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SYNTHESIS OF NEW LUNAR PARALLEL STRUCTURE ROBOTIC ROWERS

Abstract

The purpose of this research is to analyze different designs and constructions of four, six, and eight-wheeled self-propelled robots for use on Mars and propose a new self-propelled six-wheeled robot with a new construction. The study aims to conduct theoretical and practical analyses of the technical parameters of the dynamics of the proposed rover's construction through mathematical calculations based on the parameters of individual electromechanical devices.

The research found that the proposed suspension of the overall body integrated with the rocker-bogie and the supporting platform with the synchronizing differential mechanism via the line enables the wheels of the opposite side to overcome single obstacles while reducing the tilt angle of the supporting platform. Comparative analysis with prototypes of balanced sides of the six independently controlled wheeled robot showed that when controlled at various speeds, the transition levels of the sides (suspensions) must be adapted to complex terrain, and all wheels must be reliably in contact with the ground through an automatic control system controlled by an electromechanical device.

Additionally, a theoretical mathematical model has been developed for the optical control scheme for controlling the six-wheeled robot at a distance using optical (FSO) signals in free space. Based on the findings, the research concludes that the proposed self-propelled six-wheeled robot with the new construction could effectively operate on Mars, overcoming single obstacles while reducing the tilt angle of the supporting platform. The proposed automatic control system ensures reliable contact of all wheels with the ground during different speeds, and the theoretical mathematical model for the optical control scheme offers a promising control mechanism for the rover's distance control. Overall, the research offers valuable insights into the design and construction of self-propelled robots for space exploration, specifically on Mars.