H∞ control option for a combined energy and attitude control system

Abstract

A combined energy and attitude control system (CEACS) is a hybrid system that uses flywheels to store energy and provide a simultaneous attitude control in satellites. Previous work appeared in Advances in Space Research (ASR) employing the proportional-derivative (PD) control has proven that CEACS works well and achieves its mission requirement. However, the in-orbit system performance uncertainties present a challenge to the CEACS attitude pointing capability. Thus, this paper complements the previous mentioned work, and focuses on employing the H∞ optimal attitude control solution for the CEACS attitude control enhancement. The mathematical model and numerical treatments for the CEACS H∞ control architecture are presented. Numerical results show that a better attitude pointing accuracy at least up to 0.043° can be achieved with the H∞ control method.

Keyword: H∞ control; Optimal control; Satellite attitude control; CEACS