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A POWER AND COMMUNICATION LINK BETWEEN THE LUNAR SURFACE AND LUNAR CAVERNS FOR EXPLORING ROBOTS.

Abstract

Lava caves are formed as a result of a geological process associated with the cooling of basaltic lava flows. On the Moon, this process might result in caves many kilometres long and hundreds of metres in diameter. Skylights, a vertical hole between the lava tube and the lunar surface, can provide access to lava tubes. This is a fantastic potential for long-term missions, future permanent human colonies, and access to pristine samples of lava, secondary minerals, and volatiles.. Inside lava tubes, there is no access to solar light or a direct line of sight (for communications) to the lunar surface. This is a challenge for any robot (or swarm of robots) probing the lava tunnels. Robocrane addresses both issues by deploying a piece (known as the Charging head, or CH) at the bottom of the skylight using a crane. This CH functions as a battery charger as well as a communication relay for the exploring robots. The necessary energy is taken from the crane's solar panel (on the surface) and directed to the bottom of the skylight through an electrical line running parallel to the crane lifting wire. The use of a crane enables the system to deal with uneven terrain surrounding the skylight rim while also protecting the wires from abrasion from the rocky surface and pit rim. The charger in the CH is wireless, so charging may begin as soon as any of the robots approaches the CH. This prevents difficult and time-consuming docking processes, which are exacerbated by the orography of the skylight floor. Because the robots do not need to develop their own self-deployment mechanism, the crane infrastructure may also be utilised to deploy the exploring robots inside the pit, minimising their design limitations and mass budget. Finally, RoboCrane has all of the sensors and actuators required for remote control from a ground station.

RoboCrane was created in a parametric tool so that it may be dynamically and quickly modified to input-variable changes such as the number of exploring robots, their electrical characteristics, crane reach, and so on.