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多线阵CCD位姿测量光学系统

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Multiple linear CCD pose measuring optical system

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摘要 针对悬浮试验场内飞行物体的高精度姿态测量,提出了采用面阵CCD辅助识别的多线阵CCD姿态测量系统。设计了采用柱面镜组构成的线阵CCD专用成像镜头。在被测飞行物体上安装3个红色发光二极管(LED)光点作为合作目标,2个面阵CCD和3个线阵CCD同时对光点成像,通过测量光点空间位置坐标,计算出飞行物体的姿态高度。线阵CCD光学镜头选用(635±15)nm的红光作为工作标段,设计的全视场角为19°,焦距为90.04 mm。系统采用7片柱面镜和1片红色滤光片组成像方远心光路,从而有效消除像差,实现大景深测试。测试结果表明:设计的镜头畸变优于0.05%,景深可达1.5 m,可配合线阵CCD实现高精度测试。

关键词 : 姿态测量, 线阵CCD, 像方远心光路, 柱面镜组

Abstract : For the high precision attitude measurement of flying objects in a suspension test field, a multiple linear CCD attitude measurement system with an area array CCD as auxiliary recognition was proposed. Aspecial imaging lens consisting of cylindrical lenses was designed for the linear CCD . Three red Light Emission Diodes(LEDs) were mounted on a flying object to be as cooperation targets, while two area array CCDs and three linear CCDs were utilized to image for the light spots. Finally, the attitude angles of the fly object were obtained by measuring the space position of the light spots. The working region of the linear CCD optical lens is at wavelength (635 ± 15) nm, the full angle of view is 19° and the focal length is 90.04 mm. Seven pieces of cylindrical lenses and a piece of red filter were used to compose a telecentric optical path of image space, which effectively eliminates the aberration and completes the measurement for a larger depth of field. The results show that the lens distortion is less than 0.05%, and the depth of field is up to 1.5 m. The designed system achieves high accuracy measurement by combining linear array CCDs and special imaging systems.

Key words : attitude measurement linear CCD telecentric optical path of image space cylindrical lenses

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