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RESEARCH ON MARS THREE-ROCKER LOCOMOTION SYSTEM WITH AUTOMOTIVE SUSPENSION

Abstract

The Chinese government is planning to send a rover to investigate the Mars surface in the near future, and we have been developing and proposing a three-rocker locomotion system with automotive suspension, namely the Tri-Rocker MR-I, which has the predominant characteristics of high packing efficiency, mobility and stability. Tri-Rocker MR-I has three rockers composed of parallel four-bar linkages, which are assembled on the front, left and right sides of the rover body respectively through by elevating screws, and they have both functions of deployment and uplifting. Tri-Rocker MR-I's mechanical design is described, and its suspension and elevating screws' parameters are optimized by considering geometry traffic ability, terrain adaptability, anti-overturn ability et al. A digital model of the location system was created and optimized by numerical simulations of statics, kinetics in the unfolding and locomotion processes. A 300kg, 1.4m1.4m0.6m prototype was fabricated and tested in a simulated Mars surface field, and it exhibited fine performances as follows: The load-tare ratio of locomotion system is 6.67, packing efficiency is 0.414, the maximum height of surmounting obstacles is 0.6 m, the maximum depth of crossing groove is 0.4 m, the maximum degree of climbing slopes is 30, the maximum degree of keeping stable on slopes is 45, the maximum height of uplifting base is 0.55m, et al.