



Control of Nonlinear Multibody Flexible Space Structures (Lecture Notes in Control and Information Sciences)

Atul G. Kelkar, Suresh M. Joshi

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Addressing the difficult problem of controlling flexible spacecraft having multiple articulated appendages is the aim of this volume. Such systems are needed for space mission concepts including multi-payload space platforms and autonomous space-based manipulators. These systems are characterised by highly nonlinear dynamics, flexibility in members and joints, low inherent damping, and modeling uncertainty. A complete nonlinear rotational dynamic model of a generic multibody flexible system is derived, and is shown to possess certain passivity properties. The main result is a class of passivity-based nonlinear and linear output feedback control laws that enable globally stable closed-loop manoeuvres. The control laws are robust to parametric uncertainties, unmodeled uncertainties, and in some cases, actuator and sensor nonlinearities. All results given are also applicable to flexible terrestrial manipulators.

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