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应用

基于压缩感知和LBG算法的SAR数据压缩与重构方法

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摘要：

针对如何大幅压缩SAR海量数据并获得有效的重构结果以完成SAR场景目标的高分辨成像问题，本文提出利用压缩感知（Compressed Sensing, CS）和Linde-Buzo-Gray （LBG）算法共同完成。对于SAR所接收到的回波信号，首先依据CS理论构造随机高斯噪声观测矩阵对回波信号进行降维处理，然后，利用LBG算法对CS压缩后的数据再进行压缩编码以达到进一步大幅压缩的目的。对于数据重构问题，同样分为两步：一是利用LBG算法编码的逆过程进行解码恢复，二是依据CS理论利用平滑L0（smooth L0, SL0）算法重构原始回波信号。在此基础上，再利用传统频率变标（Frequency Scaling, FS）SAR成像算法进行高分辨成像。仿真结果证明了本文方法的有效性。

关键词： 合成孔径雷达数据；压缩感知；Linde Buzo Gray算法；频率变标算法；压缩倍数

SAR Data Compressing and Reconstructing Method Based on Compressed Sensing and LBG Algorithm

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Abstract:

Aimed at the issue of how to compress huge SAR data apparently and obtain reconstructed results to complete SAR high resolution imaging for scene target, in this paper, a new approach combined with Compressed Sensing (CS) and LBG algorithm together is proposed. For SAR returned signal, firstly, according to CS theory, random Gauss noise matrix is designed as a measurement matrix to put forward data compressing. Secondly, Linde-Buzo-Gray (LBG) algorithm is employed to compress encode of every sample in order to complete diminishing data furthermore. What’s more, data reconstruction process still contains the two ordinal steps. One is decode process which is the inverse encode process of LBG algorithm. The other is original returned signal reconstruction by smooth L0 (SL0) algorithm according to CS theory. On the basis of that, the traditional Frequency Scaling (FS) algorithm is executed to achieve the final SAR image. The effectiveness of the proposed approach can be validated by simulation results.

Keywords: Synthetic aperture radar data Compressed Sensing Linde-Buzo-Gray algorithm Frequency Scaling algorithm compressing time

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