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HUMAN-ROBOTIC PARTNERSHIP LESSONS-LEARNED DURING SIMULATED MARS SURFACE EXCURSIONS THE RIO TINTO ANALOGUE SITE

Abstract

After several laboratory and precursor field tests of the Aouda.X spacesuit simulator, in conjunction with various biological and geophysical experiments, a five-day test series was conducted at the Rio Tinto Mars-analogue site in southern Spain. In the framework of the PolAres programme of the Austrian Space Forum, a first test of the Phileas rover was performed, seven scientific and engineering experiments investigated selected aspects of a human exploration mission in an operational environment. Rio Tinto offers an excellent location for mars analogue simulations. The surface topography as well as the mineralogical similarity to the MER Opportunity landing site at Meridianum Planum, the effects of the fine granular and dusty environment provided high fidelity simulation conditions to test candidate instruments for a human Mars mission and demonstrate the "Phileas" drivetrain structure. One focus of the experiments was on the interaction of the "Phileas" rover with the Aouda.X spacesuit simulator. A Microsoft Kinect on the Phileas rover was used to data stream 4D data to map the natural environment. This telemetry was also used to track and recognize human body and gestures for future methods to controlle the rover via human gestures.

Another experiment focused on the interaction of the Phileas rover with the Dignity rover and the White Label Space Lander mock-up. During bad lightening conditions at twilight, Dignity and Phileas rover inspected the lander for "landing damages" on the mock-up and give the operators a first impression of the operational challenges of a robotic mission. The results from these experiments could be helpful for future human-robotic interaction strategies.

The field crew was supported by a full-scale Mission Control Center (MCC) in Innsbruck, Austria. The field telemetry data was channelled to the MCC to enable a Remote Science Support team to study field data in near-realtime and have the opportunity to influence the flight planning as the mission proceeded. This allowed external researches to obtain a high level of situational awareness and give operators the possibility to interact with their robotic experiment.