

发电

基于拉盖尔模拟神经网络的过热汽温直接自适应控制系统

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摘要: 提出一种Laguerre(拉盖尔)模拟复合正交神经网络并应用于电厂过热汽温的直接自适应控制。模拟神经网络被作为直接自适应控制器,这种单隐层正交神经网络是基于Laguerre复合正交多项式函数,并具有在线连续学习的简单算法,且学习算法与被控对象模型无关。由于采用3层网络结构,输入层与隐层之间不用权值调整,在学习算法中只要在输出层与隐层之间寻找最佳权值,因此网络学习速度较快。网络隐层节点(处理元)是Laguerre多项式展开项,展开项的多少决定着网络的学习速度和精度。通过对具有严重参数不确定性、扰动以及大延迟的电厂过热汽温被控对象进行仿真研究,结果表明控制系统性能优于常规的PI控制系统。

关键词: 模拟复合正交神经网络 拉盖尔复合正交多项式 连续学习算法 直接自适应控制 过热汽温

Direct Adaptive Control System of Super-heated Steam Temperature Based on Laguerre Analog Neural Network

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Abstract: A kind of Laguerre analog compound orthogonal neural network was presented and was applied to the direct adaptive control of super-heated steam temperature in a power plant. Herein, the analog neural network was developed to employ the direct adaptive controller. This single-hidden layer orthogonal neural network is based on Laguerre compound orthogonal polynomial function and has a simple learning algorithm that is derived from an on-line continuously learning, and the learning algorithm is not relative to the controlled plant model. Owing to using the three-layer network structure and no weight adjustment between the input and the hidden layer, the learning algorithm is used to search for optimum weights between only the hidden layer and the output layer. Therefore, the orthogonal neural network has fast learning speed. A node(a processing element) in the hidden layer of the network is an expansion term of the Laguerre polynomials. More or less terms determine the network learning speed and accuracy. Simulation for the super-heated steam temperature in a power plant was carried out under such a control that had a severe uncertainty of parameters and disturbance, as well as a large time-delay. The results show that the control system performance is superior to the conventional PI control system.

Keywords: analog compound orthogonal neural network laguerre compound orthogonal polynomials continuously learning algorithm direct adaptive control super-heated steam temperature

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