

A Comparative Study on ANN, ANFIS and SVM Methods for Computing Resonant Frequency of A-Shaped Compact Microstrip Antennas

Authors : Ahmet Kayabasi, Ali Akdagli

Abstract : In this study, three robust predicting methods, namely artificial neural network (ANN), adaptive neuro fuzzy inference system (ANFIS) and support vector machine (SVM) were used for computing the resonant frequency of A-shaped compact microstrip antennas (ACMAs) operating at UHF band. Firstly, the resonant frequencies of 144 ACMAs with various dimensions and electrical parameters were simulated with the help of IE3D™ based on method of moment (MoM). The ANN, ANFIS and SVM models for computing the resonant frequency were then built by considering the simulation data. 124 simulated ACMAs were utilized for training and the remaining 20 ACMAs were used for testing the ANN, ANFIS and SVM models. The performance of the ANN, ANFIS and SVM models are compared in the training and test process. The average percentage errors (APE) regarding the computed resonant frequencies for training of the ANN, ANFIS and SVM were obtained as 0.457%, 0.399% and 0.600%, respectively. The constructed models were then tested and APE values as 0.601% for ANN, 0.744% for ANFIS and 0.623% for SVM were achieved. The results obtained here show that ANN, ANFIS and SVM methods can be successfully applied to compute the resonant frequency of ACMAs, since they are useful and versatile methods that yield accurate results.

Keywords : a-shaped compact microstrip antenna, artificial neural network (ANN), adaptive neuro-fuzzy inference system (ANFIS), support vector machine (SVM)

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