

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
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Author: Mr. Liangliang HAN

Institute of Aerospace System Engineering Shanghai, CASC, China

Mr. Jian YANG

Institute of Aerospace System Engineering Shanghai, CASC, China

Prof. Chen Meng

Institute of Aerospace System Engineering Shanghai, CASC, China

Mr. TANG PING

China Aerospace Science and Technology Corporation (CASC), China

Prof.Dr. Chongfeng ZHANG

Shanghai Academy of Spaceflight Technology (SAST), China Aerospace and Technology Corporation
(CASC), China

A STUDY ON THE CLIMBING GAIT ON THE SURFACE OF CHINA SPACE STATION OF A
FOUR-ARM SPACE ROBOT

Abstract

Constructing in-space infrastructure like space station, space fuel-station or space solar station will be a significant way to detect and make use of the resource in outer space. The application of space robot will relieve astronauts of operation burdens and reduce the risk of extravehicular activity in the process of assembling, repair and maintenance of these large-scale spacecrafts. This paper proposed a novel four-arm space robot for on-orbit servicing on China Space Station, which could climb on the surface of the station and do some dexterous operation. It's a redundant robot with four identical arms. Each arm is equipped with end-effectors or dexterous humanoid hand to satisfy the needs for repair or grasping. Drawing on the movement pattern of the creatures with four limbs, the robot has multiple climbing strategies and gaits to achieve a large coverage of the Space Station. This paper makes a study on the climbing gait on China Space Station of a four-arm space robot. For climbing on the typical features and environment of China Space Station, some biologically inspired gaits are proposed, such as rectilinear climbing with two arms, climbing with four arms like a Gorilla. With the help of ADAMS software, some simulations are made to prove the design of climbing gaits. The result of this paper will provide some useful reference for the development of China Space Station.