RAI 836: Probabilistic Robotics

Probabilistic Robotics. By Sebastian Thrun, Wolfram Burgard, and Dieter Fox, MIT Press (2006), ISBN: 978-0-262-20162-9.

Handouts and research articles may also be used by the instructor.

Objective

2. This course focuses on robot perception and control in the face of uncertainty. Building on the field of mathematical statistics, probabilistic robotics endows robots with a new level of robustness in real-world situations.

Course Outcome

3. This course will furnish the students with a practical experience in robot perception in partially known environments through implementations in pseudo code, detailed mathematical derivations, discussions from a practitioner's perspective, and extensive lists of exercises and class projects

Course Outline:

Topics	Allocated Periods
Introduction • Uncertainty in Robotics • Probabilistic Robotics **Bayes Filter** • Gaussian Filters • Kalman Filter • Extended Kalman Filter (EKF)	45

Nonparametric Filters • Histogram Filter • Particle Filter **Localization** • Markov Localization • EKF Localization • Multi-Hypothesis Tracking • Monte Carlo Localization **Occupancy Grid Mapping** **Simultaneous Localization and Mapping**	
• EKF SLAM • Graph SLAM	