

地球物理学报 » 2009, Vol. 52 » Issue (4) : 1114-1120 doi: 10.3969/j.issn.0001-5733.2009.04.029

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引用本文(Citation):

师学明;肖敏;范建柯;杨国世;张旭辉.大地电磁阻尼粒子群优化反演法研究.地球物理学报,2009,52(4):1114-1120,doi:10.3969/j.issn.0001-5733.2009.04.029

SHI Xue-Ming;XIAO Min;FAN Jian-Ke;YANG Guo-Shi;ZHANG Xu-Hui.The damped PSO algorithm and its application for magnetotelluric sounding data inversion.Chinese J.Geophys. (in Chinese),2009,52(4):1114-1120,doi:10.3969/j.issn.0001-5733.2009.04.029

大地电磁阻尼粒子群优化反演法研究

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The damped PSO algorithm and its application for magnetotelluric sounding data inversion

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摘要

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摘要 粒子群优化算法(PSO)是模仿鸟群寻找食物的社会行为的一种全局最优化算法,在多维空间函数寻优、动态目标寻优等方面有着收敛速度快、解质量高且需要设置的参数较少等优点.本文在研究常规粒子群优化算法的基础上,对常规的粒子群算法进行了改进,提出了一种新的惯性权重 ω 参数振荡递减策略,加快了PSO算法的收敛速度,构造的新算法称为阻尼粒子群优化算法.在MATLAB 6.5编程环境中对阻尼PSO算法进行了数值实验,并对大地电磁测深的理论模型和实测数据进行了反演试算,结果表明,阻尼PSO算法不依赖于初始模型、能够搜索到全局极值,不易陷入局部极值,是一种快速有效的地球物理反演方法.

关键词 粒子群优化算法, 阻尼, 非线性, 反演, 大地电磁测深

Abstract: Particle swarm optimization (PSO) is a global optimization strategy that simulates the social behavior observed in a flock (swarm) of birds searching for food. The advantages of PSO are fast convergence, high-quality solutions and the need for fewer parameters to make it suitable for the optimization of multi-dimensional space function and the dynamic target searching. This paper develops a new PSO algorithm, called as damped PSO with a new strategy of the parameter ω , for the inversion of magnetotelluric data. The numerical tests of damped PSO algorithm in MATLAB 6.5 for the synthetic and observed data show that the damped PSO algorithm can find the global minimum and is difficult to get stuck in the local minima, which imply that the damped PSO is a fast and effective algorithm for the inversion of geophysical data.

Keywords PSO, Damped, Nonlinear, Inversion, Magnetotelluric sounding

Received 2008-04-17;

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链接本文:

<http://118.145.16.227/geophy/CN/10.3969/j.issn.0001-5733.2009.04.029> 或 <http://118.145.16.227/geophy/CN/Y2009/V52/I4/1114>

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