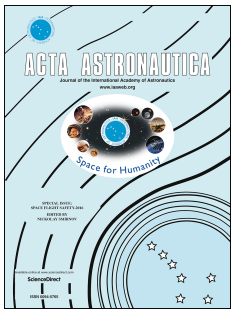
Accepted Manuscript



An adaptive reentry guidance method considering the influence of blackout zone

Yu Wu, Jianyao Yao, Xiangju Qu

PII: S0094-5765(17)30838-X

DOI: 10.1016/j.actaastro.2017.10.041

Reference: AA 6534

To appear in: *Acta Astronautica*

Received Date: 19 June 2017

Revised Date: 17 October 2017

Accepted Date: 28 October 2017

Please cite this article as: Y. Wu, J. Yao, X. Qu, An adaptive reentry guidance method considering the influence of blackout zone, *Acta Astronautica* (2017), doi: 10.1016/j.actaastro.2017.10.041.

An Adaptive Reentry Guidance Method Considering the Influence of Blackout Zone

Yu Wu[1] , Jianyao Yao[1,*], Xiangju Qu[2]

1. *College of Aerospace Engineering, Chongqing University,* Chongqing 400044, China

2. *School of Aeronautic Science and Engineering, Beihang University,* Beijing 100191, China

Abstract

Reentry guidance has been researched as a popular topic because it is critical for a successful flight. In view that the existing guidance methods do not take into account the accumulated navigation error of Inertial Navigation System (INS) in the blackout zone, in this paper, an adaptive reentry guidance method is proposed to obtain the optimal reentry trajectory quickly with the target of minimum aerodynamic heating rate. The terminal error in position and attitude can be also reduced with the proposed method. In this method, the whole reentry guidance task is divided into two phases, i.e., the trajectory updating phase and the trajectory planning phase. In the first phase, the idea of model predictive control (MPC) is used, and the receding optimization procedure ensures the optimal trajectory in the next few seconds. In the trajectory planning phase, after the vehicle has flown out of the blackout zone, the optimal reentry trajectory is obtained by online planning to adapt to the navigation information. An effective swarm intelligence algorithm, i.e. pigeon inspired optimization (PIO) algorithm, is applied to obtain the optimal reentry trajectory in both of the two phases.

* Corresponding author: Jianyao Yao. E-mail: yaojianyao@cqu.edu.cn