

UE Adaptive control systems



Level
Baccalaureate
+5



ECTS
3 credits



Component
UFR PhITEM
(physique,
ingénierie, terre,
environnement,
mécanique)



Semester
Automne

- > **Teaching language(s):** English
- > **Open to exchange students:** Yes
- > **Code d'export Apogée:** PAX9MIAA

Presentation

Description

The Adaptive Control course covers fundamental concepts and practical techniques to achieve or maintain a desired level of performance in a control system, especially when the parameters of the plant model are unknown or change over time.

Outline :

1. Introduction to the adaptive control

Basic Adaptive Control Configurations, Application examples.

2. Parameter adaptation algorithms

Gradient algorithm, recursive least squares Algorithm, stability of parameter adaptation algorithms.

3. Identification in open loop – a brief review

Data acquisition, model complexity, parameter estimation, model validation.

4. Iterative identification in closed loop and controller redesign

Algorithms for identification in closed loop (CLOE, F-CLOE and AF-CLOE), Validation of models identified in closed loop, Iterative identification in closed loop and controller re-design.

5. Direct and Indirect Adaptive Control

Tracking and regulation with independent objectives (known parameters), adaptive tracking and regulation with independent objectives (direct adaptive control), pole placement (known parameters), adaptive pole placement (indirect adaptive control).

Lab :

Iterative identification and controller re-design for the Throttle Valve.

Course parts

CM	Lectures (CM)	18h
TP	Practical work (TP)	12h

Period : Semester 9

Bibliography

- D. Landau, G. Zito "Digital control systems" Springer, London, 2005.
- D. Landau, R. Lozano, M. M'Saad, A. Karimi "Adaptive Control", Springer, London, 2011.
- D. Landau "Adaptive control – the Model reference approach" Dekker, NY, 1979.
- D. Landau "Identification in closed loop- A powerful design tool (better models, simpler controllers), Control Eng. Practice, no. 1, Jan. 2001.
- D. Landau "From robust control to adaptive control" "Control Eng. Practice, vol. 7, no10, pp1113-1124, 1999.
- Karimi, I.D. Landau "Robust adaptive control of a flexible transmission system using multiple models", IEEE Trans. on CST, March 2000.
- D. Landau, A. Constantinescu, D. Rey "Adaptive narrow band disturbance rejection applied to an active suspension – an internal model approach" Automatica, Vol. 41, n°4, 2005.
- D. Landau, M. Alma, T.A. Airimitoie "Adaptive feedforward compensation algorithms for active vibration control with mechanical coupling" Automatica, Vol.47 pp. 2185-2196, 2011.

Useful info

Campus

➤ Grenoble - University campus