

基于谱间预测和联合优化的高光谱压缩感知图像重构

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Compressed Hyperspectral Image Sensing Reconstruction Based on Interband Prediction and Joint Optimization

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摘要

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摘要 基于高光谱图像压缩采样数据特性的分析, 提出一种基于谱间预测和联合优化的压缩感知图像重构算法。首先在谱间通过线性预测去除高光谱图像观测向量的强谱间相关性, 得到熵值更小的预测残差向量; 然后在凸集交替投影(Projections Onto Convex Sets, POCS)的基础上提出基于最陡下降法的联合优化算法对预测残差向量进行重构, 提高重构质量; 同时采用像素点为指导的收敛准则提高算法的收敛速度。实验结果表明, 在相同观测值数目下, 该文算法的重构质量(PSNR)明显优于其它已有重构算法, 并且具有较低的计算复杂度。

关键词: 高光谱图像 压缩感知 线性预测 凸集交替投影 最陡下降法

Abstract: According to the correlation analysis of Compressed Sensing (CS) measurements for hyperspectral images, a new reconstruction algorithm based on interband prediction and joint optimization is proposed. In the method, linear prediction is first applied to remove the correlations among successive hyperspectral measurement vectors. The obtained residual measurement vectors are then recovered using the proposed joint optimization based POCS (Projections Onto Convex Sets) algorithm with the steepest descent method. In addition, a pixel-guided stopping criterion is introduced to stop the iteration. Experimental results show that the proposed algorithm exhibits its superiority over other known CS reconstruction algorithms in the literature at the same measurement rates, while with a faster convergence speed.

Keywords: Hyperspectral imagery Compressive Sensing (CS) Linear prediction Projections Onto Convex Sets (POCS) Steepest descent method

Received 2010-12-06;

本文基金:

国家自然科学基金(61072065, 61007011, 60802076), 111基地项目(B08038)和中央高校基本科研业务费专项资金(JY10000901007)资助课题

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引用本文:

刘海英, 吴成柯, 吕沛, 宋娟. 基于谱间预测和联合优化的高光谱压缩感知图像重构[J] 电子与信息学报, 2011, V33(9): 2248-2252

Liu Hai-Ying, Wu Cheng-Ke, Lv Pei, Song Juan. Compressed Hyperspectral Image Sensing Reconstruction Based on Interband Prediction and Joint Optimization[J], 2011, V33(9): 2248-2252

链接本文:

http://jeit.ie.ac.cn/CN/10.3724/SP.J.1146.2010.01343 或 http://jeit.ie.ac.cn/CN/Y2011/V33/I9/2248

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