Paper ID: 19691
student

SPACE DEBRIS SYMPOSIUM (A6)
Poster Session (P)

Author: Mr. Haitao Liu
College of Aerospace Science and Engineering, National University of Defense Technology, China, lhtnudt@163.com

Dr. Qingbin Zhang
China, qingbinzhang@sina.com.cn
Prof. Leping Yang
National University of Defense Technology, China, ylpnudt@163.com
Dr. Yanwei Zhu
National University of Defense Technology, China, zywnudt@163.com

MODELING AND SIMULATION OF DEPLOYMENT DYNAMICS OF SPACE WEBS

Abstract

In recent years, defunct satellites mitigation has become a hot issue in the space field. Several solutions have been proposed, including the electrodynamic debris eliminator (EDDE), US, manipulator capture de-orbit scheme by Li Yuheng, China, and the robotic geostationary orbit restorer (ROGER) of net capture and tugging, ESA. As new species of lightweight flexible space structure, space webs indicate great potential to mitigate space debris and capture orbital objects. Compared with traditional manipulators, the space webs are characterized by advantages of high degree of deformation, lightweight, long capture distance, sufficient error tolerance, and small impact on the tug. However, it is too difficult to make analytical model of space webs for its complex dynamic characteristics of nonlinear and flexible, thus mathematical models are necessary in the analysis of space webs. It is still a great challenge to predict accurately the dynamic behavior of flexible web systems, so experiments would be useful and necessary for the final simulation results. In this paper, the flexible web is modeled as a series of collected semi-damp springs with masses lumped at appropriated nodes. Meanwhile, the tether parameter such as stiffness and damp ratio are obtained from experiment data, and the aerodynamic force of each segment is considered for ground test. The dynamic model is firstly verified by ground test. The simulation results are in well agreements with experiment data. Then, characteristics of space flexible web, such as shape and strain distribution, are investigated for the given mission of orbital capture.