Abstract

This paper presents a systematic neural network approach based on the concept for Learning from Examples for the prediction of aerodynamic characteristics from the Wind tunnel test data. Aerodynamic coefficients are modeled as functions of angle of attack, Normal force coefficient, Mach number, and Lift force Coefficients. The training data which is fed as the input to the
neural network is derived from wind tunnel test measurements and numerical simulations. In this paper, a comparative study of the efficiency of neural network prediction based on LFE (Learning from Examples) for different architectures and training dataset sizes is presented. The results of the prediction reflect the sensitivity of the architecture and training dataset size. For a training set of 136 data points and a training set with Mach number ranging from 0.6 to 3, the Generalized Regression Neural network (GRNN) constantly outperformed the Radial basis function neural network and Backpropagation network regression model in time effectiveness. The objective of this paper is to demonstrate that the neural network approach based on the concept of learning from examples is a fast and reliable way for predicting aerodynamic coefficients.

References

Computer Science

Index Terms

Artificial Intelligence

Keywords

Wind tunnel test
Back propagation neural network
Mach number

Radial basis function neural network