EQ2400 Adaptive Signal Processing 6.0 credits

Adaptiv signalbehandling

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for EQ2400 valid from Autumn 2007

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

For single course students: 180 ECTS credits and documented proficiency in English B or equivalent

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

This course treats adaptive signal processing algorithms for extracting relevant information from noisy signals. The emphasis is on recursive, model based estimation methods for signals and systems whose properties change in time. Applications in, for example, communications, control and medicine are discussed.

Learning outcomes:

After the course, each student is expected to be able to:

- Design and apply optimal minimum mean square estimators and in particular linear estimators. To understand and compute their expected performance and verify it.
- Design, implement and apply Wiener filters (FIR, non-causal, causal) and evaluate their performance.
- Use a combination of theory and software implementations to solve adaptive signal problems. Especially:
- Identify applications in which it would be possible to use the different adaptive filtering approaches.
- Design, implement and apply LMS, RLS, and Kalman filters to given applications.
- Analyze the accuracy and determine advantages and disadvantages of each method.
- Use the theoretical understanding to do troubleshooting, e.g., in cases the observed performance is not as expected.
- Report the solution and results from the application of the above filtering techniques to given problems.

Course contents

Fundamentals for adaptive systems; mean-square estimation, Wiener filters. Introduction to adaptive structures and the least squares method. State space models. Kalman filters. Search techniques: Gradient and Newton methods. LMS (least mean squares), RLS (recursive least squares). Analysis of adaptive algorithms: Learning curve, convergence, stability, excess mean square error, mis-adjustment. Generalizations of LMS and RLS.

Course literature

Lecture notes: Adaptive Signal Processing, Hjalmarsson & Ottersten, KTH-EE

Examination

- PRO1 - Project, 1.0 credits, grading scale: P, F
- PRO2 - Project, 1.0 credits, grading scale: P, F

• TENA - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

2 Project assignments (PRO1, 1 ECTS credits, grading P/F; PRO2, 1 ECTS credits, grading P/F) completed and reported in pairs of at most 2 students before given deadlines. Written exam (TENA, 4 ECTS credits, grading A-F)

Ethical approach

• All members of a group are responsible for the group's work.

• In any assessment, every student shall honestly disclose any help received and sources used.

• In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.