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论文

地平式望远镜消旋K镜的设计

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摘要:

地平式望远镜在进行天体目标跟踪观测时会产生像旋,即视场中的星体会围绕视轴中心旋转,给实时目标识别和基于多帧积累的图像处理算法带来了诸多不便.本文针对地平式望远镜的Coude光路,设计了一种通光口径较大,由三面平面反射镜组成的K镜消旋机构来消除像旋.消旋K镜由三面反射镜组成,通光口径为42 mm,第一面反射镜与第三面反射镜的夹角选择为120°,使K镜通光口径较大,能在全光谱波段范围内使用.入射光线绕光轴转动一定的角度,K镜相应的转动入射光线转角的一半,则出射光线不产生旋转.第一面反射镜和第三面反射镜由两面平面镜固定在金属三角架上组成,替代由三棱体磨制的反射镜面,利用自准直平行光管和高准确度转台装配各反射镜,使K镜光轴和回转轴同轴,并采用直流力矩电机直接驱动,使系统具有较快的响应速度.测角元件采用Renishaw圆光栅,细分后的角分辨率为0.072″.

关键词: 地平式望远镜 视场旋转 消旋 K镜

Design of K Mirror for Alt-az Telescope

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Abstract:

Stars in the image field are rotating around image center when alt-az telescope tracks celestial targets, which increases difficulty to real time target identification and image processing based on multi-frame images. The K mirror with large aperture is designed to compensate image rotation for the Coude optical path of alt-az telescope in the paper. K mirror is composed of three reflecting mirrors, and its aperture is 42 mm. The angle between reflecting mirror 1 and reflecting mirror 3 is 120 degrees, and K mirror can be used in all spectral ranges. If incoming vector rotates a certain angle, and K mirror rotates half the angle that incoming vector rotated, then output vector does not rotate any angle. The reflecting mirror 1 and reflecting mirror 3 are made of plane mirrors and fixed on a metal triangle, substituting reflector which is made of triangular prism. Every reflecting mirror is assembled by using photoelectric auto-collimator and fine rotating platform, so it can be sure that the light axis of K mirror and the rotating axis of K mirror are in one line. The K mirror is directly drived by DC toque motor for the reason of fast response speed, and Renishaw angle encoder which angle resolution can be reach 0.072 arcsec by interpolation is adopted.

Keywords: Alt-az telescope Image field rotation De-rotation K mirror

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