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热工自动控制

基于菌群－粒子群算法的水轮发电机组PID调速器参数优化

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摘要： 为解决水轮发电机组调速器PID参数优化问题，引入菌群优化(bacterial foraging optimization，BFO)算法。考虑到BFO算法收敛速度慢，而粒子群优化(paticle swarm optimization，PSO)算法具有较好的收敛性，提出BFO-PSO算法。以描述菌体间相互吸引、相互排斥、相互学习的Jcc指标与综合ITAE指标之和构成一种新型适应度函数。数值计算结果表明：与BFO算法、PSO算法相比，BFO-PSO算法收敛速度快，能有效改善水轮机调节系统空载工况和孤网运行条件下过渡过程的动态性能。

关键词： 菌群优化算法 粒子群优化算法 水轮发电机组 PID参数优化

Optimal PID Governor Tuning of Hydraulic Turbine Generators With Bacterial Foraging Particle Swarm Optimization Algorithm

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Abstract: To improve the quality of PID parameters of the turbine governor, bacterial foraging optimization (BFO) algorithm was introduced. Considering the slow convergence of BFO algorithm and the good convergence of particle swarm optimization (PSO) algorithm, a novel method named BFO- PSO algorithm was proposed. The integrated ITAE index plus the Jcc index which weights the interaction between bacterial cells constitutes a new type of fitness function, which can reflect the effect of bacterial swarm's mutual attraction, mutual repellence and mutual learning. Through numerical experiments, it's found that compared to the classic BFO algorithm and the classic PSO algorithm, BFO-PSO algorithm converges faster and can effectively improve the dynamic performance of the hydraulic turbine governing system transients on no-load and isolated operation conditions.

Keywords: bacterial foraging optimization algorithm particle swarm optimization algorithm hydroelectric generating set PID parameters optimization

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参考文献：

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1. 何娜 黄丽娜 武建 徐殿国.基于粒子群优化算法的混合有源滤波器中无源滤波器的多目标优化设计[J]. 中国电机工程学报, 2008,28(27): 63-69
2. 刘平 吴广宁 隋彬 李瑞芳 曹晓斌 樊春雷 蒋伟.雷电流波形参数估计仿真研究[J]. 中国电机工程学报,

2009,29(34): 115-121