

过程系统工程

利用结构逼近式混合神经网络实现间歇反应器的建模

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摘要

提出了一种新的混合神经网络建模方法——结构逼近式混合神经网络。基于此结构建立的混合神经网络可以充分利用已知非线性系统的结构信息,使神经网络“灰盒”化,更好地解释和描述系统各变量间的因果关系,从而提高网络的建模精度和模型的可靠性。本文介绍了这类神经网络的基本特性、拓扑结构和训练方法。报告了一个典型放热液相二级平行间歇反应的建模过程;并针对间歇反应过程测量滞后的情况,与两种不同的混合神经网络模型作了比较,仿真和比较结果证明了方法的有效性。

关键词

[结构逼近式混合神经网络](#) [间歇反应器](#) [建模](#) [串联混合神经网络](#)

分类号

Modeling of batch reactor based on structure approaching hybrid neural networks approach

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Abstract

A new hybrid neural networks modeling approach, named structure approaching hybrid neural network (SAHNN) is presented in this paper. The characteristics and structure of this approach are introduced. The approach which combines first-principles model with neural networks fully utilizes structural information of known nonlinear system, makes neural networks a “grey-box”, describes and explains the consequence relation of system variables in a better way. A detailed analysis of SAHNN modeling was performed. Considering delayed measurement of outputs, simulation of a chemical batch reactor was performed and comparison of two types of hybrid neural network (HNN) was made. The results of simulation and comparison showed that the approach was a promising tool to model complicated nonlinear system effectively and could be utilized as a vehicle to control and optimize chemical reactors.

Key words

[SAHNN](#) [batch reactor](#) [modeling](#) [HNN](#)

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