

Radial Distortion Correction Based on the Concept of Verifying the Planarity of a Specimen

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Abstract : Because of the rapid development of digital camera and computer, digital image correlation method has drawn lots of attention recently and has been applied to a variety of fields. However, the image distortion is inevitable when the image is captured through a lens. This image distortion problem can result in an innegligible error while using digital image correlation method. There are already many different ways to correct the image distortion, and most of them require specific image patterns or precise control points. A new distortion correction method is proposed in this study. The proposed method is based on the fact that a flat surface should keep flat when it is measured using three-dimensional (3D) digital image measurement technique. Lens distortion can be divided into radial distortion, decentering distortion and thin prism distortion. Because radial distortion has a more noticeable influence than the other types of distortions, this method deals only with radial distortion. The simplified 3D digital image measurement technique is adopted to measure the surface coordinates of a flat specimen. Then the gradient method is applied to find the best correction parameters. A few experiments are carried out in this study to verify the correctness of this method. The results show that this method can achieve a good accuracy and it is suitable for both large and small distortion conditions. The most important advantage is that it requires neither mark with specific pattern nor precise control points.

Keywords : 3D DIC, radial distortion, distortion correction, planarity

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