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LUNAR LEAPER: A LOCOMOTIVE VEHICLE FOR EXPANDED OUTREACH OF LUNAR ENVIRONMENT WITH DUAL OPERATIONS

Abstract

Space exploration as a challenge since long, rapid growth in the sector witnessed in recent decades with technological attempts to explore new horizons beyond our solar system with study of near-earth objects remain incomplete. Only about five percent of the moon discovered in recent findings, lunar caves demand need for development of advanced technology. Travel on lunar surface with diverse wheeled and propelled lunar vehicles proposed, wheeled rovers tend to be slow and susceptible to the moon's topographical abnormalities. While, propelled rovers consume immense quantities of propellant. An evident necessity to enhance the mobility of rovers allowing a reach over rough terrains brings up the paper involving the structural aspect of 'Lunar Leaper', with a dual operational capability with actions including jumping and crawling, the rover is capable of covering an extensive portion of the moon's surface that include challenging terrains. The rover is designed to perform angular jumps for a considerable period of time according to estimated range and height with the payloads. With reduce in overall interaction, the structure with least ground contact provides increased efficiency contributing to lunar exploration, enabling crossover of hard structures, qualifying effective operation of the rover. All movements of the rover are purely a function of its structure and non-continuous propulsion. The computer aided design of the structure, modelled on Autodesk Fusion 360 is iteratively simulated using COMSOL Multi-physics to support the theoretical analysis. The Lunar Leaper is a hope for distant and expansive outreach of the lunar environment providing a baseline for advanced lunar exploration technologies in near times.