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论文与报告

一种基于主动视觉的三维结构恢复和直接欧氏重建算法

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摘要

利用三正交平移运动, 提出了一种三维结构恢复和直接欧氏重建新算法. 算法仅需利用主动视觉平台控制相机作一组三正交平移运动, 然后通过图像对应点和平移运动的距离就可以恢复平面结构信息和进行欧氏重建. 并且无需假定相机畸变因子为零. 算法计算过程中无需求解相机的内参数, 也无需进行分层重构, 它是一种直接的欧氏重建算法, 避免了传统算法中的相机标定、仿射重建等两大难题, 并且计算过程完全线性化, 简单实用. 最后用模拟实验和真实图像实验对算法进行验证, 实验结果表明了算法的有效性和准确性.

关键词 三正交平移运动 三维结构恢复 直接欧氏重建 主动视觉 计算机视觉

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A Novel Algorithm for 3D Structure Recovery and Direct Euclidean Reconstruction Using Active Vision

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Abstract

From the motions of three mutually orthogonal translations (TMOT), we develop a novel algorithm for 3D structure recovery and direct Euclidean reconstruction. Our algorithm only requires the camera to undergo one set of TMOT via the active vision platform. Then we can recover the planar structure and reconstruct the Euclidean coordinates directly from the images correspondences and the three translation distances of TMOT. The zero skew assumption is not required. The algorithm does not need to know the camera's intrinsic parameters. Nor does it need stratified reconstruction. Therefore, the two main problems of camera calibration and affine reconstruction are successfully avoided. The algorithm is linear and easy to perform. We have tested the proposed algorithm with both synthetic data and real image data. The results show that the algorithm is very effective and accurate.

Key words TMOT 3D structure recovery direct Euclidean reconstruction active vision computer vision

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