Novel TBG-based Guidance Law against Maneuvering Target with Prescribed Performance under Input Saturation

Li Jianfeng\textsuperscript{1}, Shen-min Song\textsuperscript{1}, and Xiaoping Shi\textsuperscript{1}

\textsuperscript{1}Harbin Institute of Technology School of Astronautics

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Abstract

To achieve a fast engagement satisfying the desired terminal LOS angles, transit performance, and anti-saturation properties, a novel time base generator (TBG)-based sliding mode guidance law with prescribed performance is proposed for intercepting a maneuvering target. A modified TBG-based Lyapunov function is constructed, based on which a novel non-singular fast terminal sliding manifold with adjustable temporal behavior is designed, and the reaching phase and sliding phase of SMC are regulated by two TBG functions, which brings about a lower risk of input saturation and a faster convergence rate of LOS angle tracking error. The transformed variables are incorporated into guidance law to ensure the tracking errors are always within a prescribed bound. To further handle the input saturation problem, a modified anti-windup compensator is designed, and the external disturbances derived from the maneuvering target are estimated and compensated adaptively. The simulation results show the effectiveness of the proposed method by comparison with other guidance laws.

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