

Using the ISS to Prepare for Exploration (01)
Exploration Technology Demonstrations Using ISS (2)

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METERON AS PREPARATION FOR EXPLORATION

Abstract

In all or most scenarios being considered for human exploration of the universe, the first steps to be taken will involve robotics. Before humans descend on a heavenly body (Moon, Mars, asteroid), there will be a phase where robots will explore the surface and prepare for human arrival. For some tasks, these robots can be controlled from Earth by sequential commanding and waiting for the results before giving the next command. For more complex tasks however, especially when not everything is as foreseen, a more advanced level of tele-operation could be required. The most advanced level currently includes full immersion with stereovision and master-slave control with force feedback and dextrous manipulation. Such control can only take place when a communication channel is available with high bandwidth and low latency, which means that direct control from Earth is not possible. The control station will have to be located in a spacecraft orbiting the heavenly body.

METERON is a project which mimics this scenario with a ground segment and robotic systems on Earth and a control station on the ISS. In METERON, a series of experiments will be executed focussing on communications, telerobotics and end-to-end operations. The experiments should gradually increase in complexity from the first communications tests in 2012 until the full immersive tests around 2016. The need for, performance of and other merits of the various robot commanding modes will be assessed. Communications architectures and methods, e.g. Disruption Tolerant Networking (DTN) will be evaluated.

First METERON joint activities are already underway together with NASA and discussions with Russia are on-going as well. The paper will describe the METERON system and experiments and their relevance for exploration.

A second generation of this equipment could be placed in cis-lunar space. The paper will also analyse how the METERON demo can create opportunities for tele-ops of lunar robotic surface assets from a cis-lunar man-tended infrastructure.