

## 一种适合DTC应用的非线性正交反馈补偿磁链观测器

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### 摘要

提出一种适合永磁同步电机直接转矩控制的非线性正交反馈补偿定子磁链观测器,从确保磁链和反电势正交的角度出发,保证电机在宽运行范围定子磁链观测的准确性,能有效解决传统磁链观测器存在的直流漂移、磁场饱和及电机极低速运行时磁链观测不准等问题。新型观测器结构简单,无需PI调节,没有非线性饱和和限幅环节,对电机参数鲁棒性好,且易于工程实现。针对一台2 kW永磁同步电机,采用数字信号处理器DSP对所提出的观测器进行了数字化实现。实验表明,该观测器能在宽速度范围内精确地估算电机定子磁链,实现永磁同步电机直接转矩控制系统的高性能控制。

关键词 [非线性正交补偿](#) [定子磁链观测器](#) [永磁同步电机](#) [直接转矩控制](#) [滤波](#)

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## A New Nonlinear Perpendicular Flux Observer with Compensation Feedback Suitable for DTC Application

### Abstract

A new nonlinear perpendicular flux observer with compensation feedback suitable for DTC application is presented in this paper, which is capable of ensuring flux linkage to be perpendicular to back electromotive force, so the stator flux linkage including its amplitude and phase angle can then be estimated accurately over a wide speed range. Therefore the proposed observer could solve those problems associated with traditional observer such as dc drift, magnetic saturation and inaccurate estimation of stator flux linkage at very low speed operation. Besides, this observer is very simple in structure, neither PI regulator nor nonlinear saturation limiter block included, robust to motor parameters uncertainty, suitable for application where the motor flux is required to vary or not to vary during operation and easy to implement in the industrial application. The experiment was implemented by the DTC controller in a 2 kW PMSM setup via a digital signal processor (DSP). The results indicate that the proposed observer can estimate accurately the stator flux linkage including its amplitude and phase angle when motor running at a very low frequency of 0.7 Hz and at the rating frequency of 100 Hz. The high performance operation for PMSM DTC using proposed flux observer has been achieved with satisfaction in laboratory.

Key words [Nonlinear perpendicular compensation](#) [Stator flux linkage observer](#) [Permanent magnet synchronous motor](#) [direct current](#) [Filter](#)

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