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HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
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PANORAMA OF IDEAS FOR EXPLOITATION OF HUMANOID ROBOTS IN SPACE ACTIVITIES AND EXPLORATION

Abstract

The humanoid robots have always been a challenging subject of study due to their complexity, not only in replicating the human body movements, but also in emulating its autonomous behavior and interaction with the outside world. However, only recently, the knowledge gained in this field allowed the use of humanoid robots in space and paved the way for interesting future applications. In February 2011, "Robonaut 2" was launched on STS-133 and delivered to the International Space Station (ISS) to support astronauts in their daily operations, by performing tasks gradually more and more complex. Afterwards, in August 2013, a 34 cm tall Japanese humanoid robot called "Kirobo" arrived on the ISS to assist astronaut Koichi Wakata in various experiments. Indeed, a deeper understanding of how well robots and humans can interact and cooperate each other along with advancements in technology, will hopefully allow the robots to take more active roles in assisting astronauts on missions. In this context, the aim of this paper is to provide with a panorama of ideas on human robotic collaboration onboard to enhance the crew's ability to perform their mission successfully and return safely to Earth. Firstly, the use of humanoid robots is suggested to improve crew's habitat interface, reduce visual chaos and avoid the difficulties in distinguishing instruments and in performing activities. Humans and robots will have to coordinate to apply the 5S methodology and organise a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. This will result in an increase of comfort and general habitability. Secondly, the presence of robots onboard is recommended as crew psychological support, to mitigate latent and overt stressors. Indeed, robots can take over monotonous and routine tasks by reducing boredom and tedium and hopefully replace the crew in low tolerance for errors operations, including risky extravehicular activities. Furthermore, humanoid robots are particularly suitable to help astronauts in recreation and space art activities. In conclusion, this paper suggests the use of space analogues as part of a stepwise approach for implementing new capabilities needed for future space missions.