

Proposal for a
Open Invited Track

submitted to the

**IFAC 2017 - The 20th World Congress of the
International Federation of Automatic Control, 9-14
July 2017**

**“Optimization-based controller design for nonlinear
systems: analytic and geometric analysis”**

Organizers

Roberto Ferretti

Roma Tre University, Roma (Italy)
Ferretti@mat.uniroma3.it

Frédéric Jean

ENSTA ParisTech, Université Paris-Saclay, Palaiseau (France)
Frederic.Jean@ensta-parisetch.fr

Hasnaa Zidani

ENSTA ParisTech, Université Paris-Saclay, Palaiseau (France)
Hasnaa.Zidani@ensta-paristech.fr

General Overview:

Optimization-controller design has been appealing in engineering areas for over several decades because it allows to use powerful theoretical and numerical tools from optimal control for analysing and designing controllers for advanced and complex control systems. This field has far wider scope than its first applications to aerospace engineering would suggest, and now embraces areas where the dynamical models describe chemical reactors (process control), vehicles (traffic flow control), wind generators and solar panels (power systems control) or might even describe virtual economic systems relating management decisions to economic consequences over time (econometrics and resource economics). The pressure to develop more efficient processes in order to meet the demands of next generation technology is leading to problems of increasing size and complexity.

Despite the great progress in the development of numerical solution methods in the last decades, the increasing complexity of models and control tasks triggers a constant demand for more and more efficient methods. Whenever applicable, analytical methods (based on geometric control and/or nonsmooth analysis) are even more useful, because they provide closed solution formulas which are easy to evaluate and yield structural insight into the behavior of the optimal solution.

Another main challenge in the field of optimization-based controller design is to develop numerical algorithms that are sufficiently fast and accurate for the much-needed technological developments, in numerous industrial sectors.

This open invited track will bring together leading researchers who are working on optimization-based controller design, who combine expertise in theoretical, numerical and application oriented aspects of the field. The aim of this track is to discuss some of the recent developments of the field and to stimulate future advances.

Keywords: Optimal Control; Nonlinear Control Systems; Geometric Control; Nonsmooth Analysis; Numerical methods; Hamilton-Jacobi-Bellman Approach; Inverse Optimal Control.

IFAC technical committee for evaluation: The topics of this proposed track lie mainly into the field of the technical committee *TC 2.4 – Optimal Control* and more generally of the committee *CC 2 – Design Methods*.