

Resumen de Tesis Doctoral



UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Escola de Doctorat

DNI/NIE/Pasaporte

Nombre y apellidos

Título de la tesis

Unidad estructural

Programa

Códigos UNESCO

(Mínimo 1 y máximo 4, podéis verlos en <http://doctorat.upc.edu/gestion-academica/carpeta-impresos/tesis-matricula-y-deposito/codigos-unesco>)

Resumen de la tesis de 4000 caracteres máximo (si se superan los 4000 se cortará automáticamente)

Abstract

Equipped with appropriate control strategies, permanent magnet (PM) machines are becoming one of the most flexible types of actuators for many industrial applications. Among different types of PM machines, five-phase BLDC machines are very interesting in fault tolerant applications of PM drives.

Torque improvement in five-phase BLDC machines can be accomplished by optimizing their mechanical structure or by enhancing their controlling methods. New current controllers are proposed in this thesis to improve the quality of generated torque under normal operations of five-phase BLDC machines. Proposed current controllers are based on combination of predictive deadbeat controlling strategy and Extended Kalman Filter estimation. These controllers will be the basis for accurate faulty operation of the motor.

Operation of five-phase BLDC machines under faulty conditions has also been considered in this study. To improve the generated torque under faulty conditions, both amplitude and phase angle of fundamental and third current harmonics are globally optimized for the remaining healthy phases.

Under faulty conditions, appropriate reference currents of a five-phase BLDC machine have oscillating dynamics both in phase and rotating reference frames. As a result, the implemented current controllers under these conditions should be robust and fast.

Predictive deadbeat controllers are also proposed for faulty conditions of five-phase BLDC machines.

Fault tolerant five-phase BLDC machines are very interesting in automotive applications such as electrical vehicles and more electric aircraft. In addition, these devices are gaining more importance in other fields such as power generation in wind turbines. In all of these applications, the efficiency of PM machine is of most importance. The efficiency of a typical five-phase BLDC machine is evaluated in this thesis for normal and different faulty conditions.

Experimental evaluations are always conducted to verify the theoretical developments. These developments include proposed controlling methods, optimized reference currents, and simulated efficiency of five-phase BLDC machine under different operational conditions.

Lugar

Fecha

Firma