

论文

旋转型行波超声电机的等效电路模型

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摘要:

在推导旋转型行波超声电机定转子运动拉格朗日方程和压电陶瓷电流方程的基础上, 建立了超声电机的等效电路模型. 并通过测量单相定子导纳、由摩擦层和转子材料特性参数估算模型中相关元件的值和解析计算电机输出功率及摩擦损耗的方法, 对模型进行简化, 并获取其中各参数. 将电机不同负载转矩及驱动频率的工作条件考虑在内, 以电机的等效电路模型作为驱动器的电气负载来设计驱动器参数. 给出了理论计算同实测的结果, 验证了等效电路模型的正确性和有效性.

关键词: 旋转型行波超声电机 等效电路模型 驱动电路设计

Electrical Equivalent Circuit Model of Traveling Wave Rotary Ultrasonic Motor

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Abstract:

The Lagrange Equations of the stator and the rotor motion and the current equation of the piezoceramics are derived, based on which, the electrical equivalent circuit model of traveling wave rotary ultrasonic motor (TRUM) is established. The stator admittance circle is measured by frequency scanning, and the parameters of the frictional layer and the rotor are calculated with the relevant material characteristics, and the output power and the frictional power loss are calculated. Through this way, the equivalent circuit model is predigested and the value of the parameters in the model can be obtained. Taking equivalent circuit model as electrical load of the motor driver, the parameters in the driving circuit can be designed at different working conditions, such as different load torque, and different driving frequency. The calculated results and the experimental results are presented to verify the correctness and effectiveness of the equivalent circuit model.

Keywords: traveling wave rotary ultrasonic motor electrical equivalent circuit model driving circuit design

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