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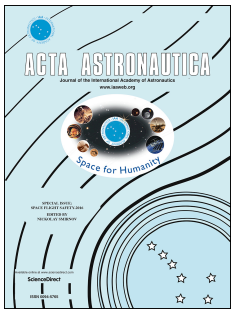

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Dynamic Modeling and Super-Twisting Sliding Mode Control for Tethered Space Robot

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Abstract: Recent years, tethered space capturing systems have been considered as one of the most promising solutions for active space debris removal due to the increasing threat of space debris to spacecraft and astronauts. In this paper, one of the tethered space capturing systems, Tethered Space Robot (TSR), is investigated. TSR includes a space platform, a space tether, and a gripper as the terminal device. Based on the assumptions that the platform and the gripper are point masses and the tether is rigid, inextensible and remaining straight, the dynamic model of TSR is presented, in which the disturbances from space environment is considered. According to the previous study, the in-plane and out-of-plane angles of the tether oscillate periodically although the tether is released to the desired length. A super-twisting adaptive sliding mode control scheme is designed for TSR to eliminate the vibration of the tether to assure a successful capture in station-keeping phase. Both uncontrolled and controlled situations are simulated. The simulation results show that the proposed controller is