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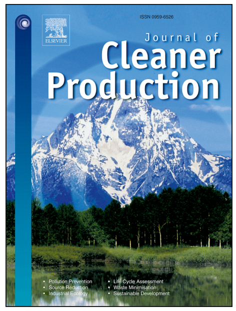

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Generalized Three Phase Robust Load-Flow for Radial and Meshed Power Systems with and without Uncertainty in Energy Resources using Dynamic Radial Basis Functions Neural Networks

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Abstract: This paper presents a new approach for robust load-flow in radial and meshed electric power systems. In the presented method, with an acceptable level of accuracy, and even exact, the ability of radial basis function (RBF) artificial neural networks (ANNs) for nonlinear mapping is exploited to solve nonlinear equation set of load flow analysis that can be applied to a wide range of nonlinear equation sets. Unlike Newton Raphson (NR) method, the proposed method does not need to calculate partial derivatives and inverse Jacobian matrix and so has less computation time. Moreover, it is suitable for the radial and ill-conditioned networks that have higher values of R/X ratio. The method includes all types of buses, i.e. *PQ*, *PV* and Slack buses. The proposed method is a general method which is applicable to all types of power system networks, including radial, meshed, and open-loop. The proposed method is applied to different power and distribution test systems and compared with the other load-flow methods and the results validate its authenticity, robustness, efficiency and accuracy.

Key Words: Dynamic Artificial Neural Networks, Radial Basis Functions, Load Flow, Nonlinear Equations.

Nomenclature

Symbol	Definition
P_i , Q_i	The injected active/reactive powers to *i*th bus
V_i , δ_i	The voltage magnitude/phase angle at bus *i*
Y_{ij} , θ_{ij}	The magnitude/argument of the *ij*th element of y_{bus} matrix
N	Number of Buses
$[P]_{abc}$, $[Q]_{abc}$	Three phase real/reactive powers vectors
$[V]_{abc}$	Three-phase voltage Magnitude vector
$[\delta]_{abc}$	Three-phase voltage phase angle vector
YBabc	The elementary three-phase YBUS matrix
$[P]_{abc}$, $[Q]_{abc}$	Three phase real/reactive power vectors
V_0	Desired Magnitude of Bus Voltage