

Error Analysis of Dynamical Measurement System Based on Binocular Vision

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With the rapid development of industrial cameras, binocular stereo vision is widely used in the field of manufacturing. Using two or more image points of one point in space to restore space depth information is called stereo vision, which process is known as three-dimensional reconstruction. Binocular stereo vision is normally used in the static test and has been rarely reported for the dynamical measurement. One of the major reasons is that the error of dynamical testing using binocular stereo vision is unknown. In this paper, an error analysis of binocular vision for dynamical testing is presented. In the system of binocular vision measurement, the errors of measurement result are generated by the deviation between the calculated world coordinates and the actual world coordinates. On the assumption that the calibration result is correct under the premise, a system of error model parameters is established by analyzing the deviation between the ideal point and the projection point on the CCD target surface. When light passing through the camera lens, the internal and external parameters of the cameras which have effects on measurement results are mainly studied. The effects of non-synchronization when the double cameras take photos for the points with sinusoidal movements are analyzed. The proposed model analyzes the sources of errors in dynamical testing using stereo vision and can be used to minimize those non-synchronous errors for improving the measurement accuracy.

Keywords: Binocular stereo vision, Camera, 3D reconstruction, Measurement errors, Errors model, Measurement accuracy