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人工神经网络在飞机总体外形智能CAD中的应用

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APPLICATION OF ARTIFICIAL NEURAL NETWORKS IN INTELLIGENT CAD OF AIRCRAFT PRELIMINARY CONFIGURATION DESIGN

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摘要 将人工神经网络应用于飞机总体外形智能CAD中，针对现有方法的局限性，研究了参数神经网络，提出了一种综合考虑影响神经网络学习3个主要因素（权值、激励函数和拓扑结构）的WAFS学习算法，并研究了隶属函数的神经网络表达和基于神经网络的并行推理，给出了有关应用实例。

关键词： 人工神经网络 飞机总体外形 智能CAD

Abstract: Aircraft preliminary configuration design is a complicated engineering design. Although the fuzzy set theory and an expert system have been applied to it, both of them have their own difficulties, i.e., the specification of membership function for a fuzzy set, and the knowledge acquisition bottleneck and the low inference efficiency in the expert system. In this paper, artificial neural networks (ANNs) are applied to the intelligent CAD of aircraft preliminary configuration designs. Parametric neural network and WAFS (Weight, Activation Function and Structure) learning algorithm are proposed to overcome the slow learning speed and hard determined network size problems in the back propagation neural network. Membership function representation by ANN and parallel reasoning methods based on ANN are studied. Some examples in aircraft preliminary configuration designs are presented to demonstrate the effectiveness of the proposed ANN methods.

Keywords: ar tificial neur al networ k aircr aft preliminar y configur ation intelligent CAD

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