Researchers improve performance with robotic systems on the ISS

October 12 2007

Researchers from NASA and Lockheed Martin have successfully tested software for a robotic extension device that has been shown to dramatically improve astronauts' ability to perform remote tasks under adverse conditions on the International Space Station (ISS).

James C. Maida, Charles K. Bowen, and John Pace developed the method for use with the Special Purpose Dexterous Manipulator, which works in conjunction with the current Space Station Remote Manipulator System (SSRMS). They presented their findings at the Human Factors and Ergonomics Society 51st Annual Meeting on October 3 in Baltimore, Maryland.

Robotic devices on the ISS make it possible for astronauts to perform tasks without leaving the vehicle. Manipulating these devices is challenging, particularly in bright sunlight and deep darkness. Maida and colleagues employed augmented reality techniques to create a graphical informational overlay that can be used in simulations of robotic installation tasks to improve operator performance.

The installation task requires intense concentration by the astronaut to align an external orbital replacement unit (ORU) within ¼ inch and ½ degree at its installation point. The task is accomplished by viewing the scene of the installation through a camera and manipulating robotic arms. The researchers used enhanced live video with dynamic overlay information superimposed on features in the operators' field of view to guide them regarding the direction of motion of the robotic arm, the

type of motion, and the correct position for installation.

Twelve highly skilled robotics operators were tested on four installation tasks under conditions of dynamic sunlight and very dark nights with and without the overlay. In all cases, accuracy and efficiency improved significantly when using the new overlay system, and all 12 operators found the overlay information extremely helpful in performing the ORU alignment operation. Time to complete the task was also reduced.

The researchers conclude that because the graphics are relatively simple and the computational requirements are low, the overlay system could be implemented on existing flight hardware used on the space shuttle and the ISS.

Source: Human Factors and Ergonomics Society