SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations (IP)

Author: Dr. ACHUTANANDA PARHI
Indian Space Research Organization (ISRO), India

Mr. Mahesh V
India
Mr. Eswaran V
Indian Space Research Organization (ISRO), India
Mr. Levin G
Indian Space Research Organization (ISRO), India
Dr. Jayachandran T
Indian Space Research Organization (ISRO), India

AN OVERVIEW OF CHALLENGES IN DESIGN AND DEVELOPMENT OF LUNAR ROVER FOR MOON EXPLORATION

Abstract

For aiming an unmanned robotic mission to moon for exploration of the moon atmosphere and mineralogy, it is essential to have an industrial and instrumental rover. Typical lunar surface are amenable to travel by wheeled nailed vehicles on steep unconsolidated slopes and strewn rock fields. The Rover must design to tolerate the harsh lunar day and night thermal environment. The primary design limiting environments are thermal, radiation and dust environments and the vacuum and terrain environments are of secondary importance. The rover must overcome obstacles of 150 mm height minimum and craters of 100 mm width. It needs to climb up slopes of minimum 29 degree and down 30 degree. Several robust elements of the locomotion system are identified and analyzed to ensure the overall functionality of the locomotion system and appropriate interfacing with other rover systems. Such elements include gross wheel sizing, actuator sizing and geometric clearances. With these elements sized appropriately, a first cut of the locomotion design and mass budget can be completed. This technical note outlines the preliminary design and configuration of six wheeled rover, material requirements for sustaining in the adverse environment, lunar environmental issues and behavioral study of moon environment. Five degrees of freedom manipulator can be mounted on the front runner of the rover to monitor the day–to-day activities like solar cell cleaning, sample testing and passing command during imbalance stage while traversing on high terrain surface etc. The detailed kinematics of the five degree of freedom manipulator is generated by using Denavit-Hartenberg (DH) algorithm and presented.