GRNN) " in accordance with Universiti Putra Malaysia (higher degree) act 1981 and Universiti Pertanian Malaysia (higher degree) regulations 1981. The committee recommends that the candidate be awarded the relevant degree.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

_____

MARYAM MIRZAEI

Date: 22 February 2011

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