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信息科学

基于复合Zernike矩相角估计的图像配准

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摘要: 提出了一种基于复合Zernike矩相角估计的图像配准方法。首先,利用尺度不变检测子Harris-laplace检测图像中的兴趣点作为初始特征点,计算以兴趣点为中心、邻域具有尺度不变性的Zernike矩;提出一种鲁棒的相角估计方法,用于估计两个归一化区域的旋转角度值。然后,利用Zernike矩的幅值和相角信息,通过比较每个兴趣点邻域Zernike矩的相似度提取出初始匹配点。最后,提出一种迭代角度修正算法用于精确估计变换参数,并对输入图像进行几何变换后将两幅图像配准。实验结果表明,该算法可在尺度缩放、任意角度旋转以及噪声等复杂条件下实现图像的高精度配准。当旋转角度误差小于 20° 时,图像的平均覆盖率达到94.125%,有效降低了误匹配的概率。

关键词: 图像配准 兴趣点 尺度不变性 相位和幅值分量 Zernike矩

Image registration based on complex Zernike moment phase angle estimation

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Abstract: An image registration method based on complex Zernike moment phase angle estimation was proposed. Firstly, the Harris-laplace operator was used to detect interest points in an image, and the interest points were regarded as initial feature points. The Zernike moments defined on the scale normalized interest point neighborhood were computed, and a new robust estimation method for phases was presented to compute the rotation angle between two normalized regions. Then, the magnitude and phase angle information of Zernike moments were combined and used to measure the Euclidean distance between two matching regions. Finally, an iterative refined angle method was proposed to estimate the parameters accurately, and the image registration was finished after the geometric transform of input images. The experimental results show that the proposed algorithm implements a precise image registration under the scaling, arbitrary rotation and noise. The average coverage percentage achieves 94.125% when the rotation angle error is less than 20° , which reduces the false match rate effectively.

Keywords: image registration interest point scale invariance phase and magnitude component Zernike moment

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