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An Optimal Approach for Full-Detailed Friction Model Identification of Reaction Wheel

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Abstract : The ever-increasing use of satellites demands a search for increasingly accurate and reliable pointing systems. Reaction wheels are rotating devices used commonly for the attitude control of the spacecraft since provide a wide range of torque magnitude and high reliability. The numerical modeling of this device can significantly enhance the accuracy of the satellite control in space. Modeling the wheel rotation in the presence of the various frictions is one of the critical parts of this approach. This paper presents a Dynamic Model Control of a Reaction Wheel (DMCR) in the current control mode. In current-mode, the required current is delivered to the coils in order to achieve the desired torque. During this research, all the friction parameters as viscous and coulomb, motor coefficient, resistance and voltage constant are identified. In order to model identification of a reaction wheel, numerous varying current commands apply on the particular wheel to verify the estimated model. All the parameters of DMCR are identified by classical Levenberg-Marquardt (CLM) optimization method. The experimental results demonstrate that the developed model has an appropriate precise and can be used in the satellite control simulation.

Keywords : experimental modeling, friction parameters, model identification, reaction wheel
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