

摘要：建立了空中高帧频图像测量吊舱系统，用于飞机校飞和导弹离梁、下滑及飞行姿态等关键阶段的观测。为了保证系统中可见光与红外同视轴以及吊舱具有良好的气动外形，系统采用可见光与红外共光路设计。以光学标校配准法进行图像的配准，提出能够提高标校精度的处理方法，并对光学标校配准法的特点进行总结。比较分析了在时域内能达到实时性的几种图像融合方法及效果。最后，探讨了可消除不同分辨率的异源图像融合后的边缘痕迹的方法，提出采用窗函数法既可以保留融合的效果又可以消除融合后的边缘痕迹。实验结果表明：基于共光路设计并采用光学标校配准法处理100 frame/s的异源图像，配准率可达到99%，稳定性为95%，配准耗时为2 ms。所述方法基本满足空中高帧频图像测量吊舱对图像配准与融合精度，实时性和抗干扰性的要求，适合工程应用。

关键词：光学测量吊舱 共光路设计 双波段 高帧频 光学标校配准 图像融合

Design of measuring gondola system with high frame rate for image fusion

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Abstract: An image measuring aerial gondola system with high frame rates was established to observe the critical stages of aircrafts such as the flight calibration of aircraft and the beam-leaving, felling and attitude of missiles. To ensure the visual and infrared lights to be coaxial in the system and the entire system to be a perfect aerodynamic shape, the common-path design was used for both visual and infrared paths. The optical calibration method was used in image registration, and a processing approach was proposed to improve the calibration accuracy. Then, the characteristics of optical calibration were summarized. Several image fusion methods to achieve real-time effect in the time domain were analyzed and their results were compared. Finally, how to eliminate the edge traces of the fusion image with different sizes was discussed, and it suggests that the window function method can not only retain the effect of fusion but also can eliminate the edge traces of fusion images. The experiment results indicate that the common-path design is used to process different source images with a frame rate of 100 frame/s can increase the registration rate to 99%, the stability to 95%, and allow the registration time to 2 ms (immediately image registration after read from the sensor). The proposed method basically meets the requirements of the image measuring aerial gondola system for high-precision, real-time and strong anti-interference of registration and fusion of high frame rate images and is suitable for engineering applications.

Keywords: optical measuring aerial gondola common-path design dual-band high frame rate optical calibration registration image fusion

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