Calibration of 3D Computer Vision Using Circular Control Points

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Abstract

In the paper a grid of circular dots is used to calibrate a stereo vision to measure the deformation field of a material with micron measurement accuracy. The center positions of circular dots were used as calibration points. Since the projection of the circular dot on the image plane is an ellipse, the relationship between the center of the circular dot and the center of the ellipse was obtained mathematically in the paper to reduce the bias between the camera model and the observed center of the ellipses. In addition, both of the radial and decentering lens distortions are included in the camera model equation to improve the accuracy of the model equation. After camera calibration, experiments on rigid body translation tests are performed to evaluate the baseline measurement errors of the stereo vision.

Keyword：Stereo vision, circular control points, radial distortion, decentering distortion, camera calibration