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DESIGN AND MANUFACTURING OF A SMALL LOW-COST LUNAR ROVER EQUIPPED WITH REMOTE AND AUTONOMOUS MOVEMENT, SURFACE MAPPING AND ENERGY MANAGEMENT ORIENTED TOWARDS DEMOCRATIZING LUNAR RESEARCH

Abstract

The current state of celestial body exploration is heavily limited by the high costs of sending rovers to space. This has led to an unintended monopolization of said research. Although groups like NASA are highly reliable, science is based on the premise that everyone should be able to replicate the experiment and contrast their results. In order to achieve this in the space field, our group has set out to develop a small, light and affordable rover which would allow small businesses and individuals to perform their own research. The rover's main functionalities are remote and autonomous movement via artificial intelligence; an energy management system which includes solar panels as well as a battery pack; and a surface mapping utility. Moreover, the main structure includes sufficient spare volume, mass and power output to allow for additional research devices. The hardware includes basic telemetry and a control system in charge of ensuring that the electronics remain in their operational temperature range. Furthermore, the rover is equipped with multiple radar sensors that allow for the surface mapping process, which in itself is used as the input for the autonomous movement AI. In addition, the chosen structural material guarantees fine protection against ionizing radiation. Lastly, a vibration damping system is included to diminish the white noise recorded by the sensors along with a signal filtering software. In conclusion, thanks to its clear benefits such as light weight and affordable price, our rover could potentially have an analogous impact in lunar research as the cubesat initiative had on space research. Not only do we hope that it will increase the industry's interest in small lunar rovers but also that it brings the general public closer to space. The next step towards democratizing space relies on obtaining the trust of investors, launching companies and the scientific community.