

过程系统工程

基于多目标的模糊神经网络及在pH控制过程中的应用

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摘要

设计了一种基于多目标的动态模糊递归神经网络(FRNN)建模方法,用于pH中和过程的广义预测控制。所设计的多目标优化算法以提高拟合精度和简化网络结构为原则,同时优化模糊神经网络中的模糊规则数、隶属度函数中心点及其宽度,由此得到的FRNN模型可以高精度拟合pH中和过程。依据该动态模型,在控制过程的每一个控制周期得到其局部线性模型,将广义预测控制中复杂的非线性优化问题转化为简单的二次线性规划问题。仿真对比结果验证了所提方法的有效性。

关键词

[多目标优化](#) [模糊递归神经网络](#) [广义预测控制](#) [pH中和过程](#)

分类号

Multi-objective optimization based FRNN and its application to pH control process

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Abstract

A multi-objective optimization based dynamic fuzzy recurrent neural network (FRNN) modeling method was designed to control the pH neutralization process by generalized predictive controller (GPC). To improve the FRNN fitting accuracy and simplify the network structure, a multi-objective optimization algorithm was proposed to optimize fuzzy rule numbers, center points and widths of Gaussian membership functions. The dynamic FRNN model was then obtained to precisely fit the pH neutralization process. Based on the dynamic model, the local linear model could be obtained at every control period. The complex non-linear optimization problem of GPC was changed into a simple quadratic linear programming problem. Simulation results showed the feasibility of the proposed method.

Key words

[multi-objective optimization](#) [fuzzy recurrent neural network](#) [generalized predictive control](#) [pH neutralization process](#)

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