

论文

一种基于创造性思维的粒子群优化算法

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摘要:

针对粒子群优化(PSO)算法在复杂问题求解中出现的早熟收敛问题,从认知心理学角度进行分析,将创造性思维(CT)引入PSO算法,提出一种基于创造性思维的PSO算法(CTPSO).基于CT过程的“四阶段”模型,构建了算

法框架,改进了速度更新公式,在粒子个体的惯性、个体认知和社会能力的基础上增强CT能力,以提升其整体寻优性能.典型测试函数的运行结果表明,该算法具有较强的全局搜索能力,收敛速度快,算法稳定性好,且未增加新的参

数和计算复杂度.

关键词: 群智能; 粒子群优化; 创造性思维; 四阶段模型

Particle swarm optimization algorithm based on creative thinking

Abstract:

Particle swarm optimization(PSO) suffers from the premature convergence problem in complex optimization problems. To solve this problem, this paper analyzes PSO algorithm from cognitive psychology and proposes a creative thinking(CT) based PSO algorithm(CTPSO). Based on the four stages model in CT process, a framework of CTPSO is designed, and the evolution model is adapted, which includes a CT model besides the memory model, cognitive model and social model in standard PSO to improve the optimization capability of particles. CTPSO is applied to some wellknown benchmarks, and experimental results show that CTPSO possesses more powerful global search capabilities, better convergence rate and robustness, meanwhile it does not introduce new parameters and computational complexity.

Keywords: swarm intelligence; particle swarm optimization; creative thinking; four stages model

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