

# Camera Calibration and Three-dimensional Deformation Measurements Using Circle Grid

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## Abstract

A dot target with  $N \times N$  array of circular dots was used to erect a world coordinate system and  $M$  calibration point with known positions in the system. Using the  $M$  calibration points in the space and their corresponding image points in the image plane, the stereo vision was calibrated to extract the intrinsic and extrinsic camera parameters. In the paper the centers of the circular dots are taken as the calibration points. The projections of the circular dots onto the image plane will become circles or ellipses. A subpixel localization technique was developed to accurately find the positions of the edge points for the circular or elliptical dots. Fitting a conical section to the obtained edge points to locate the centers of the circular and elliptical dots, the calibration points in the space and their corresponding image points in the image plane were acquired. After camera calibration, a rigid body translation test was performed to evaluate the baseline measurement errors of the stereo vision in each of the directions  $x$ ,  $y$ , and  $z$ .

Keyword :