

## M3 : Stabilization of Nonlinear Dynamical Systems

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### Summary:

We present techniques for designing stabilizing control laws directly obtained by applying Lyapunov method for studying stability.

We start with necessary conditions for stabilizability. Then we introduce the notion of Control Lyapunov Functions to state some sufficient conditions. This notion allows also to quantify robustness with respect to various classes of effects.

Our next steps consists in building Control Lyapunov Functions for systems whose dynamics admit some specific form. This leads to backstepping and forwarding.

We end with some results on output feedback.

### Contents:

- Stability and stabilization
- Necessary conditions for stabilization
- Sufficient conditions for stabilization
- Robustness
- Backstepping
- Forwarding
- Output feedback



Prof. Laurent Praly graduated from Ecole Nationale Supérieure des Mines de Paris in 1976. After working in industry for three years, in 1980 he joined the Centre Automatique et Systèmes at Ecole des Mines de Paris. From July 1984 to June 1985, he spent a sabbatical year as a visiting assistant professor in the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign. Since 1985 he has continued at the Centre Automatique et Systèmes where he served as director for two years. In 1993, he spent a quarter at the Institute for Mathematics and its Applications at the University of Minnesota where he was an invited researcher.

His main interest is in feedback stabilization of controlled dynamical systems under various aspects -- linear and nonlinear, dynamic, output, under constraints, with parametric or dynamic uncertainty, disturbance attenuation or rejection --. On these topics he is contributing both on the theoretical aspect with many academic publications and the practical aspect with applications in power systems, mechanical systems, aerodynamical and space vehicles.