

Satellite cascade attitude control via fuzzy PD controller with active force control under momentum dumping

ABSTRACT

In this paper, fuzzy proportional-derivative (PD) controller with active force control (AFC) scheme is studied and employed in the satellite attitude control system equipped with reaction wheels. The momentum dumping is enabled via proportional integral (PI) controller as the system is impractical without momentum dumping control. The attitude controllers are developed together with their governing equations and evaluated through numerical treatment with respect to a reference satellite mission. From the results, it is evident that the three axis attitudes accuracies can be improved up to ± 0.001 degree through the fuzzy PD controller with AFC scheme for the attitude control. In addition, the three-axis wheel angular momentums are well maintained during the attitude control tasks.

Keyword: Satellite; Fuzzy proportional-derivative (PD) controller; Active force control (AFC); Momentum dumping