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基于泊松碟采样的地震数据压缩重建

唐 刚[1,2], 杨慧珠[1]*

1. 清华大学航天航空学院地震波勘探开发研究所,北京 100084;
2. 中国石油勘探开发研究院石油物探技术研究所,北京100083

Seismic data compression and reconstruction based on Poisson Disk sampling

TANG Gang[1,2], YANG Hui-Zhu[1]*

1. Institute of Seismic Exploration, School of Aerospace, Tsinghua University, Beijing 100084, China;
2. Department of Geophysical Exploration Technology, Research Institute of Petroleum Exploration & Development, Beijing 100083, China

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摘要 在地震资料处理领域,数据的压缩和重建是非常重要的问题,但往往由于数据的严重缺失或采样原因而达不到理想的效果.新发展起来的压缩感知理论为重建欠采样数据提供了可能,而选用合适的采样方法是其中的关键技术之一.本文基于傅里叶变换和压缩感知理论,采用泊松碟采样,对不完整地震数据进行恢复重建.数值实验表明,与传统的单纯随机采样方法相比,泊松碟采样方法在保持采样随机性的同时,使采样点的分布更加均匀,有效地调节了采样间距,从而达到更好的恢复效果,可以有效地指导地震数据采集设计及重建.

关键词: 泊松碟采样 傅里叶变换 压缩感知 数据重建

Abstract: Compression and reconstruction are very common and necessary in seismic data processing, but usually it is impossible to get high-quality results, due to severely missing traces or sampling problems. A newly developed theory, named compressive sensing, provides the possibility for recovering undersampled data, where proper sampling scheme is one of the key techniques. In this paper, we employ Poisson Disk sampling, which possesses blue-noise pattern spectrum, to improve the recovery quality based on Fourier transform and compressive sensing. Experiments show that Poisson Disk sampling can achieve better recovery than simply random sampling, due to its ability to distribute samples more uniformly and keep randomness at the same time.

Keywords: Poisson Disk sampling Fourier transform Compressive sensing Data reconstruction

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About author: 唐 刚, 男, 1983年生, 清华大学地震波勘探开发研究所博士毕业,现在中国石油勘探开发研究院工作, 主要从事地震数据处理方面的研究. E-mail:gtangthu@gmail.com

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