

SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

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AN INNOVATIVE TECHNOLOGY FOR ON-ORBIT SOFT CAPTURE

Abstract

In the complex space environment, satellites are prone to failure and can not work properly. Therefore, on-orbit satellite servicing, such as on-orbit assembly and mitigation of orbital debris, are very important. As the primary means of on-orbit satellite servicing, on-orbit capture technology has been attached great importance to the world's space power. On-orbit capture technology includes several key technical difficulties. One of them is how to steadily capture the cooperative /non-cooperative target satellites which maybe contain a relatively large linear/angular momentum, meanwhile, with little effect on the based satellite attitude control. The current researches on this problem are mainly focused on the Single/Multi-Rigid Arm Capture(SMRAC) technologies, such as space docking and space multi-arm robot, etc. A bottleneck of SMRAC is that the capturing process will produce a great of pulse collision momentum between the based satellite and the target satellite. Furthermore, the pulse momentum is not controllable and maybe lead to two satellites roll, collision or even damage.

Therefore, in this paper, aiming at the solution of uncontrollable capture collision momentum caused by the SMRAC, an innovative technology of Space Soft Capture(SSC) with its prototype model are proposed to find the strategy of making the transformation from pulse collision momentum to soft controllable momentum which is suitable to based satellite control. Compared with existing SMRAC technologies, the simulation experiments show that the impact of pulse collision momentum caused by the target satellite can effectively be reduced by using the SSC technology both in time and energy domain. These research achievements mentioned above have practical significance for the operation of space station and other on-orbit satellite servicing.