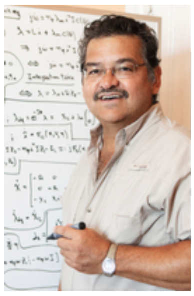
SEMINAR ANNOUNCEMENT



WHO: **PROF. ROMEO ORTEGA**
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WHAT: **PID Passivity-Based Control: Application to Energy and Mechanical Systems**

WHEN: **Friday, 21 June 2019, 11:00–12:00**

WHERE: Via Claudio 21, Bldg 3/a, Meeting Room 4.19, IV floor

Abstract — Motivated by current practice, in this seminar we explore the possibility of applying the industry-standard PID controllers to regulate the behavior of nonlinear systems. As it is well-known, PID controllers are highly successful when the main control objective is to drive a given output signal to a constant value. PIDs, however, have two main drawbacks, first, the task of tuning the gains is far from obvious when the systems operating region is large; second, in some practical applications the control objective cannot be captured by the behavior of output signals. We show that, for a wide class of physical systems, these two difficulties can be overcome exploiting the property of passivity of the system.
Passivity is a fundamental property of dynamical systems, which in the case of physical systems captures the universal feature of energy conservation. It is well-known that PID controllers are passive systems—for *all* positive PID gains—and that the feedback interconnection of two passive systems is stable. Therefore, wrapping the PID around a passive output trivializes the gain tuning task. Clearly, the first step in the design is to identify *all passive outputs* of the system. It turns out that this task is achievable for a large class of physical systems described by port-Hamiltonian models. In many applications the desired values for the outputs are different from zero, whence the PID is wrapped around the error signal. In this case, it is necessary to investigate whether the system is passive with respect to this error signal—a property called passivity of the incremental model, which is studied in the course.
If the control objective is to stabilize (in the Lyapunov sense) a *constant equilibrium* it is necessary to build a Lyapunov function. In the course we identify—via some easily verifiable integrability conditions—a class of systems for which this more ambitious objective is achieved.

Biosketch — **Prof. Romeo ORTEGA** was born in Mexico. He obtained his BSc in Electrical and Mechanical Engineering from the National University of Mexico, Master of Engineering from Polytechnical Institute of Leningrad, USSR, and the Docteur D'Etat from the Politechnical Institute of Grenoble, France in 1974, 1978 and 1984 respectively. He then joined the National University of Mexico, where he worked until 1989. He was a Visiting Professor at the University of Illinois in 1987-88 and at McGill University in 1991- 1992, and a Fellow of the Japan Society for Promotion of Science in 1990-1991. He has been a member of the French National Research Council (CNRS) since June 1992. Currently he is a Directeur de Recherche in the Laboratoire de Signaux et Systèmes (CentraleSupelec) in Gif-sur-Yvette, France. His research interests are in the fields of nonlinear and adaptive control, with special emphasis on applications.
Prof. Ortega has published three books and more than 280 scientific papers in international journals, with an h-index of 73. He has supervised 35 PhD thesis. He is a Fellow Member of the IEEE since 1999 and an IFAC Fellow since 2016. He has served as chairman in several IFAC and IEEE committees and participated in various editorial boards of international journals. Currently he is the Editor in Chief of Int. J. on Adaptive Control and Signal Processing.