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Author: Prof. Mitsushige Oda
JAXA, Japan

Mr. Kent Yoshikawa
Tokyo Institute of Technology, Japan

PROPOSAL OF AN ASTRONAUT SUPPORT ROBOT TO BE USED INSIDE THE LAB MODULES OF ISS

Abstract

The International Space Station is equipped with various kind of equipment. The onboard astronauts are busy in operating the space station and also enjoying their own daily activities. However these activities produce dusts. Astronauts have to spend their important weekend hours to clean up the space station. Since ISS is the weightless space, dusts will not piled up on the floor as is on the Earth but are caught up around the air inlet and the outlets of the air circulation equipment. In each weekend astronauts are cleaning the space station using the vacuum air cleaner to collect dusts. Another task which wastes astronauts' valuable hours is to monitor equipment during experiments and maintenance Based on these astronauts' experiences JAXA issued an RFP (Request For Proposal) to invite proposals to develop robot(s) which will clean up and to monitor the space station equipment. A team lead by Prof. Oda, which has proposed, developed and conducted the astronaut support robot experiments named REX-J on ISS in 2012, has proposed two types of space robots in response to this RFP, one for monitoring and the other is for cleaning inside the space station. These two robots have different each other. The monitoring robot has a flexible arm to reach the proper position and pose to monitor instruments where there are many cables floating inside the laboratory module. If it is on the Earth, cables are laid down on the floor, but in space cables are floating inside the space. Therefore the robot must move around avoiding collision with cables. The cleaning robot is something like a vacuum cleaner with a locomotion system based on the experience of REX-J. REX-J demonstrated on the space station that the tether based space robot can move around the space facility. The merit of the tether based robot is that the size of the robot is small even if the robot moves in a wide area. The cleaning robot will move along the handrails inside the laboratory module. After the robot arrives at a proper position to extend and to detract the tubular robot arm using originally designed as a tube of the air cleaner. Selection of robot(s) to be developed and to be used on the international space station will be decided soon. If this proposal will be selected, then the detailed development plan will be presented.