Key Technology of Space Exploration (8)
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OPTIMIZED CONTACTLESS TARGET DE-TUMBLING STRATEGY USING ROBOT WITH EDDY-CURRENT BRAKE

Abstract

Space debris has greatly increased with recent launch missions. Former active debris removal tests using space robot mainly focused on the fundamental technology of target recognition, joint control and path planning. However robots contacting directly with the surface of targets with large mass and angular momentum will cause severe collision problems. A target de-tumbling strategy is proposed in this paper by using two robot arms. Each robot arm is equipped with magnetic coil, which can generate eddy current in conductive targets and gradually de-tumble rotation without contact. The three-dimension rotation model of a discarded satellite and upper stage is established based on its distribution of the moment of inertia and the safe working space of the robots is calculated. By analyzing the point of application and direction of the magnetic force, an optimized de-tumbling trajectory for the robots is presented to minimize the de-tumbling time by reducing the targets'angular momentum. At last, a simulation is processed to verify the optimized de-tumbling method.