

Accepted Manuscript

Soft landing on an irregular shape asteroid using Multiple-Horizon Multiple-Model Predictive Control

MohammadAmin AlandiHallaj, Nima Assadian



PII: S0094-5765(17)30807-X

DOI: [10.1016/j.actaastro.2017.08.019](https://doi.org/10.1016/j.actaastro.2017.08.019)

Reference: AA 6438

To appear in: *Acta Astronautica*

Received Date: 13 June 2017

Revised Date: 15 August 2017

Accepted Date: 18 August 2017

Please cite this article as: M. AlandiHallaj, N. Assadian, Soft landing on an irregular shape asteroid using Multiple-Horizon Multiple-Model Predictive Control, *Acta Astronautica* (2017), doi: 10.1016/j.actaastro.2017.08.019.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Soft Landing on an Irregular Shape Asteroid using Multiple-Horizon Multiple-Model Predictive Control

MohammadAmin AlandiHallaj, Nima Assadian*

Department of Aerospace Engineering, Sharif University of Technology, Tehran, Iran

Abstract

This study has introduced a predictive framework including a heuristic guidance law named Predictive Path Planning and Multiple-Horizon Multiple-Model Predictive Control as the control scheme for soft landing on an irregular-shaped asteroid. The dynamical model of spacecraft trajectory around an asteroid is introduced. The reference-landing trajectory is generated using Predictive Path Planning. Not only does the presented guidance law satisfy the collision avoidance constraint, but also guarantees the landing accuracy and vertical landing condition. Multiple-Horizon Multiple-Model Predictive Control is employed to make the spacecraft track the designed reference trajectory. The proposed control approach, which is a Model Predictive Control scheme, utilizes several prediction models instead of one. In this manner, it inherits the advantages of optimality and tackling external disturbances and model uncertainties from classical Model Predictive Control and at the same time has the advantage of lower computational burden than Model Predictive Control. Finally, numerical simulations are carried out to demonstrate the feasibility and effectiveness of the proposed control approach in achieving the desired conditions in presence of uncertainties and disturbances.

Keywords: Asteroid Landing, Model Predictive Control; Predictive Path Planning; Multiple-Horizon Multiple-Model Predictive Control;

List of abbreviation

EKF Extended Kalman Filter

* Corresponding author. Office phone: +98 (21) 6616 4607, Fax: +98 (21) 6602 2731.
Email addresses: amin_hallaj@ae.sharif.ir (M.A. AlandiHallaj), assadian@sharif.edu (N. Assadian)

Download English Version:

<https://daneshyari.com/en/article/5472113>

Download Persian Version:

<https://daneshyari.com/article/5472113>

[Daneshyari.com](https://daneshyari.com)