

## 光电稳定平台中高阶扰动观测器的应用

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## Application of high order observer in EO stabilized platform

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**摘要** 由于光电稳定平台在稳定视轴时易受到摩擦、风阻、不平衡以及载体扰动等干扰力矩的影响,本文研究了利用高阶扰动观测器抑制扰动力矩的机理和方法。该扰动观测器由控制对象的逆模型和进行了高阶设计的改进型滤波器组成。提出的方法将观测量作为电流环的输入,利用电流环超高的控制带宽抑制扰动力矩。对系统的扰动抑制能力进行了仿真,结果显示高阶扰动观测器对高阶扰动模型具有很好的抑制能力:对于阶跃扰动和斜坡扰动,三阶扰动观测器的抑制率为100%;对于抛物波扰动,三阶扰动观测器的抑制率为99.999996%。另外,观测器对于控制对象模型的摄动具有很好的鲁棒性。提出的方法可以在提高伺服系统响应速度的同时保证系统的鲁棒性,满足光电稳定平台的应用要求。

**关键词** : 光电稳定平台, 干扰力矩, 高阶扰动模型, 高阶扰动观测器

**Abstract** : As Electric-Optic(EO) stabilized platform is effected by the disturbance of friction, windage, unbalance and base motion in stabilizing a Line of Sight(LOS), this paper explores the mechanism and method to eliminate the disturbance torque by a high order observer. The observer is consist of an inverse system of the control object and a modified filter, and the modified filter is implemented by a high order design. The observer is used for observing the disturbance torque, then the current loop with a very high bandwidth is utilized to compensate the disturbance torque. The eliminating disturbance ability of the system is simulated. The results show that the high-order disturbance observer has the ability to eliminate the high-order disturbance model: the 3th order observer eliminates the disturbance by 100% for the step and ramp disturbance; and eliminates the disturbance by 99.999996% for the parabola disturbance. Moreover, the observer also has good robustness to the perturbation of the control object. The method improves the response speed of the servo system meanwhile ensuring the robustness of the system, so that it satisfies the application requirements of the EO stabilized platform.

**Key words** : electro-optical stabilized platform disturbance torque high-order disturbance model high-order disturbance observer

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