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信息科学

基于快速方向预测的高分辨率遥感影像压缩

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摘要： 针对传统的自适应方向提升小波变换（ADL-DWT）算法在高分辨率遥感影像压缩中计算复杂度过高的问题，提出一种新的基于方向预测的提升小波变换（DP-LWT）算法，实现了高分辨率遥感影像的快速、高效压缩。新算法首先将高分辨率遥感影像分为若干不重叠子块，然后采用梯度算子快速预测遥感影像中每个图像块的最佳提升方向，并沿着最佳预测方向插值完成方向提升小波变换，最后进行SPIHT编码。实验结果表明，新算法有效削弱了遥感影像各子带中非水平与非垂直方向的高频系数；与传统自适应方向提升小波变换相比，在重建高分辨率遥感影像峰值信噪比基本相同的情况下，有效减少了小波变换中方向预测的计算复杂度。

关键词： 遥感图像处理 图像压缩 小波变换 自适应方向提升 方向预测

Remote sensing image compression based on fast direction prediction

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Abstract: As traditional Adaptive Direction Lifting based-Discrete Wavelet Transform（ADL-DWT) has higher computational complexity in the compression of high-resolution remote sensing images, this paper proposes a new lifting wavelet transform scheme based on Direction Prediction called DP-LWT to implement the fast and efficient compression of high-resolution remote sensing images. The new algorithm first divides a high-resolution remote sensing image into a number of non-overlapping sub-blocks. Then, the gradient operator is used to predict the best lifting direction of every sub-block in the remote sensing image quickly, and completes the direction lifting wavelet transform by the interpolation along the best lifting direction. Finally, the remote sensing image is coded by SPIHT. The experimental results show that the new algorithm effectively weakens the high-frequency coefficients on the non-horizontal and non-vertical directions of every image subband. Compared with the traditional ADL, the DP-LWT can effectively reduce the time computational complexity of directional prediction in lifting wavelet transform, and keeps the Peak Signal to Noise Ratio (PSNR) of the reconstructed high-resolution remote sensing image to be the same as that of the ADL basically.

Keywords: Remote sensing image processing   Image compression   Wavelet transform   Adaptive direction lifting   Direction prediction

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