信号处理 2014, 30(2) 163-171 DOI:
ISSN: 1003-0530 CN: 11-2406/TN

算法研究

非下采样形态学Shearlet变换:提高结构细节捕捉的图像表示新方法

刘俊良, 雷琳, 周石琳

国防科学技术大学电子科学与工程学院

摘要:

针对Shearlet变换缺乏平移不变性以及对结构细节捕捉能力较差等不足，提出提高结构细节捕捉的非下采样形态学Shearlet变换。不同于传统的离散Shearlet变换，本文采用非下采样形态学Haar金字塔分解代替拉普拉斯金字塔分解，实现对源图像的多尺度分解。结构细节捕捉能力较强的非下采样形态学Haar金字塔取消了下采样操作，不仅使变换具有平移不变性，而且提高了变换结构细节捕捉和保持的能力。经过图像融合实验结果对比，验证了该变换在图像融合应用中结构细节捕捉能力的有效性。

关键词： Shearlet变换；形态学金字塔；结构细节捕捉；图像融合

Non-subsampled Morphological Shearlet Transform Algorithm: A New Image Representation to Promote Structural Details Capturing

LIU Jun-Liang, LEI Lin, ZHOU Shi-Lin

The Department of Electronic Science and Engineering, National University of Defense Technology

Abstract:

A novel algorithm of non-subsampled morphological Shearlet transform (NMST) is put forward here to overcome the drawbacks of Shearlet transform such as the absence of shift-invariance and the ambiguity of captured structural details. In contrast with the traditional discrete Shearlet transform, NMST adopted the undecimated morphological Haar pyramid (UMHP) taking the place of Laplacian Pyramid to realize multiscale

decomposition of the source image. UMHP that has a better details capturing ability cancels the subsampling operations, which makes NMST shift-invariant and to improve capturing structural details ability and the sustained ability. Through comparing the experiment results of image fusion, NMST algorithm is proved to be effective in capturing the details.

Keywords: Shearlet transform Morphological pyramid the ability of capturing structural details image fusion

收稿日期 2013-04-09 修回日期 2013-08-16 网络版发布日期 2014-02-25

DOI:

基金项目:

国家自然科学基金项目（61105031）

通讯作者:

作者简介:

作者Email: liujunliang_1988@163.com