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RESEARCH ON THE PRACTICE AND EFFICIENCY IMPROVEMENT OF THE
EXTRAVEHICULAR ACTIVITY MISSION SUPPORTED BY CHINA SPACE STATION
MANIPULATOR

Abstract

China space station was completed in 2022, and the space station manipulator had successfully completed several extravehicular activity missions of multiple batches of astronauts. The space manipulator supporting the extravehicular activity was a high-risk activity, which involved complex factors such as spacecraft system, space environment, man-machine cooperation and so on. In this paper, the practice of manipulator support for extravehicular activity of astronauts in China Space Station was analyzed. Special research has been carried out on the efficiency improvement of space manipulator support for the extravehicular activity under the premise of ensuring the safety of astronauts, and targeted solutions are proposed. The basic task planning of the space manipulator was carried out by sorting out the influence factors of the extravehicular activity and analyzing its importance. At the same time, the optimization analysis of the space manipulator supporting the extravehicular activity was carried out from the aspects of path planning, command interval, human-machine cooperation, etc. The simulation analysis method was used to verify the whole process of the safety of space manipulator and astronaut in the optimization scheme to improve the task safety, and the semi-physical method was used to verify the rationality of the instructions in the optimization scheme to improve the task efficiency. Finally, the optimized scheme of the manipulator was used in the actual extravehicular activity, and the proposed solution could effectively improve work efficiency. The research results can provide useful reference for other countries in the world to implement the space manipulator to support extravehicular activity.