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PII: S0094-5765(17)30189-3

DOI: 10.1016/j.actaastro.2017.12.047

Reference: AA 6627

To appear in: Acta Astronautica

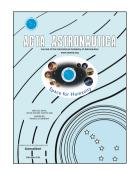
Received Date: 7 February 2017

Revised Date: 14 November 2017

Accepted Date: 31 December 2017

Please cite this article as: X. Chu, J. Zhang, Y. Zhang, Q. Hu, G. Zhai, Y. Li, Safe-trajectory optimization and tracking control in ultra-close proximity to a failed satellite, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2017.12.047.

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Safe-Trajectory Optimization and Tracking Control in Ultra-close Proximity to a Failed Satellite

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5 This paper presents a trajectory-optimization method for a chaser spacecraft operating in ultra-close proximity to a failed satellite. Based on 6 7 the combination of active and passive trajectory protection, the constraints in the optimization framework are formulated for collision 8 avoidance and successful docking in the presence of any thruster failure. 9 10 The constraints are then handled by an adaptive Gauss pseudospectral method, in which the dynamic residuals are used as the metric to 11 12 determine the distribution of collocation points. A finite-time feedback control is further employed in tracking the optimized trajectory. In 13 particular, the stability and convergence of the controller are proved. 14 Numerical results are given to demonstrate the effectiveness of the 15 16 proposed methods.

Key words: trajectory optimization; collision avoidance; active and passive trajectoryprotection; adaptive Gauss pseudospectral method; finite-time control

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I. Introduction

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Autonomous spacecraft rendezvous is an enabling technology for many space missions. The first successful test of autonomous spacecraft rendezvous took place in 1967[1]; since then,

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