Advanced satellite attitude control strategies under actuation constraints and multiple sources of disturbance

Soutenance de thèse – MAGNANI Guido
25 novembre 2024 à 14h00
Salle des thèses ISAE-SUPAERO, 10 Avenue Edouard Belin, Toulouse

Devant le jury composé de :

Mme Manuela Battipede, Politecnico di Torino, Rapporteur
M. Guillaume Sandou, CentraleSupélec, Rapporteur
M. Alexandre Falcoz, Airbus Defence and Space, Examinateur
M. Luca Zaccarian, LAAS-CNRS, Examinateur
M. Jean-Marc Biannic, ONERA, Directeur de thèse
M. Mario Cassaro, ONERA, Co-directeur de thèse
Mme Hélène Evain, CNES, Encadrante

Résumé

In a scenario of highly autonomous geostationary satellites, with self-assembly and self-maintenance capabilities, manipulator arms perturbations coupled with fuel slosh dynamics represent a significant risk of performance degradation for the satellite attitude and orbit control system. While passive fuel slosh damping solutions and manipulator arm disturbances compensators exist on their own, a unique active control solution capable of rejecting the perturbations while optimally preventing the saturation of the actuators is lacking and of great interest in the space industry for weight, cost, and complexity of manufacturing reduction. This study explores the integration of robust control and model reference adaptive control techniques with reference governor schemes. The objective is to propose a unique control solution to guarantee precise satellite attitude control in the presence of unmodeled perturbations and actuator constraints. The theoretical advancements from this research also extend to scenarios such as handling propeller failures in quadrotors under state and input constraints and optimizing the design of the guidance modes for satellite missions like the CNES Microcarb mission.

Mots clés
Satellite Attitude Control, Adaptive Control, Predictive Control, Uncertain Systems, Constrained Systems.

Lien Zoom :
https://isae-supaero-fr.zoom.us/j/95010532975?pwd=kjF5jVr5nGzZ8m8m1lj3m1nPPuP0LO.1

ID de réunion: 950 1053 2975
Code secret: 440995