短文与研究通讯

偏振探测系统的摄像机标定与图像畸变校正研究

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摘要：

偏振探测在许多相关领域的应用日益广泛，探测系统的标定及校准是精确提取被探目标的前提。本文针对偏振探测系统，分析了基于2D平面标靶的摄像机标定算法，建立了摄像机线性模型和非线性畸变模型，通过线性及非线性结合的算法，得到了精确的摄像机内外部参数。利用镜头的畸变模型，提出了一种采用牛顿迭代算法来求解高阶非线性方程组对图像畸变校正的方法，建立了各像素点畸变量与到畸变中心距离的关系，最后对畸变校正前后的图像进行了测试实验，测试结果表明：测试点实际畸变大小符合理论畸变量关系，很好地验证了镜头的径向畸变特性；经畸变校正后的偏振图像能有效提高被探目标提取的准确率，偏振图像的畸变校正对复杂背景下目标提取准确率的影响最明显。

关键词：　偏振探测　摄像机模型　标定　畸变校正

Research on camera calibration and correction of image distortion based on polarization detection system

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Abstract:

Polarization detection is becoming increasingly widespread in many related fields, the calibration and correction of the polarization detection system is a premise to extract exploration targets accurately. In this paper, the principle of camera calibration algorithm based on 2D planar is introduced, and the linear model as well as nonlinear distortion model of the camera is set up. Then we get accurate internal and external camera parameters by linear and nonlinear algorithm. We obtain the projection coordinates before distortion by solving binary higher-order nonlinear equations based on the lens distortion model. To achieve effective correction of distorted images, we set up the relationship between amount of distortion of each pixel and distance to the distortion center. In addition, we carry on a test to the distortion image before and after correction, the result shows that the actual amount of distortion is consistent with theory of distortion model; the polarization image after correction can effectively raise the accuracy of object extraction, and the correction of polarization image has the most positive impact for the accuracy of object extraction in complex background.

Keywords: polarization detection　camera model　calibration　distortion correction

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