

基于区间多目标量子文化算法的无线传感器网络覆盖能效优化

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Energy-efficient coverage optimization of wireless sensor networks based on interval multi-objective quantum-inspired cultural algorithm

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摘要

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摘要

针对不确定环境下无线传感器网络覆盖能效优化问题, 提出一种传感器节点区间感知模型; 进而考虑网络覆盖率和节点冗余率, 将其转化为区间多目标优化问题. 基于一种新型区间个体依可能度占优关系, 提出区间多目标量子文化算法, 根据区间占优个体信息提取隐含知识, 用于指导量子个体更新及进化个体变异与选择. 不同环境下的仿真结果表明: 基于所提出算法获得的Pareto 解具有更好的收敛性、分布性和延展性; 相应的无线传感器网络布局更合理.

关键词: 区间感知模型, 多目标量子文化算法, 无线传感器网络, 可能度占优

Abstract :

Aiming at the energy-efficiency coverage optimization problem of wireless sensor networks under the uncertain environment, an interval sensing model for the sensor node is constructed. Subsequently, it is converted to an interval multi-objective optimization problem by taking the coverage rate and the node's redundancy rate as two objectives. A multi-objective quantum cultural algorithm with interval parameters is proposed based on a novel dominance relationship derived from the possibility degree, which is used to compare two interval individuals. In the belief space, the implicit knowledge extracted from non-dominated individuals is used to update the quantum individuals and guide the mutation or selection operation of the evolutionary individuals. The simulation results under various environments show that the optimal Pareto front obtained by the proposed algorithm has better convergence, uniformity and scalability. Corresponding wireless sensor network's layouts are more reasonable.

Key words: interval sensing model interval multi-objective quantum cultural algorithm wireless sensor networks dominant by possibility degree

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