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Adaptation of a Circuit Theory Method to Allocate Transmission Usage in Bilateral Transaction with Artificial Neural Network

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Abstract

This paper proposes a method to allocate transmission usage for simultaneous bilateral transactions using artificial neural network (ANN). The basic idea is to use supervised learning paradigm to train the ANN, utilising a conventional circuit theory method as a teacher. Based on solved load flow and followed by a procedure to decouple the line usage on the basis of transaction pairs, the description of inputs and outputs of the training data for the ANN is obtained. The structure of artificial neural network is designed to assess the extent of line usage by each generator while supplying to their respective customer. Most commonly used feedforward architecture has been chosen for the proposed ANN based transmission usage allocation technique. Almost all the system variables obtained from load flow solutions are utilized as an input to the neural network. Moreover, tan-sigmoid activation functions are incorporated in the hidden layer to realize the non linear nature of the transmission usage allocation. The proposed ANN provides promising results in terms of accuracy and computation time. A 6-bus and also the modified IEEE 14-bus network is utilized as test systems to illustrate the effectiveness of the ANN output compared to that of conventional methods.