

Improvement of Camera Calibration Based on the Relationship between Focal Length and Aberration Coefficient

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Abstract : In the processing of camera-based high precision and non-contact measurement, the geometric-optical aberration is always inevitably disturbing the measuring system. Moreover, the aberration is different with the different focal length, which will increase the difficulties of the system's calibration. Therefore, to understand the relationship between the focal length as a function of aberration properties is a very important issue to the calibration of the measuring systems. In this study, we propose a new mathematics model, which is based on the plane calibration method by Zhang Zhengyou, and establish a relationship between the focal length and aberration coefficient. By using the mathematics model and carefully modified compensation templates, the calibration precision of the system can be dramatically improved. The experiment results show that the relative error is less than 1%. It is important for optoelectronic imaging systems that apply to measure, track and position by changing the camera's focal length.

Keywords : camera calibration, aberration coefficient, vision measurement, focal length, mathematics model

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