COMBINATION OF ARTIFICIAL NEURAL NETWORKS 
AND GENETIC ALGORITHM - GAMMA TEST METHOD 
IN PREDICTION OF ROAD TRAFFIC NOISE

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Abstract

This paper proposes an expert system based on Artificial Neural Networks (ANNs) to model road traffic noise. Feed-Forward Neural Networks (FFNNs) that are trained with the Levenberg-Marquardt back-propagation algorithm were used. Models were evaluated using mean squared error (MSE) and coefficient of determination (R²) as statistical performance parameters. In traffic noise modelling, the noise level at a receptor position due to the source of traffic emission is modelled as a function of the traffic conditions, road gradient, road dimensions, speed and height of buildings around the road. The curse of dimensionality problems is caused by the large number of input variables in the ANN model. The Hybrid Genetic Algorithm-Gamma Test (GA-GT) as a data pre-processing method for determining adequate model inputs was also evaluated. Genetic algorithms are frequently used for the selection of input variables, and, therefore, reduce the total number of predictors. Through the hybrid model, six out of twelve sets of predictor candidates were introduced as input variables in the ANN model. Comparing the results of the hybrid model (ANN-GA-GT) with those of the ANN model indicates that the hybrid model has more advantages, such as improving performance prediction, reducing the cost of future measurements and less computational and data storage requirements. Consequently, the ANN-GA-GAMMA model is recommended as a proper method for predicting traffic noise level.

Key words: back propagation network, expert system, genetic algorithm, neural network modelling, noise pollution

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