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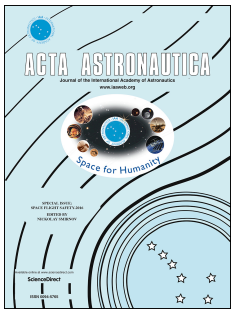

Soft landing on an irregular shape asteroid using Multiple-Horizon Multiple-Model Predictive Control

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

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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 heritages 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

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