MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures - Dynamics and Microdynamics (3)

Author: Ms. LI Haiyan
China, lihaiyan10111213@163.com

Dr. Lei Jin
Beihang University, China, jinleibuaa@163.com

ON-ORBIT IDENTIFICATION OF INERTIA PARAMETERS OF COMBINED SPACECRAFT USING SPACE MANIPULATOR

Abstract

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Abstract There will be more and more rendezvous and docking missions with the development of space technology. Inertia parameters of the combined spacecraft will be changed significantly after a server spacecraft is docked to a target satelliteThis paper presents an approach for on-orbit identification of inertia parameters of combined spacecraft. The momentum-based identification in most of the published work is proposed under the assumption that the linear and angular momentums of the whole system are knownBut the parameters cannot be identified when the momentums are actually not knownTo solve this problem, the linear and angular momentums are expressed in the inertial frame to insure the conservation of components of momentum rather than in the base body-fixed frameThen, by eliminating the linear and angular velocities of the combined spacecraft and angular velocity and angle of each join, the momentum increment equations are obtained and the inertial parameters of spacecraft become the only unknown. Finally, the parameters are identified by using two steps. The first step is to identify mass and mass center of the compound spacecraftThe second step is to identify inertia tensor of the compound spacecraftThe advantages of the approach are1) the inertial parameters can be accurately identified whether the inertial momentums are known;2) it can decouple the massmass center and inertia tensor without consuming valuable jet fuel. 3) It only requires the velocities of the spacecraft rather than acceleration and force.