电力系统

混合粒子群优化算法在电网规划中的应用

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摘要

在含被动聚集因子的粒子群优化(particle swarm optimization with passive congregation，PSOPC)算法和和谐搜索(harmony search，HS)的基础上，构建了一种新的混合粒子群优化(heuristic particle swarm optimization，HPSO)算法。该算法根据电网规划的特点，采用"飞回机制"处理变量的约束条件，利用和谐搜索处理规划问题的约束条件，使粒子群在迭代过程中始终保持在可行域内，同时该算法中引入了被动聚集因子，有效改善了粒子的进化机制，提高了粒子的自由搜索能力。18节点算例验证了该算法应用于电网规划的正确性和有效性，HPSO算法、粒子群优化算法和PSOPC算法的比较结果表明该HPSO算法具有较好的收敛性能。

关键词

电网规划；粒子群优化(PSO)；被动聚集因子；和谐搜索(HS)；飞回机制；约束条件

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Application of Heuristic Particle Swarm Optimization Method in Power Network Planning

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Abstract

A heuristic particle swarm optimization (HPSO) is constructed based on particle swarm optimization with passive congregation (PSOPC) and harmony search (HS) scheme. According to the features of power network planning, the "fly-back mechanism" method is used to handle variable constraints; the constraints of planning problem is dealt with by harmony search to make the particle swam kept in feasible domain during the whole iteration procedure. Meanwhile, the passive congregation is led into the proposed algorithm, thus the evolutionary mechanism of particle is effectively improved and the free search ability of particle is enhanced. The correctness and effectiveness of applying the constructed algorithm in power network planning are validated by the results of calculation example of an 18-bus system, and the result shows that the HPSO algorithm relatively has good convergence in contrast to basic PSO and PSOPC. The comparison results of the same example calculated by HSPO, basic particle swarm optimization (PSO) and PSOPC respectively show that the constructed algorithm possesses better convergence.

Key words

power network planning；particle swarm optimization (PSO)；passive congregation；harmony search (HS)；fly-back mechanism；constraint

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