SYSTEMS DESIGN ENGINEERING

Topics in Particle Filtering

SYDE 770 - *Topic 7*   **Fall**

The course is concerned with perception in the face of uncertainty. The topics build on the field of mathematical statistics and how probabilistic techniques enable robots and agents with a level of robustness for real-world situations. The techniques presented allow the solving of problems of localization and mapping for robotics and their combination (Simultaneous Localization and Mapping) for probabilistic robotics. The techniques are equally appropriate for the detection and tracking of targets in time & spatial signals, where the signals can either be vision, bio-signals, inertial or GPS data. The area of probabilistic robotics has chiefly relied on active sensors such as sonar and laser for acquiring perceptual information.

This course will chiefly focus on computer vision techniques only. The theory behind Particle filters is covered, as well as their relationship to Kalman filtering, estimations theory and Bayes theorem. Sampling methods, modelling and improvements to Particle filtering are also covered alongside potential application areas. The emphasis is placed on students utilizing the theory in a particular problem space, choosing appropriate modelling and sampling strategies and dealing with combinatorial issues. There will be weekly
assignments as well as a project.

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