

Project announcement
EML 6934
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October 23, 2009

1 Instructions

- *Project Goal:* The goal of the project is to use what you have learned in the class to learn a more advanced topic on your own, not to apply what you learned in the class. In this sense, this project might be slightly different from what you are used to.
- *Project Structure:* projects can be individual or done in groups (maximum group size: two students). You will present your work in the form of a 20-minute presentation, and you'll have 5 minutes of Q&A (so each presentation will take a total of 25 minutes). No project reports. Your project will be graded solely based on the
- *Grading:* You'll be judged solely on the basis of the presentation. If it is a group project, each member should present half the material. *Your presentation should demonstrate that you have a clear understanding of the material you are presenting.* Specifically, the following criteria for grading the project presentation will be used: clarity of presentation (60%), ability to answer questions (20%), finishing within time: (20%)
- *Date and time:* The presentations will be held in MCCA 2196 on 11/30 and 12/7 during 1 pm to 7 pm. The exact schedule will be decided later. The room has a projector and a computer; so you need to only bring your slides in electronic format (pdf is safer), perhaps in a USB key.

1.1 What you need to do now

- Decide on a topic and write a 1 or 1/2 page “abstract” of the project (what you are planning to do). If you are going to present a paper, it can as short as “I am going to present the paper xxxxx.. I will take an example from XXX and implement the method described in the paper to study the method’s performance.”

- Choose one of the two possible dates.
- email me the abstract and the date (along with any time slot that you *cannot* present in), by **Nov 1**

if you are not sure if what you are doing is what is expected of you, you are welcome to have an review with me during the week of Nov 17-24 in which I'll give you feedback on your progress.

2 List of suggested topics

I have indicated the difficulty level of some of the suggested projects. The following coding scheme is used:

- dd: average
- ddd: challenging
- dddd: extremely challenging

Kalman filtering

1. *Unscented Kalman Filtering*: “A new extension of the Kalman filter to Nonlinear systems” S. J. Julier and J. K. Uhlmann, Signal processing, sensor fusion, and target recognition. Conference No6, Orlando FL, 1997, vol. 3068, pp. 182-193 (**ddd**)
2. *Ensemble Kalman Filtering*: “A brief tutorial of the Ensemble Kalman Filter”, Jan Mandel, arXiv:0901.3725v1 (**dddd**)
3. *Kalman filtering with out-of-sequence measurements*. “Update with Out-of-Sequence Measurements in Tracking: Exact Solution”, Y. Bar-Shalom, IEEE Transactions on Aerospace and Electronic Systems, vol. 38, no. 3, July 2002 (**dd**)

System identification

1. *Expectation Maximization algorithm and its application to system ID*: (**dd/ddd**)
2. *Numerical computation of ML estimates for LTI system ID* (**dd**)
3. “Maximum-Likelihood identification of noisy input-output models”, R. Diversi, R. Guidorzi, and U. Sovernini, Automatica, 43 (2007), 464-472 (**dd**)
4. Review of errors in variable methods

Computer vision/robotics:

1. ML estimation of two-view relative pose (**dd/ddd**)

2. Statistical analysis of the error in 8-point algorithm (**ddd**)

Bayesian estimation:

1. Nonparametric Belief Propagation for Self-Localization of Sensor Networks”, Ihler et. al., IEEE Journal on Selected Areas in Communication, special issue on Distributed Collaborative Sensor Networks, April 2005, Vol. 23, No. 4 pp. 809-819. (**dd/ddd**)
2. *MCMC methods*: “estimation via Markov Chain Monte Carlo”, James C. Spall, IEEE Control Systems Magazine, April 2003, pp. 34-45. (**ddd**)

others

1. *Total least squares and its applications*: Crassidis and Junkins book can be a starting point. (**dd**)