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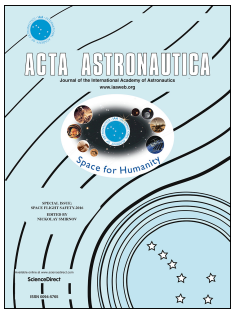

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Model Predictive Control for Spacecraft Rendezvous in Elliptical Orbit

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Abstract

This paper studies the control of spacecraft rendezvous with attitude stable or spinning targets in an elliptical orbit. The linearized Tschauner-Hempel equation is used to describe the motion of spacecraft and the problem is formulated by model predictive control. The control objective is to maximize control accuracy and smoothness simultaneously to avoid unexpected change or overshoot of trajectory for safe rendezvous. It is achieved by minimizing the weighted summations of control errors and increments. The effects of two sets of horizons (control and predictive horizons) in the model predictive control are examined in terms of fuel consumption, rendezvous time and computational effort. The numerical results show the proposed control strategy is effective.

Keywords: Rendezvous; Tumbling spacecraft; Tschauner-Hempel equation; model predictive control; trajectory planning.

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