Probabilistic Robotics
Overview

MSc course Artificial Intelligence 2017
http://staff.fnwi.uva.nl/a.visser/education/ProbabilisticRobotics/

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Probabilistic robotics is a subfield of robotics concerned with the algorithms to couple the perception and control part. It relies on statistical techniques for representing information and making decisions. By doing so, it accommodates the uncertainty that arises in most contemporary robotics applications.
Structure of the course

- Lectures on Monday & Wednesday
- Practical Session on Tuesday & Thursday
Goals for the Course

- Insight in the mathematical foundation of the techniques and algorithms applied in the field

- Experience with the derivation of models from clear problem descriptions

- Practical experience with applying the techniques to datasets & “real robots”
Literature

- http://www.probabilistic-robotics.org/
Grading

- 1/2 exam grades, 1/2 assignments grade
- Exam grade: final exam
- Exams will be “open-book”
Some practical issues

- Try to keep up with reading the chapters
- Ask questions whenever something in the lecture or the book is not clear to you
- Slides will become available online:
  http://staff.fnwi.uva.nl/a.visser/education/ProbabilisticRobotics
Assignments

- Exercises from the book
- Matlab-exercises
- Python-exercises
Topics covered in the course

- Robot Motion and Perception
- Localization
- Mapping
- Exploration
Autonomous Multi-Robot Exploration in Communication-Limited Environments

Julian de Hoog, Stephen Cameron and Arnoud Visser
The Book

- Part I: The Basics
  - Introduction
  - State Estimation & Recursive Filters
  - Robot Motion
  - Robot Perception

- Part II: Localization
  - Markov and Gaussian
  - Grid And Monte Carlo

- Part III: Mapping
  - Occupancy Grid Mapping
  - Simultaneous Localization and Mapping
  - Advanced SLAM algorithms

- Part IV: Planning and Control
  - Approximate POMDP Techniques
  - Exploration
Sebastian Thrun

- Former Director of the Stanford AI Lab
- Winner of the DARPA Grand Challenge 2005
- Founder of the Google X lab
- Builder of the interactive museum tour-guide robot Rhino - Minerva
Currently

The adventure is coming

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Our mission is to make the dream of personal flight a reality. We believe when everyone has access to personal flight, a new, limitless world of opportunity will open up to them. At Kitty Hawk, we engineer, design and build safe, fun, easy-to-fly aircraft.
Wolfram Burgard

- Head of the research lab for Autonomous Intelligent Systems at the Universität Freiburg

- Supervisor of Sebastian Thrun
- Initiator of the interactive museum tour-guide robot Rhino / Minerva
- Advisor in the NurseBot project
Dieter Fox

- Director of the Robotics and State Estimation Lab at the University of Washington

- Student of Sebastian Thrun
- Programmer of the interactive museum tour-guide robot Rhino / Minerva
- RoboCup Aibo League veteran
Impact

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Robotics  Artificial Intelligence  Computer Vision
Common background: Museum Tour-guides

Rhino, Bonn, 1997

Minerva, Washington, 1998