

## ICPF驱动的柔性微型机器龟腿的动力学分析\*

作者: 李德胜<sup>1\*</sup>, 聂林<sup>1</sup>, 郭书祥<sup>2</sup>

单位: 1. 北京工业大学机械电子学院, 北京 100022; 2. 日本国立香川大学, 日本香川 761-0396

基金项目:

摘要:

设计了一种新型仿龟的柔性微型机器人, 它具有四条腿并能在水下爬行和游动, 其中龟腿由一种智能薄膜ICPF (Ionic Conducting Polymer Film) 驱动。ICPF具有被低电压驱动、柔性和快速响应的特点。为了提高机器龟的可靠性和灵活性, 我们运用伪刚体动力学法 (PRBDM) 建立了机器龟腿的动力学模型, 此模型是基于静力学和运动学并考虑了动态影响因素建立起来的。然后, 分析了机器龟腿的角位移幅度系数的变化规律。最后通过实验测量了机器龟腿末端的位移, 其变化规律与理论上推导出的结果相近, 因此验证了龟腿的动力学模型可以比较精确地反映龟腿的摆动角度位移, 可以分析龟腿的频率特性。

关键词: 伪刚体动力学法; 柔性微型机器龟; 角位移; 频率

## Analysis on Dynamics for Flexible Leg of ICPF Actuated Tortoise-like Micro-robot\*

**Author's Name:** LI De-sheng<sup>1\*</sup>, NIE Lin<sup>1</sup>, GUO Shu-xiang<sup>2</sup>

**Institution:** 1. School of Mechanical Engineering and Applied Electronics Technology, Beijing University of Technology, Beijing 100022, China; 2. Department of Intelligent Mechanical Systems, Kagawa University, Kagawa 761-0396, Japa

**Abstract:**

In the paper, we present a novel tortoise-like flexible micro-robot with four legs which can crawl and swim underwater. These legs are actuated by ICPF (Ionic Conducting Polymer Film) which is a kind of smart film and has the characteristics of flexibility, good response and being driven by a low voltage. For analyzing the characters of the robot and improving the reliability and feasibility of the robot, we establish the dynamic model of the micro-robot by applying Pseudo-Rigid-Body-Dynamic-Model (PRBDM). The model is established by considering the dynamic effect of the robot, which is based on statics and kinematics. Then, the displacement analysis of the micro-robot' leg based on PRBDM is investigated. Applying PRBDM, the relation between the displacement of the robot' s leg and the frequency of the electrical voltage is theoretically derived and some analysis and experiment graphs about the displacement of the leg are performed.

**Keywords:** pseudo-rigid-body-dynamic-model; tortoise-like flexible micro-robot; angle displacement; frequency

投稿时间: 2010-04-27

[查看pdf文件](#)