

Class Website

All information concerning the class: announcements, class facts, problem sets, etc.

http://www.idsc.ethz.ch/Courses/recursive_filtering

Please check regularly. Announcements concerning the class are only made on the website.

Description

Contents:

Probability review; Bayes theorem; recursive estimation using Bayes theorem; introduction to estimation; standard Kalman filter; extended Kalman filter; particle filtering.

Notes:

Notes available online: *Introduction to Estimation and the Kalman Filter* by H. Durrant-Whyte and other notes.

Requirements:

Introductory probability theory and matrix-vector algebra.

Class Facts

Instructor	Prof. Raffaello D'Andrea, rdandrea@ethz.ch
Teaching Assistants	Angela Schöllig, aschoellig@ethz.ch Sebastian Trimpe, strimpe@ethz.ch
Lecture	Wednesday, 13:15 to 15:00, NO C 6
Exercise	Wednesday, 15:15 to 16:00, NO C 6
Office hours	By appointment (please send an e-mail to the teaching assistants).
Exam	Final exam during the examination session, covers all material.
Grading	<i>40% quiz/programming exercises, 60% final exam</i> if the grade for the quiz and programming exercises is better than the grade in the final exam; <i>100% final exam</i> otherwise. Only the two best grades from the quiz and the programming exercises will count towards the 40% above. PhD students will get credits for the class if they pass the class (final grade of 4.0 or higher).
Repetition	The final exam is only offered in the session after the course unit. Repetition is only possible after re-enrolling. Students who took the class in Spring 09 and have to retake the course should inform the teaching assistants before the beginning of the new class .

Lectures

#	Date	Topic	Reading*
1	Mar 03	Probability Review	1, 2
2	Mar 10	Probability Review	1, 2
3	Mar 17	Bayes Theorem	1, 2
4	Mar 24	Recursive Estimation using Bayes Theorem	1, 2
5	Mar 31	Introduction to Estimation	3
–	Apr 07	<i>Easter break</i>	–
6	Apr 14	Standard Kalman Filter	4, 5, 6
7	Apr 21	Standard Kalman Filter	4, 5, 6
8	Apr 28	Extended Kalman Filter	7
–	May 05	<i>no lecture and exercise class</i>	–
–	May 12	<i>no lecture and exercise class</i>	–
9	May 19	Particle Filtering	<i>to be announced</i>
10	May 26	Particle Filtering	<i>to be announced</i>
–	Jun 02	<i>no lecture and exercise class</i>	–

* *Introduction to Estimation and the Kalman Filter* by H. Durrant-Whyte.

Quizzes and Programming Exercises

During the semester, there will be a graded quiz and programming exercises, which can be used to improve the final grade for the course (see “grading” above). The quiz will take place at the beginning of the lecture and will test the student’s understanding of the corresponding topic. The programming exercises will require the student to apply the lecture material. Up to three students can work together on the programming exercises. If they do, they have to hand in one solution per group and will all receive the same grade.

#	Type	Topic	Dates
Q1	Quiz	Probability, Bayes Theorem, Estimation (Lectures #1 to #5)	Apr 14
P1	Programming	Kalman filter	Apr 28 (issued) May 12 (due)
P2	Programming	Particle filter	May 26 (issued) Jun 09 (due)

Problem Sets

We will make sets of problems and solutions available online for the chapters covered in the lecture. It is the student’s responsibility to solve the problems and understand their solutions. The teaching assistants will answer questions in office hours and some of the problems might be covered during the exercise classes.

#	Topic
1	Probability review
2	Bayes theorem, recursive estimation using Bayes theorem
3	Introduction to estimation
4	Kalman filter
5	Particle filter