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Author: Mr. Francisco García-de-Quirós
EMXYS (Embedded Instruments and Systems S.L), Spain, fgarciaq@emxys.com

Prof. Gianmarco Radice
University of Glasgow, United Kingdom, Gianmarco.Radice@glasgow.ac.uk
Dr. Jose Antonio Carrasco
EMXYS (Embedded Instruments and Systems S.L), Spain, joseacarrasco@emxys.com

DESIGN OF A COOPERATIVE ROBOTIC COMMUNITY FOR SURFACE MOON EXPLORATION

Abstract

Distributed robotic systems, formed by a community of cooperative autonomous micro-rovers, pose important advantages on surface planetary exploration. Besides of typical system benefits such as increased robustness and reliability, cooperative multi-robot systems enable new paradigms involving distributed instrumentation, large area sensor deployment, sensor fusion techniques to perform on-site research, etc.

Nevertheless, and though the current State-Of-The-Art in computation technologies and communications enable highly complex distributed processing on very small platforms, there are still many research challenges as this discipline involves the integration of many disciplines such as artificial intelligence, control theory, electronics, mechatronics, etc.

In this contribution, a Top-Down approach for a Moon surface exploration mission is described. First, a mission concept is presented in which the cooperative robotic community is deployed on the surface in a way compatible with the egress the main exploration rover. From this point, a small autonomous rover design is presented, together with the computational architecture and the cooperation mechanisms designed with the aim that the robotic community takes part supporting the exploration tasks of the main rover (deploying instruments or checking the soil stability to ensure a safe navigation of the main rover).

Main results and conclusions obtained after different field tests on a relevant scenario, are finally presented.