

勘探地球物理学

量子遗传算法在大地电磁反演中的应用

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摘要 量子遗传算法(QGA)以量子理论为基础,通过利用量子位编码代替经典遗传算法的二进制位编码,利用量子旋转门定向更新种群来代替传统方法中种群的选择、交叉和变异过程,使得算法具有一定的内在并行运算能力和量子的隧道效应,从而加快了搜索速度,改善了收敛速度,并具有更强的全局寻优能力.本文针对地球物理反演问题的非线性、多极值特点提出一套实现方案,通过理论模型和实测数据试验对比研究,表明量子遗传方法在大地电磁反演中的寻优质量和效果明显优于传统遗传算法.

关键词 [量子遗传算法](#) [大地电磁反演](#) [全局寻优](#) [遗传算法](#)

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Quantum genetic algorithm and its application in magnetotelluric data inversion

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Abstract Based on quantum mechanics, the quantum genetic algorithm (QGA) encodes with qubit instead of binary codes of classical genetic algorithms and makes directional updating with quantum rotation gates to replace the procedures of selection, crossover and mutation in genetic algorithms, therefore the algorithm possesses the great capabilities of internal parallel computing and quantum tunneling effect, to speed up the searching speed and improve the convergence rate greatly in searching the global optimization. In this paper, the author proposes a realizing scheme for geophysical inversion problem with nonlinear and multi-minimum properties, and test many synthetic models and real data to study the reliability in MT inversion. The computing efficiency of quantum genetic algorithm shows that it is a more stable and effective nonlinear inversion method with global convergence than traditional genetic algorithm.

Key words [Quantum genetic algorithm](#); [Magnetotelluric data inversion](#); [Global optimization](#); [Genetic algorithm](#)

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