

Robotic Satellite Servicing

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Abstract

As satellites and spacecraft near the end of their expected lifetime, many begin to incur failures in key components, expend their attitude control fuel, or reach computer obsolescence. Moreover, many satellites suffer post-launch mishaps, including failed deployment of solar arrays and antennae and electronic failures of critical components that lead to mission failure. A free-flying spacecraft with an integral robotic front-end capable of reaching satellites in geosynchronous orbit would provide a valuable asset in addressing these failures. Satellite servicing could take advantage of recent advances in mobile manipulation in order to dock or berth to the target vehicle. After the servicer is docked, the robot can perform servicing tasks with a manipulator or make necessary repairs in-situ. For example, the servicer would be able to perform visual inspection, replace failed components, deploy stuck solar arrays, refuel tanks with liquid propellant, and perform many other maintenance tasks to support a single satellite or a constellation of satellites. The proposed full-day workshop will bring together international researchers in the fields of space and servicing robotics to exchange ideas in key enabling technology areas: manipulation, contact dynamics, pose estimation, teleoperation and haptics, shared autonomy, compliant control, multi-manipulator systems, time-delay compensation, and interactions in a space environment.