

APPLICATIONS OF ARTIFICIAL NEURON NETWORKS FOR SOLUTION OF AN INVERSE PROBLEM OF GAS DYNAMICS OF COMPRESSOR

This paper presents a solution of an inverse problem of the gas dynamics of compressor cascades using artificial neural networks (ANN) by summarizing the experimental data resulting from plane cascades purging. The technique for determination of geometrical parameters of the cascade of profiles for given parameters of the flow at infinity in front and behind the cascade is developed using the solution proposed. The technique uses ANN, the architecture of which is a multilayer perceptron, for calculations of aerodynamic characteristics of the cascade of profiles. The modified model of a classical genetic algorithm is used for ANN designing. Network training is performed using the error backpropagation method. The effectiveness of the developed technique was evaluated by solving an inverse problem of the gas dynamics for given flow parameters and a subsequent determination of aerodynamic characteristics of the cascade, based on a numerical simulation of the turbulent gas flow. The results obtained confirm the robustness of the technique reported for solving inverse problems of the gas dynamics of compressor cascades using ANN for generalization of the experimental data. The results of this work can be used at the stage of a conceptual design of compressor wheels for aircraft gas turbine engines and various power plants. The application of these results will automate and improve the design process, energy characteristics of the produced prototypes.

Keywords: compressor cascade, inverse problem of gas dynamics, aerodynamic characteristics, geometrical parameters of cascade, artificial neuron network, design of artificial neuron network, multilayer perceptron.

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