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Error analysis and a new steering law design for spacecraft control system using SGCMGs

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Abstract

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Abstract Based on the singular value decomposition theory, this paper analyzed the mechanism of escaping/avoiding singularity using generalized and weighted singularity-robust steering laws for a spacecraft that uses single gimbal control moment gyros (SGCMGs) as the actuator for the attitude control system. The expression of output-torque error is given at the point of singularity, proving the incompatible relationship between the gimbal rate and the output-torque error. The method of establishing a balance between the gimbal rate and the output-torque error is discussed, and a new steering law is designed. Simulation results show that the proposed steering law can effectively drive SGCMGs to escape away from singularities.

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