光学精密工程 » 2015, **Vol. 23** » Issue (4): 1196-1204 DOI: 10.3788/OPE.20152304.1196

消隐点共线约束逐点畸变校正算法

赵振庆, 叶东, 吴斌, 陈刚, 杨子军

哈尔滨工业大学 电气工程及自动化学院, 黑龙江 哈尔滨 150001

Point wise distortion correction algorithm with vanishing point collinear constraint

ZHAO Zhen-qing, YE Dong, WU Bin, CHEN Gang, YANG Zi-jun

School of Electrical Engineering and Automation, Harbin Institute of Technology, Harbin 150001, China

摘要 图/表 参考文献 相关文章 (15)

全文: PDF (1689 KB) RICH HTML NEW

输出: BibTeX | EndNote (RIS)

摘要 对逐点图像畸变校正算法进行分析和研究。分析了基于四点共线交比不变性的逐点畸变校正算法的校正精度, 指出该算法由于初始使用图像点含有误差导致计算其他图像点产生了精度改变, 同时给出了计算结果误差较小时的图像点位置和相对距离的选取方法。基于上述分析, 提出了基于消隐点共线约束的逐点畸变校正算法。该算法利用消隐点来提高直线拟合精度, 利用共线特征来约束校正图像点精度。该算法不仅可以优化基于四点共线交比不变性算法校正的图像点, 同时也可以优化初始使用的图像点, 从而提高所有图像点畸变校正精度。基于MATLAB的仿真实验显示:对于400万像素的镜头, 校正后图像点最大误差是初始图像点噪声的29.05倍。针对实物图像对基于四点共线交比不变性法校正的图像点, 基于消隐点共线约束法校正的图像点和未校正采集图像点的交比值进行对比, 结果表明本文提出算法优于四点共线交比不变性算法的结果。

关键词 : 计算机视觉, 图像校正, 畸变校正, 消隐点, 交比不变性, 共线约束

Abstract : Point wise correction algorithms are researched and analyzed. The correction accuracy of a point wise distortion correction algorithm based on four-point collinear cross ratio invariability is investigated. It points out that the initial used image points which contain errors will cause the accuracy change in the calculation of other image points. Then, it gives the selection method for image point locations and relative distances when the calculation error is smaller. Based on the above, this paper proposes a point wise distortion correction algorithm based on vanishing point collinear constraint. The algorithm uses vanishing points to improve the linear fit accuracy and the collinear feature to constrain the corrected distortion accuracy. It not only optimizes the image point errors of the distortion correction algorithm based on a four-point collinear cross ratio invariance, but also the initial image point errors, so that the accuracy of distortion correction of all image points is improved ultimately. The simulation based on MATLAB shows that the maximum error of corrected image points is 29.05 times that of the initial image point noise for four million pixels. In contrast to the physical image using the cross ratios from the correction algorithms based on four-point collinear invariant cross ratio and vanishing point collinear constraint as well the uncorrected image, it indicates that the performance of proposed algorithm is better than that of the algorithm based on four-point collinear cross ratio invariance.

Key words : computer vision image correction distortion correction vanishing point cross-ratio invariability collinear constraint

收稿日期: 2014-12-09

中图分类号: TP391.4

基金资助:国家自然科学基金资助项目(51075095);黑龙江省自然科学基金资助项目(No.E201045)

作者简介: 赵振庆(1983-),男,河北张家口人,2007年、2010年于燕山大学分别获得学士、硕士学位,主要研究方向为机器视觉、图像处理。E-mail:zzq725@126.com;叶东(1968-),男,湖北武汉人,博士,教授,博士生导师,1990年、1995年和1999年于哈尔滨工业大学分别获得学士、硕士和博士学位,主要从事基于串/并联结构的坐标测量理论和技术、双目/单目视觉坐标测量理论和技术等方向的研究。E-mail:yedong@hit.edu.cn

引用本文:

赵振庆, 叶东, 吴斌, 陈刚, 杨子军. 消隐点共线约束逐点畸变校正算法[J]. 光学精密工程, 2015, 23(4): 1196-1204. ZHAO Zhen-qing, YE Dong, WU Bin, CHEN Gang, YANG Zi-jun. Point wise distortion correction algorithm with vanishing point collinear constraint. Editorial Office of Optics and Precision Engineering, 2015, 23(4): 1196-1204.

链接本文:

http://www.eope.net/CN/10.3788/OPE.20152304.1196 **或** http://www.eope.net/CN/Y2015/V23/I4/1196

服务

把本文推荐给朋友

加入我的书架

加入引用管理器

E-mail Alert

RSS

作者相关文章

赵振庆

叶东

吴斌

陈刚

杨子军