

热工自动控制

一种改进的遗传多目标优化算法及其应用研究

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摘要

为解决含多个目标和多约束的优化问题, 本文结合了非支配排序思想、精英保留策略、小生境技术, 并对传统的小生境技术中基于个体适应度的淘汰技术进行改进, 提出了一种向量模适应度函数来作为淘汰准则, 得到一种改进的Pareto遗传多目标优化算法。通过最小化两个多元目标函数, 验证了该算法能够获得更加均匀分布的Pareto前沿, 避免了局部收敛的问题。在此基础上, 将改进多目标优化算法用于PID控制器参数整定, 以锅炉过热汽温串级控制系统为例进行了仿真研究。结果表明改进的遗传多目标优化算法可以获得多组对应不同性能指标的控制器参数, 为决策者提供了更多的选择余地, 具有很好的应用价值。

关键词 [遗传算法](#) [多目标优化](#) [非支配排序](#) [精英保留](#) [小生境技术](#) [PID参数整定](#)

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An Improved Genetic Algorithm in Multi-objective Optimization and Its Application

Abstract

For solving Multi-objective and multi-restriction optimization problem, this paper used non-dominated ranking method, elitist preserve strategy, niche approaches, and presented an individual vector module adaptive function as wash out rule, then an improved Pareto multi-objective optimization with genetic algorithm was found. Minimized two duality functions and indicated that this method avoids the problem of local convergent and optimal solutions distribute more uniformity. Based on it, this algorithm was used to PID controller parameters tuning, and the boil superheated steam temperature cascade control system is used as an example for simulation research. The results suggested that the application of multi-objective optimization with GA can obtain many controller parameters corresponding different performance targets, with more choices are offered to decision-makers, and has high application value.

Key words [Genetic algorithm](#) [Multi-objective optimization](#) [Non-dominated ranking](#) [Elitist preserve](#) [Niche approaches](#) [PID parameters tuning](#)

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