

ECE 767
Tracking and Sensor Information Fusion

COURSE OUTLINE

Please refer to course website for updated information.

CALENDAR DESCRIPTION

This is intended as a follow-up course for ECE771, which deals with single-sensor single-target tracking in a clean environment. This new course will introduce the advanced concepts and algorithms for multisensor-multitarget tracking under realistic conditions (with imperfect sensors and measurement uncertainties). In addition, this course will deal with multisource information fusion with applications to communications, signal processing and target tracking.

SCHEDULE And MODE OF DELIVERY

Lecture: Fridays 2:00 a.m.- 5:00 p.m.

INSTRUCTOR

Dr. R. Tharmarasa
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Office: ITB-A211
Phone: 905-525-9140 ext. 24171
Office Hours: By appointment

COURSE WEBSITE/S

<http://avenue.mcmaster.ca>

COURSE OBJECTIVES

By the end of this course, students should be able to:

- Implement a multitarget tracker to handle false alarms and miss detections.
- Select a suitable tracker/filter for a given tracking problem.
- Evaluate the performance of a tracker/fuser.
- Compare different tracking algorithms.
- Fuse tracks/measurements from multiple sources optimally.
- Develop an algorithm for a resource management problem.

ASSUMED KNOWLEDGE

Programming in MATLAB

COURSE MATERIALS

Textbooks:

1. Y. Bar-Shalom, P.K. Willet and X. Tian, *Tracking and Data Fusion: A Handbook of Algorithms*, YBS publishing, 2011.

Additional References:

1. Y. Bar-Shalom, X. Rong Li and T. Kirubarajan, *Estimation with Applications to Tracking and Navigation*, John Wiley & Sons, 2001.
2. Y. Bar-Shalom and X. R. Li, *Multitarget-Multisensor Tracking: Principles and Techniques*, Storrs, CT: YBS Publishing, 1995.
3. S. Blackman and R. Popoli, *Design and Analysis of Modern Tracking Systems*, Artech House, 1999.

COURSE OVERVIEW

Week	Topic
1	Introduction to target tracking
2	Performance evaluation
3	Tracking with multiple sensors
4	Track initialization and track management
5	Algorithms for tracking a single target in clutter
6	Algorithms for tracking multiple targets in clutter
7	Extended target tracking
8	Track-to-track fusion
9	Performance prediction
10	Resource management
11	Nonlinear filters (PF, UKF,...)
12	Sensor registration
13	Practical issues

Note: all timings are approximate.

At certain points in the course, it may make good sense to modify the schedule. The instructor may modify elements of the course and will notify students accordingly (in class, on the course website).

ASSESSMENT

Component	Weight	Due Date
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Class participation	10%
Quizzes	10%
Homework assignments	55%
Project	25%
Total	100%

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EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

RESEARCH ETHICS

The two principles underlying integrity in research in a university setting are these: a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities. Any departure from these principles will diminish the integrity of the research enterprise. This policy applies to all those conducting research at or under the aegis of McMaster University. It is incumbent upon all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to <http://www.mcmaster.ca/policy/faculty/Conduct/ResearchEthicsPolicy.pdf>.

www.eng.mcmaster.ca/ece