# Open Invited Track

21st IFAC World Congress, Berlin, Germany, July 12 – 17, 2020

# "Estimation and Observer Design Methods in Nonlinear Systems"

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**Abstract**

This invited session is proposed for inclusion in The International Federation of Automatic Control (IFAC) which will be held in Germany, Berlin from July 12 to 17, 2020. The goal of this session is to present recent advances on the design of estimation algorithms and state observers for nonlinear systems and their application to output feedback control and fault diagnosis. The development of theoretical methods, as well as real-world applications, are considered.

## BRIEF DESCRIPTION OF THE SESSION

The proposed open invited session track focuses on fundamental issues in state estimation and control of nonlinear systems and their application to output feedback control and fault diagnosis. It aims to give an opportunity of the conference attendees to be aware by state of the art and the new design techniques developed in the field of nonlinear estimation and its role in control design systems.

The problem of observer design naturally arises in a system approach, as soon as one needs some internal information from external (directly available) measurements. Different purposes can motivate the need for this information: modeling (identification), monitoring (fault detection), or driving (control) the system. All those purposes are jointly required when aiming at keeping a system under control. Subsequently, this makes the observer problem the heart of a general control problem. Unlike linear time-invariant systems where the state estimation problem is analogous to the control design problem, the design of a stable observer is a significant and separate challenge in nonlinear systems.

Several powerful techniques for nonlinear estimation and observer design have been developed and explored in the last few years. Further, the need for nonlinear filters and observers has been felt and pursued in many new, modern, and essential applications. This special session will report on new estimation techniques and emerging applications that are making use of these new design techniques.

Topics include, but are not limited to:

- State observer design for nonlinear system;
- Adaptive observers for nonlinear systems;
- Systems with unknown inputs; descriptor systems;
- Interval observers;
- Learning observers;
- Self-synchronization in multi-agent systems;
- Observer for quasi-LPV systems; switched systems; uncertain systems;
- Fault diagnosis and fault tolerant control;
- Robust consensus of networked systems;
- Cyber-attack detection.

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