FILTRAGE ADAPTATIF : APPLICATION AU CONTRÔLE ACTIF DE BRUIT

ADAPTIVE FILTERING : APPLICATION TO ACTIVE NOISE CONTROL

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| Lecturers : 12.0 | TC : 6.0 | PW : 8.0 | Autonomy : 6.0 | Study : 0.0 | Project : 0.0 | Language : MI

Objectives

In recent years, adaptive filtering has found an increasing number of applications (echo cancellation in telephony, channel equalization in communication systems, denoising of bio-medical signals, ...). This course aims to discuss the basic principles, the scope of applicability, and the implementation aspects of adaptive filtering. The originality of the course resides in a multi-disciplinary treatment of the adaptive filtering problem going from the design methods (Signal Processing) to hardware implementation with embedded digital processors (Digital Electronics). A specific focus will be put on the problem of active noise control in Acoustics, a typical application of adaptive filtering.

Keywords : Wiener filter, adaptive filtering algorithms (LMS, RLS, ...), digital signal processors, Acoustics, active noise control

Programme

Introduction to adaptive filtering
Wiener filter and quadratic optimization
LMS algorithm
Architecture of DSPs
Hardware implementation
Introduction to Acoustics
Passive noise control
Active noise control and applications

Learning outcomes

- Understand the theory of adaptive filtering
- Apply adaptive filtering algorithms
- Explain the architecture of digital signal processors
- Implement adaptive filtering methods for active noise control

Independent study

Objectifs : To design an active control system in all its dimensions : acoustic diagnosis, algorithm choice, performance, DSP implementation

Méhodes : Project by group of 5 students followed by an oral presentation. The work is based on experimental data and on Matlab and Simulink programs to be adapted. Each group has to propose a reasoned solution and to analyze the results.

Core texts

Simon Haykin, *ADAPTIVE FILTER THEORY*, Prentice Hall, 2013
Phil Lapsle y, Jeff Bier, Amit Shoham, E.A. Lee *SP PROCESSOR FUNDAMENTALS: ARCHITECTURES AND FEATURES* , Wiley-Press, 1997

Assessment

Final mark = 33% Knowledge + 67 % Know-How, with
Knowledge = 100% Exam
Know-How = 100% Continuous assessment