

软件、算法与仿真

一种基于非降采样Contourlet变换和MLE SAC的星空图像配准算法

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摘要:

针对不同时刻拍摄的星空图像进行叠加, 提出一种基于非降采样Contourlet 变换(nonsampled Contourlet transform, NSCT)和随机抽样最大似然算法(maximum likelihood estimation sample consensus, MLESAC)的图像配准算法。该方法首先对星空图像进行NSCT变换, 以提取特征星体的边缘, 接着以特征星体的质心为顶点, 构造特征三角形, 根据三角形全等准则对其进行匹配; 然后利用MLE SAC算法对已匹配三角形的重心进行验证, 将满足要求的特征点带入仿射变换模型, 求取变换参数, 实现图像的配准。该方法在保证配准精度的条件下, 降低了经典配准算法的复杂度, 能够有效处理光照变化以及噪声的影响。采用50组空间图像进行验证, 结果表明, 该算法能够在有效抑制星空图像光照和噪声的情况下, 实现星空图像的精确配准, 均方根误差达到0.374 1。

关键词: 星空图像 边缘提取 特征构建 特征匹配

Space image registration algorithm based on nonsampled Contourlet transform and MLESAC

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Abstract:

To superimpose the space images which are taken at different times, an algorithm based on nonsampled Contourlet transform (NSCT) and maximum likelihood estimation sample consensus (MLESAC) for space image registration is proposed. Firstly, in order to extract the edge characteristics of the stars, the space images are transformed by NSCT, and then the feature triangle whose vertexes are the mass of stars is structured according to a certain rule, and the triangle is matched according to the guidelines, and then the centers of gravity of the used congruent triangles are validated by MLESAC. Finally, the matched feature points are brought in the affine transformation model to obtain transformation parameters and the registration image is gained. The method, which reduces the complexity of the classic methods underground remaining the registration accuracy, can avoid the effects of illumination changes and noise. 50 teams' space images are used to be vivificated, and the results show that the algorithm can effectively suppress noise, light and space images circumstances, the RMSE of the registrated images can achieve to 0.374 1.

Keywords: space image edge extraction feature construction feature matching

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