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SYNTHESIS OF ROBUST CONTROLLER FOR ION BEAM SHEPHERD CONTROL SYSTEM

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The study objective is to synthesize a motion controller for an ion-beam shepherd with respect to space debris object during its contactless de-orbiting. It is assumed that the control system has sensors for measuring the shepherd attitude with respect to space debris. Hydrazine thrusters with thrust pulse-width modulation have been used as actuators of the control system. The robust controller was synthesized using the mixed sensitivity method. It provides a necessary compromise between a robust stability, the control quality and expenses considering special impacts of an ion beam, external disturbances, errors in the determination of the relative position, and the imperfection of the reactive actuators. Requirements for the synthesized controller are specified in the frequency domain by using the selected weighting functions. The synthesis results are validated by the computer simulation using the nonlinear mathematical model taking into account a wide range of orbital perturbations acting on the system.

Keywords: *ion-beam shepherd, space debris object, robust controller, mixed sensitivity method, weighting function, disturbances.*

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