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信息科学

利用平行透视投影模型的位姿迭代估计

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摘要：　提出了一种利用平行透视投影模型的高效位姿迭代估计方法来提高单目视觉测量系统的精度和鲁棒性。通过引入齐次坐标表示，避免了现有算法对平行透视投影参考点选择的限制。首先，研究了平行透视投影模型下使用齐次坐标求解目标位姿的方法，阐述了它的几何意义。然后，通过迭代的方式将其应用于一般透视模型下目标位姿的高精度估计。仿真实验结果表明,本文方法提高了基于平行透视投影模型的位姿迭代估计的精度、速度和抗噪性能。实物测量结果表明,本文方法的平移测量精度优于0.1 mm,旋转测量精度优于0.1°,可以满足各种视觉检测系统的要求。另外，使用标志点和图像特征亚像素定位技术还可进一步提高该算法的精度。

关键词：　单目视觉　位姿估计　迭代算法　平行透视投影模型

Iterative pose estimation using paraperspective camera model

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Abstract: An efficient iterative pose estimation method was proposed to improve the accuracy and robustness of monocular vision measurement systems. By using homogeneous coordinates,it avoids the limit of existing algorithms on the selection of reference points for a paraperspective camera model. First, a method to compute the pose of an object under the paraperspective camera model was researched using homogeneous coordinates, and its geometric meaning was expatiated in detail. Then, this method was used to estimate the pose of an object in an iterative way under the full perspective camera model with high precision. Simulation results indicate that the proposed method improves the accuracy, speed and robustness of the paraperspective camera model based iterative pose estimation. Real measurement results show that the translation measurement precision and rotation measurement precision of the proposed method are better than 0.1 mm and 0.1?,respectively,and it can satisfy the requirements of various vision detection systems.Furthermore, the accuracy of the proposed method can be improved further by using the land mark point method and sub-pixel feature locating tech- niques.

Keywords: monocular vision　pose estimation　iterative algorithm　paraperspective camera model

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