Scholarship for PhD thesis at Université d’Orléans
year 2016. Graduate school Orléans-Tours MIPTIS. Area: Automatic Control

Robust event-triggered estimation of nonlinear hybrid systems in the bounded-error framework

Keywords.

Host institution. PRISME EA 4229 Université d’Orléans – INSA CVL.
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Salary/Scholarship. Approx. 20 k€ gross per year.

Research statement.
Hybrid continuous-discrete dynamical systems are modelling paradigms for cyber-physical systems. These are for instance embedded systems, autonomous robots working in physical interaction with human operators, networked control systems or multi-energy distribution networks. In fact, such cyber-physical systems have only limited computation, communication or power resources. As a consequence, traditional monitoring and control techniques based on periodic sampling of both measurements and controls are no longer appropriate. This has motivated the development of new control or estimation techniques, known as event-triggered approaches [1, 2]. The idea of event-triggered control is to proceed with actuation or measurement whenever a state-dependent criterion is satisfied.

This PhD thesis aims at developing new event-triggered approaches to hybrid state estimation in the bounded-error framework. In the latter framework, one assumes that all uncertain quantities, not only measurement noise but also model uncertainty and modelling errors, belong to a bounded set with known bound with no other assumption about the distribution within the set. The candidate will further the set membership estimation techniques developed within Laboratoire PRISME [3, 4] for continuous and hybrid systems. The objectives are three folds:

1. To revisit observer design for nonlinear hybrid systems in the bounded error framework, focusing on the convergence analysis of the observation error.

2. To state the sampling rules for the event-triggered set membership observer for hybrid systems. Recent results on event-triggered control [1] or event-triggered continuous state estimation [5] are good starting points.

3. To develop an event-triggered approach to robust stabilization of non-linear hybrid systems in the bounded error framework. Reference [6] is a good start.

Applicant profile. Master 2 in Automatic Control, Applied Mathematics or equivalent.

How to apply.
Send as soon as possible before 1st May, by mail to nacim.ramdani@univ-orleans.fr.

Cover letter (motivation letter)
Curriculum Vitae
Grade transcripts (BSc, MSc) (Relevés de notes : Licence, Master 1 et 2)
Reference letter.

Selection of applicants will be achieved by end of May 2016. A short list of applicants will be asked to attend a hearing by the Graduate School (Ecole Doctorale) for final selection.

Further details, please contact Pr. Nacim Ramdani at +33 6 17 83 35 42.
References