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TELEROBOTICS CONTROL OF EXOGEOLAB LANDER INSTRUMENTS

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Introduction: The ExoGeoLab lander is a project at ESA/ESTEC initiated in collaboration with ILEWG task groups [1]. It is a structure with a rover deployment hatch, that can be equipped with several instruments such as UV-VIS, NIR and Raman spectrometers and a telescope. Those payloads can be remotely operated using a laptop connected via a Wi-Fi network. Some improvements need to be made to improve the lander's autonomy and operational capabilities. Those tasks are performed in cooperation with a team at EAC, which works on remotely operating cameras, spectrometers, a rover, a telescope and a radioastronomy system in the 20 MHz band [2]. The spectrometers were calibrated using a database of mineral established at ESTEC [3].

Figure 1 Deployment of the lander with instruments during an on field analogue campaign.

Goals: In 2016, the former Arduino+computer architecture was replaced by a centralised Raspberry-Pi architecture, allowing development of a more robust, modular and user-friendly interface for remote control [4]. The K-Stars Ekos module used by amateur astronomy community was then adapted on the lander to allow modular control of all the instruments and the lander's actuators on a single community supported GUI. Further improvements have to be made to enhance stability of the interface and replace the remnant Arduinos by Raspberry shields. Two new aspects are being investigated to improve the lander's autonomy for exploration. On the first hand, a light robotic arm has been developed at EAC [5] and has to be adapted to the lander's architecture to allow astronauts to remotely place samples on the spectrometer bench. On the second hand, distant geological feature spotted with the telescope could be explored using two drones piloted by astronauts and working together to bring back samples to the lander, thus reducing the need for EVA. For that purpose, a tool has to be developed to determine the target location knowing the telescope's orientation, and field tests will be carried out with buddy-system drones to write protocols.

Preliminary results: The remote control of the telescope focus and orientation is now successful but there is still a lack of orientation feedback for automated use or target localization. A proof of concept of drones piloted in buddy-system is currently being done.

Figure 2 Interface for remote control of the telescope focus.

We shall present at EPSC latest results from teleoperations of ExoGeoLab lander and instruments from ESTEC & EAC, and prospects for their utilisation in field research campaigns in Moon-Mars analogue environments [6].

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