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Author: Mr. Namsuk Cho
Hanyang University, Korea, Republic of

Ms. Yebin Kim
University of Sheffield, Korea, Republic of

GROUSER SHAPED MESH STRUCTURED WHEEL FOR SMALL LIGHTWEIGHT ROVER FOR LUNAR EXPLORATION

Abstract

The Apollo Missions and the Soviet Luna Project used a heavy Lunar Roving Vehicle(LRV) and the rover weighing hundreds of kilograms, and the structure of the wheels were made of mesh. Recently, rovers being developed in Japan, South Korea, India, and the United Kingdom are lightened and downsized for exploration with a specific purpose. The grouser-shaped mesh structured wheels for small lunar rovers have been tested to improve the existing problem of the grouser-shaped wheels. The problems were accumulation of regolith inside the wheels and dust generation. In addition, slip problem occurs when rotating the rover. The aim of the research is to improve the above problems of the grouser-shaped wheels by the use of a regular pattern of holes in the wheels. As the stated wheel design is more complex than the other grouser-shaped rover wheels, the research was conducted using additive Fused Deposition Modelling(FDM) 3D printing technology. The slip was improved by increasing the surface area of the rover wheels touching the surface through a regular pattern of holes. It is also expected to the reduction of dust generation by allowing regolith to pass through the holes in the grouser. Lightweight, the significant factor of rover is obtained through mesh patterned hole design. The test environment was initially used by silica, and regolith testbed. The assumption was conducted on a four-wheeled rover, and the angle of the wheels was fixed rather than variable. The rover wheels were designed and tested for improved efficiency of the moving behavior of small rover on regolith and are expected to develop small rover for further exploration of the regolith terrain.