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 : LIU Given names : Dayan

Status (prof., assistant prof., …) : Associate Professor

Laboratory : PRISME Website address : http://www.univ-orleans.fr/en/prisme

Institution : INSA Centre Val de Loire Website address : http://www.insa-centrevaldeloire.fr/

Scientific competence of the supervisor:

Dr. Dayan LIU is an Associate Professor holding a HDR degree at INSA Centre Val de Loire. His research interests mainly focus on modeling and observation for fractional order systems. Dr. Liu has published more than 100 papers in international journals and conferences, and has been a supervisor of 12 Ph.D. students (10 have defended). Dr. Liu is a Technical Committee Member of CAA: Fractional Order Systems and Control, and IFAC: 2.2 Linear Control Systems, an Editorial Board Member of two journals and a Guest Editor of 5 Special Issues on the topic of fractional systems and control.

Two major publications in the field proposed for the PhD :

1. J. Liu, D.Y. Liu*, D. Boutat, X. Zhang and Z.H. Wu, Innovative non-asymptotic and robust estimation method using auxiliary modulating dynamical systems, Automatica, 152, 110953, 2023.
2. Y.Q. Wei, D.Y. Liu*, D. Boutat, H.R Liu and Z.H. Wu, Modulating functions based model-free fractional order differentiators using a sliding integration window, Automatica, 130, 109679, 2021.

Website address of the personal page : https://www.researchgate.net/profile/Da-Yan-Liu/research

Supervisor's email : dayan.liu@insa-cvl.fr

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

Title : Fast Distributed Estimation for Fractional Order Systems using Integral Transformations

Subject :

Fractional calculus was introduced in many fields of science long time ago. It was first developed in the middle of the ninetieth century. Unlike classical differential equations, fractional order differential equations can better describe some natural phenomena due essentially to their memory and hereditary properties. However, there always exist some useful unknown variables and parameters in these equations that need to be estimated from available data. Very recently, a new type of integral based fast estimation method has been proposed and applied in many situations. The idea is to construct a set of modulating functions to transform the studied differential equations to integral equations. The objective of this thesis is to extend this method using a distributed idea for fractional order differential equations containing different characters, such as nonlinearity, singularity, and time-delays. To this end, some integral transformations similar to the Laplace transform will be studied, such that the developed modulating functions based method can be easily applied.

Keywords :

Fractional differential equations; Transformation methods; Integral formulas; Numerical simulations.

Expected collaborations :

The second supervisor of this thesis is Prof. Driss Boutat. He is an international expert on control and observation. Until now, he has published more than 130 journal and conference articles. He is supervisor of 16 PhD students. He was leader of the control team in PRISME, and the winner of the Order of Academic Palms Chevalier (Knight). From 2017 to 2024, he is appointed as a foreign expert of high level by the Chinese government.

Background required from the applicant :

Strong background in mathematics and Matlab simulations.

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

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