

永磁同步电机伺服系统的有限时间位置控制

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摘要 研究了永磁同步电机伺服系统的位置跟踪问题.利用反馈线性化的思想,对永磁同步电机的数学模型进行分析,实现了电机模型的精确线性化和解耦.首先,将永磁同步电机位置跟踪系统采用反馈线性化技术变换为两个线性子系统,分别对其设计相应的基于连续状态反馈线性化的有限时间控制器,并设计了有限时间负载观测器来观测估计外部负载扰动.对永磁同步电机位置跟踪的闭环系统进行了稳定性的分析.与对应的渐近稳定控制的方案相比,基于有限时间的控制方案实现了永磁同步电机对期望信号的有限时间跟踪,获得了更好的动态响应和抗扰动性能.仿真结果表明了该控制方案的有效性.

关键词 [永磁同步电机](#), [有限时间控制](#), [位置跟踪](#), [反馈线性化](#), [有限时间负载观测器](#).

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Finite-Time Control for Permanent Magnet Synchronous Motor Position Tracking System

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Abstract This paper investigates the problem of position tracking of Permanent Magnet Synchronous Motor (PMSM) servo system. On the basis of analyzing the mathematical model of the PMSM, the exact linearization and decoupling of the motor model can be achieved by using the feedback-linearization technique. First, the PMSM position tracking system is transformed to two linear control subsystems by using the feedback linearization. The corresponding finite-time controllers are designed respectively for the two subsystems, and a load estimator based on finite time control is developed to observe and estimate the external load disturbance. The analysis of stability is given for the PMSM closed-loop system. Compared with the corresponding asymptotically stable control method, the scheme based on the finite-time control can track the desired position signal in finite-time and obtain a better dynamic response and anti-disturbance performance. The simulation results illustrate the effectiveness of the control scheme.

Key words [PMSM](#) [finite-time control](#) [position tracking](#) [feedback linearization](#) [finite-time load estimator](#).

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