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### 基于梯度算法的永磁伺服系统惯量辨识性能研究

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### Research on Inertia Identification Performance of Permanent Magnet Servo Systems Based on Gradient Algorithm

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摘要

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**摘要** 为抑制惯量扰动对高性能伺服驱动系统性能的影响,系统应具有惯量辨识和控制器参数自整定的功能,而精准、快速地辨识出系统实时转动惯量值是其需要首先解决的关键技术。本文针对惯量辨识展开了研究,推导出永磁同步电机(PMSM)惯量辨识的梯度公式,并研究了影响惯量辨识收敛速度和精度的因素。通过仿真和实验表明,梯度算法用于永磁伺服系统的惯量实时辨识是有效的,惯量辨识的收敛速度较快,最快可控制在5 s左右,且给定速度周期越短、转速变化范围越大,惯量辨识的实时性越好,这为下一步进行系统速度控制器参数自整定提供了基础。

**关键词:** 高性能 永磁同步电机 伺服系统 惯量辨识 梯度算法 辨识性能

**Abstract:** In order to suppress the influence of inertia disturbance on a high performance servo drive system, the system should possess the function of inertia identification and self-tuning of controller parameters. Among them, identifying the real-time inertia value accurately and rapidly should be solved first as the key. Research on inertia identification is conducted in this paper, which derives an inertia identification gradient formula of the permanent magnet synchronous motor (PMSM), and analyzes factors influencing the convergence time and precision of inertia identification. Simulation and experiments demonstrate that the gradient algorithm is effective. The convergence time of identification is short and it can be limited to around five seconds. The shorter the period and the larger the given range of a given velocity, the better is the real-time property of inertia identification. This study can provide basis for the parameter self-tuning of the speed controller.

**Keywords:** high performance permanent magnet synchronous motor servo system inertia identification gradient methods identification performance

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