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激光发射系统快速反射镜的光线反射过程

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Reflection process of fast-steering mirror of laser launching system

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摘要 为了精确控制光电跟踪复合轴系统的快速反射镜,研究了快速反射镜的反射过程。推导出了快速反射镜镜子转动角度和反射光线转动角度之间的关系, 描述了快速反射镜系统的控制方法和软件实现。以推导出的快速反射镜镜子转动角度和反射光线转动角度之间的关系为理论依据,建立了快速反射镜伺服控制系统,对快速反射镜系统进行了锁零实验和跟踪实验,并与母轴系统进行了对比。实验结果显示:快速反射镜在锁零时稳态精度小于1",且响应快速;在跟踪时系统方位跟踪误差均方根为3.6",俯仰跟踪误差均方根为8.7",满足光电跟踪系统对跟踪速度和瞄准精度的要求。得到的结果表明,基于快速反射镜反射过程理论建立的快速反射镜伺服系统提高了激光发射系统的跟踪精度和响应速度。

关键词 : 光电跟踪, 激光发射系统, 快速反射镜, 光线反射, 音圈电机

Abstract : The reflection process of the fast-steering mirror in an electro-optical tracking system was researched to improve its tracking precision. Firstly, the relationship of the turning angles between fast-steering mirror and reflection light was deduced, and the control method of the fast-steering mirror system was expatiated in detail as well as the software realization. Then, by taking the relationship mentioned above for the thesis, a servo control system for the fast-steering mirror was established. Furthermore, zero-locked and tracking experiments were performed to verify the performance of the control system, and the experimental results for the fast-steering mirror system and the main shafting system were compared. Obtained results indicate that the fast-steering system has fast-response and high-precision, and the residual error is less than 1" in the zero-locked experiment. Moreover, the Root Mean Square (RMS) error of azimuth tracking in the fast-steering system is 3.6" and the RMS error of elevation tracking is 8.7" in the tracking experiment, which meets the requirement of tracking system for the tracking speed and pointing precision. The conclusion is that the servo system for fast-steering mirror based on the thesis on reflection process is characterized by high precision and fast response.

Key words : opto-electro tracking laser launching system fast-steering mirror reflection process voice coil actuator

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