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HYBRID ROBUST CONTROL OF A FREE-FLYING FLEXIBLE SPACE MANIPULATOR

Abstract

Hybrid robust control is designed for a free-flying flexible space manipulator with unknown but bounded physical parameters. The dynamical equation is established based on the Lagrange equations and the assumed mode technique. A singular perturbation model has been formulated, which consists of a fast subsystem and a slow subsystem. The fast subsystem represents the flexible part of the system, and the slow subsystem represents the rigid part of the system. A robust control law is constructed for the rigid counterpart of the flexible manipulator. The robust control law alone does not guarantee the stability of the flexible vibrations of the links. To suppress the flexible link vibrations, hybrid trajectories for the robust control are generated using the virtual force concept. Numerical simulations show that the link vibrations have been stabilized effectively with good tracking performance.