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A New Sliding mode Control Design for Integrated Missile Guidance and Control System

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Abstract

A new sliding mode control algorithm for integrated guidance and control (IGC) system is proposed in this paper. Firstly, the IGC model is established and the nonlinearities, target maneuvers, perturbations caused by variations of aerodynamic parameters, etc. are viewed as disturbance, so that the IGC system becomes a mismatched uncertain linear system. Secondly, a second-order disturbance observer is used to estimate the disturbances and their derivatives. Thirdly, an integral sliding mode surface is designed to obtain the rudder deflection command directly instead of the back-stepping control (BC) algorithm used in conventional IGC system, which achieves the real sense of IGC, and the stability of the system is proven strictly by Lyapunov stability theory. Finally, the superiority of the proposed IGC method is verified by comparing the simulation results of different methods under different cases.

Keywords: Integrated guidance and control (IGC); Sliding mode control; Mismatched uncertainties; Disturbance observer; Lyapunov stability theory.

1. Introduction

When designing the guidance and control system for missiles, the coupling effect of the guidance loop and control loop is usually neglected and the two subsystems are designed separately, which is

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