

基于柔性铰链支承的热驱动硅微机械手的力学模型及性能分析

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摘要:

微机械手是一种典型的微型执行器, 是微型机电系统(MEMS)的重要研究内容之一。本文以基于柔性铰链的电热驱动硅微机械手为研究对象, 建立了微夹钳的超静定力学模型, 导出了钳口处输出位移的解析式, 并在此基础上对硅微机械手的性能进行了分析。分析表明, 微夹钳的输出位移与柔性铰链切割半径成正比, 切割半径越大, 输出位移越大; 对各加载电压下的微夹钳输出位移, 其试验和理论结果的变化趋势一致, 即微夹钳输出位移随输入电压的增加基本呈线性增加。

关键词: 微型机电系统; 微机械手; V型梁电热致动器; 柔性铰链

Modeling and Performance Analysis of Electrothermal Actuating Microgripper with Flexure Hinge

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Abstract:

The Microgripper, which is typical microactuator, is one of important research contents in MEMS. In the paper, the electrothermal-actuating silicon microgripper with flexure hinges is taken as the research object, and the model of the superfluous system with two unknown variables is established. The formula of the microgripper's output displacement is deduced. And the microgripper's behavior is studied on the basis of theoretical analysis. The analytical results show that the microgripper's output displacement is directly proportional to the radius of the flexure hinge. And about the microgripper's output displacement under different applied voltages, the trend of results is accordant with one of theoretical results, that is, the microgripper's output displacement increases linearly with rising of the input voltage on the whole.

Keywords: MEMS; microgripper; V-shape beam electrothermal actuator; flexure hinge

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