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# RESEARCH ON THE CONCEPT, MECHANISM AND MODELING OF SPACE SOFT CAPTURE TECHNIQUE IN THE AREA OF ON-ORBIT SERVICING

**Abstract**

On-orbit capture technique for space target spacecraft has became an important research area in space on orbit manipulation, which is the key technique of space on-orbit service. Currently, the mainly used techniques in the area of space manipulation capture include special docking mechanism, rigid multi-arm, tethered end, flying net, and electromagnetic connection. However, these techniques have the following limitations. First, they require relative position and posture measurement, position and posture tracking, and position and posture to meet the requirement of high precision. Second, the based satellite and target satellite cannot be abnormally disturbed during the moment of space capture and the process of capture. Otherwise, the collision kinetic energy between the two satellites cannot be symmetrically transferred, the velocities of the two satellites would suddenly changed, and the space operation task would be failed. Those tough operation conditions extremely limit the improvement of space operation abilities and the development of operation techniques.

According to the above technique problems, this paper has proposed a new spatial soft capture technique, which can achieve the buffer and unload of impact force during the capture process between the two satellites, in order to smooth the capture process, solve the energy impact and disturbance problem during the capture process between the two satellites, reduce the risk caused by current space operation hard capture, and extend the application areas of space operation. This paper has carried out research on systematical theory and key techniques about the concept and mechanism of spatial soft capture. The modeling simulation and its data analysis show that the proposed concept and its proved mechanism are scientific and correct.