Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : MIRAOUI Given names : Abdellatif

Status (prof., assistant prof., ...) : Full Professor

Laboratory : FEMTO_ST/Energy departement/SHARPAC Website address : femto-st.fr/en/Research-departments/ENERGY/

Institution : UTBM Website address : www.utbm.fr

Scientific competence of the supervisor:

Professor Abdellatif MIRAOUI is mainly recognized for his scientific work in electrical engineering. It's scientific expertise includes electrical energy systems, renewable energy integration, smart grids, fuel cells, hydrogen technologies, electric and hybrid vehicle drives, and the modeling and control of energy conversion systems.

Two major publications in the field proposed for the PhD :

1. D. Zhao; F. Gao; D.Bouquain; M. Dou; A. Miraoui "Sliding-Mode Control of an Ultrahigh-Speed Centrifugal Compressor for the Air Management of Fuel-Cell Systems for Automotive Applications" IEEE Transactions on
2. B. Li, R. Roche, D. Paire, A. Miraoui "Sizing of a stand-alone microgrid considering electric power, cooling/heating, hydrogen loads and hydrogen storage degradation" Applied energy, V188, P 547-562

Website address of the personal page : https://scholar.google.com/citations?user=tMz1WTEAAAAJ&hl=fr

Supervisor's email : abdellatif.miraoui@utbm.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** I-17

Title : Robust Sliding Mode Observer Design via Singular Perturbation Approach for Control of Wind Energy Systems with Doubly-Fed Induction Machines

Subject :

In wind energy conversion systems, the doubly fed induction generator (DFIG) is widely used due to several key advantages, including: (1) variable-speed operation; (2) independent control of active and reactive power; (3) efficient power injection into the electrical grid; and (4) support for grid voltage and frequency stability. However, reliability and service continuity remain significant challenges, particularly under variable wind conditions. Ensuring robust operation and compliance with safety requirements is therefore essential. In this context, measurement errors, response delays, and the cost and fragility of speed sensors can degrade control system performance. Furthermore, sensor failures may lead to instability and reduced efficiency.

The PhD addresses these issues through the following objectives: (1) developing a mathematical model of the DFIG using singular perturbation theory; (2) applying system decomposition and order reduction based on singular perturbation theory for robust observer design; (3) designing a singularly perturbed sliding mode observer for sensorless operation; and (4) validating the proposed approach using a hardware-in-the-loop (HIL) platform.

Keywords :

Sliding mode observer, doubly fed induction generator, wind turbine, singular perturbation theory

Expected collaborations :

This work will continue the existing collaborations of the SHARPAC team with academic and private partners.

Background required from the applicant :

The candidate, holding (or currently enrolled in the final year of) a Master's degree or equivalent, must have strong skills in control theory and power/energy systems. A solid background in electrical engineering is essential, and a good level of English is required.

Existence of a PDF file detailing the proposal ("yes" or "no") : no

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