SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

DISTRIBUTED PARTICLE FILTERING VIA OPTIMAL FUSION OF GAUSSIAN MIXTURES

PhD Preliminary Research Examination

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Abstract: Particle filtering is a sequential Bayesian estimation algorithm widely used by wireless sensor networks in applications like target tracking, environment monitoring, and smart grids. As large-scale wireless sensor networks become popular, distributed particle filtering becomes necessary. We develop a distributed particle filtering algorithm based on optimal fusion of local posteriors. We derive the optimal fusion rule from Bayesian statistics and implement it in a distributed and iterative fashion via an average consensus algorithm. We approximate local posteriors as Gaussian mixtures and fuse Gaussian mixtures through importance sampling. We prove that under certain conditions the proposed distributed particle filtering algorithm converges to a global posterior locally available at each sensor in the network. Different from existing work, the proposed algorithm neither compromises approximation accuracy for fusion tractability nor compromises fusion validity for approximation accuracy. Also, the compact form of Gaussian mixtures makes the proposed algorithm efficient in communication. Moreover, importance sampling used in the fusion of local posteriors gives full flexibility to local posterior approximations and is thus compatible with adaptive Gaussian mixture learning. Numerical examples are presented to demonstrate the performance of the proposed algorithm in comparison with other distributed particle filtering algorithms.

DATE: Thursday, September 24, 2015
TIME: 10:10 a.m.
PLACE: Green Hall, Room 0120

Dissertation advisor:
Dr. Arye Nehorai

This seminar is in partial fulfillment
of the Doctor of Philosophy degree

Washington University in St. Louis
School of Engineering & Applied Science