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ASTROBEE: MULTI-FUNCTION AUTONOMOUS ROBOTS FOR FUTURE SPACE EXPLORATION

Abstract

In the future, Space Exploration will be achieved by intelligent and autonomous machines, and humans will collaborate with cognitive and empathic robotic assistants to live longer and further into Space. In mid-2019, NASA launched to the International Space Station (ISS) three Astrobee free flying robots to provide an autonomous and flexible research platform for research in microgravity, and to serve as a robotic assistant for astronauts on the ISS. Astrobee has the ability to accommodate guest researchers looking to utilize the unique capabilities of this platform in the microgravity of low earth orbit, and to advance the state of the art of guest science software and research experiments. Guest payloads for Astrobee range from gecko-inspired adhesives for perching on smooth surfaces, to augmented reality interfaces to help astronauts and robots work together effectively, to RFID reader, performing inventory of RFID tagged items inside the ISS, to ultrasonic microphone arrays, able to detect air leaks and monitor equipment health, and many more. Astrobee will also serve utility functions, such as free flying cameras to record video and provide assistance during astronaut activities, and as mobile sensor platforms to conduct surveys of the ISS. As autonomous and intelligent systems garner more interest and are increasingly being implemented in multiple industries here on Earth, questions remain about their reliability and how to trust such systems. Astrobee will be a stepping stone to demonstrate the potential of autonomous and intelligent systems for Space Exploration.