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论文

洛仑兹电机运动控制耦合机理分析及动力学建模

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摘要：

长行程永磁直线电机粗动与短行程洛仑兹电机微动构成的复合运动可满足工作台的纳米级定位精度和跟踪精度要求，其中微动台是工作台纳米精度实现的核心，运动控制存在内部干扰耦合。该文分析洛仑兹电机运动控制的内部耦合因素及机理，建立耦合机理模型；针对位置相关性耦合与力相关性耦合，分别推导对应的耦合动力学模型，并采用简化原则进行简化；结合耦合机理模型与动力学模型，提出洛仑兹电机运动控制的总动力学模型。实验结果证明了简化模型的可行性和有效性。

关键词： 洛仑兹电机 耦合机理 动力学模型

Coupling Mechanism Analysis and Dynamic Modeling for Lorentz Motor Motion Control

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Abstract:

The complex motion including a rough motion of long stroke permanent magnet linear motor and a fine motion of short stroke Lorentz motor is employed to realize nanometer positioning accuracy and tracking accuracy. The motion control of short stroke stage is the most important issue for achieving ultra-precision motion accuracy. However, its motion control suffers from some serious coupling disturbances. Coupling factors and coupling mechanism of motion control for short stroke Lorentz motor were analyzed, and the model of coupling mechanism was estibilished. The dynamic models of position dependency and force dependency were proposed with coupling mechanism model, respectively. The principle was constructed to simplify the derived dynamic models. As a result, overall dynamic model of Lorentz motor's motion control was presented. The experimental results show the effectiveness and the feasibility of the proposed models.

Keywords: Lorentz motor coupling mechanism dynamic model

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