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ANALYSIS OF THE ROBUSTNESS OF THE SYSTEM TO CONTROL THE RELATIVE MOTION OF AN ION BEAM SHEPHERD

The goal of the paper is to analyze the robustness of the system to control the ion beam shepherd motion with respect to a space debris object. The robustness was analyzed considering the action of the ion beam, a wide spectrum of orbital disturbances, relative position and actuation errors, the nonstationarity and parametric uncertainty of the plant, and limitations on the control action amplitude. Amplitude and phase stability margins were determined for each of the control channels. The stability analysis of a plant with variable coefficients was reduced to the analysis of the robust stability of a system with uncertain parameters. The uncertain parameters of the mathematical model were represented using a linear fractional transformation. Using this description, the uncertainty of the model was represented as a structured block-diagonal disturbance block. A robustness measure based on the concept of structured singular values was used. The calculated structured singular values demonstrate the system robustness to all the factors under consideration.

Keywords: *ion beam shepherd, space debris object, controller, robustness, uncertainty, disturbances, structured singular value.*

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