Paper ID: 84892
oral
student

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Sarkhan Aghadadashov
National Aviation Academy - Azerbaijan, Azerbaijan

Prof.Dr. Rasim Alizade
National Aviation Academy - Azerbaijan, Azerbaijan
Mr. Javad Samadzade
National Aviation Academy - Azerbaijan, Azerbaijan

KINEMATIC AND STRUCTURAL ANALYSIS OF TERRAIN-ADAPTIVE WHEELED ROVERS FOR MARS EXPLORATION

Abstract

This paper proposes the new structural synthesis referring to the class of mobile machines classified as wheeled Mars rovers while making an attempt to target them for providing better mobility and soil stability. Therefore, the structure suggested that is likely to befit the Mars rover is that which hosts six wheels fitted fashionably likely to form two symmetric suspensions that will help it traverse all kinds of terrains efficiently and most effectively. Its very core idea was to come up with a new structure for the bogie, one that had two separate kinematic loops of which one was created by a slider-follower seven-link guided mechanism. Its intent was to be dual-purpose in that optimizing this weight distribution of the rover and the wheel-ground contiguity should follow traction and maneuverability of the rover. Each of the sides of the rover has three wheels, where two are on the bogie and another to attach to the rocker, latched in a fixed manner to the structure of the bogie. The idea relative to the design is that it brings on board a double-independent loop structure of the bogie linkage, symmetrically interconnected to secure better stability and flexibility at the time of navigation. The kinematic synthesis of the rover was composed of two independent, paired loops of slider-follower with the coupled input links which form the seven-link mechanism of the bogie arrangement. It will definitely support managing the wheel movements so much required to keep the vehicle balanced and continuing propulsion even when coming across an obstacle. This design of the mechanism provides that the main platform of the rover remains horizontal while negotiating with the obstacles, so achieved by differential gear mechanism between both suspensions. This aspect of stability is thus very important for the rover operation as it serves as a base even if the ground condition exists or when it is stationary supporting onboard instruments and payloads. Such advanced structure and kinematic design of the vehicle are combined with this dynamic degree of control which places this research at the forefront of the current thought and technology in planetary exploration robotics. The rover thus works with ground controls sending commands in which to observe and make on-the-spot implement of ways of guidance through the adjustment of steering and strategies to avoid obstacles.