

一种全向滚动球形机器人的动力学分析与仿真

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摘要 研究了一种全向滚动球形机器人的动力学建模、分析与仿真方法. 根据机器人所受的非完整约束, 建立了其运动学模型. 根据机器人的结构特征和Lagrange-Routh方程, 建立了其动力学模型, 给出了消去未知Lagrange乘子的策略. 得到了该球形机器人的完整动力学模型, 即控制机器人运动的强耦合二阶微分方程组. 建立了描述该球形机器人完整动力学方程的仿真模型. 运动实例的动力学分析和仿真结果验证了该方法的有效性.

关键词 [球形机器人](#) [非完整约束](#) [动力学](#) [分析和仿真](#)

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Dynamic analysis and simulation of a spherical omnidirectional rolling robot

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Abstract

The method for dynamic modeling, analysis and simulation of a spherical omnidirectional rolling robot is developed. The kinematic model for the spherical robot is established according to the nonholonomic constraint acting on it. On the basis of its structural characteristics, its dynamic model is derived by applying the Lagrange-Routh equations. A strategy is given to eliminate the unknown Lagrange multipliers. Then a complete dynamic model for the spherical robot is obtained, which is a system of strong coupled second-order differential equations to control the robot's motion. Finally a simulation model that describes the complete dynamic equations of the robot is established. The motion examples of the dynamic analysis and simulation are given to verify the correctness and validity of this approach.

Key words [spherical robot](#) [nonholonomic constraint](#) [dynamics](#) [analysis and simulation](#)

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