

Subpixel Corner Detection for Monocular Camera Linear Model Research

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Abstract : Camera calibration is a fundamental issue of high precision noncontact measurement. And it is necessary to analyze and study the reliability and application range of its linear model which is often used in the camera calibration. According to the imaging features of monocular cameras, a camera model which is based on the image pixel coordinates and three dimensional space coordinates is built. Using our own customized template, the image pixel coordinate is obtained by the subpixel corner detection method. Without considering the aberration of the optical system, the feature extraction and linearity analysis of the line segment in the template are performed. Moreover, the experiment is repeated 11 times by constantly varying the measuring distance. At last, the linearity of the camera is achieved by fitting 11 groups of data. The camera model measurement results show that the relative error does not exceed 1%, and the repeated measurement error is not more than 0.1 mm magnitude. Meanwhile, it is found that the model has some measurement differences in the different region and object distance. The experiment results show this linear model is simple and practical, and have good linearity within a certain object distance. These experiment results provide a powerful basis for establishment of the linear model of camera. These works will have potential value to the actual engineering measurement.

Keywords : camera linear model, geometric imaging relationship, image pixel coordinates, three dimensional space coordinates, sub-pixel corner detection

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