MiniRovers

SUMMARY

Abstract – The aim of this report is to show the implementation of a Proof of Concept regarding the future of Space Exploration: modular rovers interconnected with different protocols. The scope of this PoC encloses the control, sequencing, intercommunication, data processing and UI of this system, showcasing that a reduction of payloads and an increase in autonomy is possible applying basic IoT concepts [1].

Keywords – IoT, NodeRed, MiniRovers, Modularity, Python

Correal. O. Alba, Castro L. Laura, Mengual P. Víctor G., Ávila O. Jorge

The necessity of MiniRovers.

Space Exploration has always been one of the most challenging aspirations of humankind. Given the complexity of these robotic mechanisms, the usage of smaller robots with specific tasks interconnected with one another is becoming increasingly popular [2].

However, a correct definition of this robotic arrays is a very complex task, and several questions arise: What should be the hierarchy of the MiniRovers? How can we define which data shall be sent? How will scientists interact with these networks?

As a Proof of Concept, we will provide a possible definition of this array, delving into some of the key features that shall be implemented.

Implementation of the Network.

Our PoC consists of two MiniRovers: a sensor, that retrieves simple data from the explored body, and an actuator, that takes ground samples. Both of them are controlled by a central computer, that sends them to specific coordinates for performing their tasks. Similarly, they send some of their data to close nanosatellites in the area, having a cloud database that can be accessed from Earth thanks to a chatbot and a website. Given the scope of the project, no CCSDS network has been defined to communicate both WiFi subsystems[3].

A detailed explanation of the control system, its code and interfaces is provided here.

Results and further tasks.

We provided a successful definition of the array, pointing out how to solve some of the most common difficulties of Space Exploration. Nonetheless, hardware and communication protocols shall be adapted to those used in common space applications.

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