Université d'ORLÉANS

AVIS DE SOUTENANCE EN VUE DE L'HABILITATION A DIRIGER DES RECHERCHES

Discipline : Sciences et Technologies Industrielles

LIU Dayan – Maître de Conférences

Présentera ses travaux en vue de l'habilitation à diriger des recherches

Le 13 janvier 2022 à 10 heures

Lieu : Amphithéâtre Chamard, IUT de Bourges

Devant le jury constitué par les personnalités suivantes :

- Pierre MELCHIOR	Professeur des Universités	Bordeaux INP/ENSEIRB-MATMECA
- Mohammed M'SAAD	Professeur des Universités	ENSI CAEN
- Michel ZASADZINSKI	Professeur des Universités	IUT Henri Poincaré de LONGWY
- Catherine BONNET	Directrice de recherches	INRIA Saclay
- Mohamed DJEMA	Professeur des Universités	Université Polytechnique Hauts-de-France
- Rachid OUTBIB	Professeur des Universités	Université d'Aix-Marseille
- Gérard POISSON	Professeur des Universités	IUT Bourges
- Holger VOOS	Professeur des Universités	Université du Luxembourg
- Driss BOUTAT	Professeur des Universités	INSA Centre Val de Loire

Résumé des travaux :

In practical applications, due to technical and economic reasons, there are always certain useful parameters and variables that cannot be measured by sensors and need to be estimated from available measurements which usually contain noises. In order to overcome these problems, many estimation methods have been developed. On the one hand, to be precise and reliable, these estimation methods must to be robust against corrupting noises due to physical sensors and \ or poor knowledge of models of real systems. On the other hand, the estimated outcomes generally have to be provided within a finite time, especially for on-line applications responding to real-time control systems. In this context, my research is carried out based on the study of two non-asymptotic and robust estimation methods: the algebraic parametric method and the modulating functions method. Thanks to these methods, the sought parameter and variables can be exactly given by algebraic integral formulas. According to the considered models, my works are divided to four parts. In Part I, the system model of linear differential equation is considered. First, the parameters of fractional order linear systems are estimated. Second, the generalized modulating functions method is introduced for state estimation of integer order linear systems and then it is applied to estimate the non-integer derivatives of the output. Third, the method is applied to estimate the positions and velocities from noisy accelerations. In Part II, the model of pseudo-state space representation is studied for fractional order linear systems. The generalized modulating functions method is applied to estimate the pseudo-state as well as its fractional derivatives by estimating the fractional derivatives of the output and a set of fractional order initial values. In Part III, two fractional order differentiators are introduced without considering any system model, which can be applied to estimate the fractional order derivatives of the output of fractional order nonlinear systems by admitting a time-delay. In Part IV, non-asymptotic state estimation is studied for integer order nonlinear systems using the observer normal forms. First, a family of nonlinear systems is proposed that can be transformed into the output-auxiliary depending observer normal Form by means of a set of changes of coordinates and an auxiliary dynamics. Then, a new modulating functions based state estimation method is introduced based on the nonlinear observer normal form. This new method can be applied to different kinds of systems, such as fractional order nonlinear systems, singular systems and time-delay systems, etc.