

Design of Optimal Proportional Integral Derivative Attitude Controller for an Uncoupled Flexible Satellite Using Particle Swarm Optimization

Authors : Martha C. Orazulume, Jibril D. Jiya

Abstract : Flexible satellites are equipped with various appendages which vibrate under the influence of any excitation and make the attitude of the satellite to be unstable. Therefore, the system must be able to adjust to balance the effect of these appendages in order to point accurately and satisfactorily which is one of the most important problems in satellite design. Proportional Integral Derivative (PID) Controller is simple to design and computationally efficient to implement which is used to stabilize the effect of these flexible appendages. However, manual tuning of the PID is time consuming, waste energy and money. Particle Swarm Optimization (PSO) is used to tune the parameters of PID Controller. Simulation results obtained show that PSO tuned PID Controller is able to re-orient the spacecraft attitude as well as dampen the effect of mechanical resonance and yields better performance when compared with manually tuned PID Controller.

Keywords : Attitude Control, Flexible Satellite, Particle Swarm Optimization, PID Controller and Optimization

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