
可折展轮式移动系统结构设计与分析

摘 要

轮式移动机构因其高速高效的特点而被广泛用于移动系统上，随着科学技术的不断进步，工业生产、航空航天以及生活中对轮式移动机构提出了更高的要求。普通轮式移动机构最显著的一个缺点是越障能力不足，在没有特殊悬挂系统的情况下，克服障碍物的能力直接受到车轮直径大小的影响，车轮直径大小通常是正相关的，即车轮直径越大，爬过不同类型障碍物的能力就越大。

在一些实际应用中，可展车轮(变直径车轮)的研究适应了以下这些需求:当车轮需要张开时打开，扩大车轮的直径；不需要打开时收缩，以减少占用空间。可折展轮式机构是近些年发展起来的一种新型折叠结构体系，在航空航天、机械工程和日常生活中都有广泛应用。

本文对可折展轮式移动系统的研究主要包含以下几个方面：首先是对可折展轮式移动系统原理和国内外应用现状作了深入的研究与分析，这为下一步对可折展轮式移动系统的具体结构分析奠定了坚实的基础；其次是对悬架、车轮结构组成和性能分析、驱动电机的合理选取、以及车轮轴的设计和校核进行了研究；最后对可折展轮式移动系统的整体进行了运动学和动力学的分析。

关键词：折展机构；轮式系统；运动学；动力学仿真

Design and Analysis of Deployable Locomotion System with Wheels

ABSTRACT

Wheeled mobile mechanism is widely used in mobile system because of its high speed and high efficiency. With the continuous progress of science and technology, higher requirements are put forward for wheel mobile mechanism in industrial production, aerospace and life. The most obvious disadvantage of ordinary wheel mobile mechanism is its insufficient ability to cross obstacles. The ability to cross obstacles without special suspension system is directly affected by the size of wheel diameter. Under normal circumstances, there is a positive correlation between them, i.e. the larger the diameter of the wheel, the more able it can climb over different types of obstacles.

In some practical applications, we do not want the diameter of the wheels to be too large, and the research on developable wheels (variable-diameter wheels) adapts to this requirement: the wheels need to be deployed to enlarge the wheel diameter and the wheels need not be deployed to shrink the occupancy space. Folding wheel mechanism is a new folding structure system developed in recent years, which is widely used in aerospace, mechanical engineering and daily life.

In this paper, the research on folding wheel mobile system mainly includes the following aspects: firstly, the principle and application status of folding wheel mobile system at home and abroad are studied and analyzed in depth, which lays a solid foundation for the further structural analysis of folding wheel mobile system; secondly, the suspension, wheel structure and performance analysis, and the combination of driving motors. The selection of rationality, design and check of wheel axle were studied. Finally, the kinematics and dynamics of the folding wheel mobile system as a whole were analyzed.

Key Words : Folding and exhibition mechanism; Wheeled system; Kinematics; Dynamic simulation

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