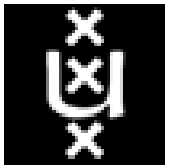

Probabilistic Robotics

Overview

BSc course Kunstmatige Intelligentie 2010
http://www.science.uva.nl/~arnoud/education/ProbabilisticRobotics/

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Probabilistic Robotics

Probabilistic robotics is a subfield of robotics concerned with the on 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

- Studio Class Room (hoor-, werkcolleges & prakticum) on Tuesday
- Studio Class Room (hoor-, werkcolleges & prakticum) on Thursday
- Studio Class Room (zelfstudie) on Thursday

Goals for the Course

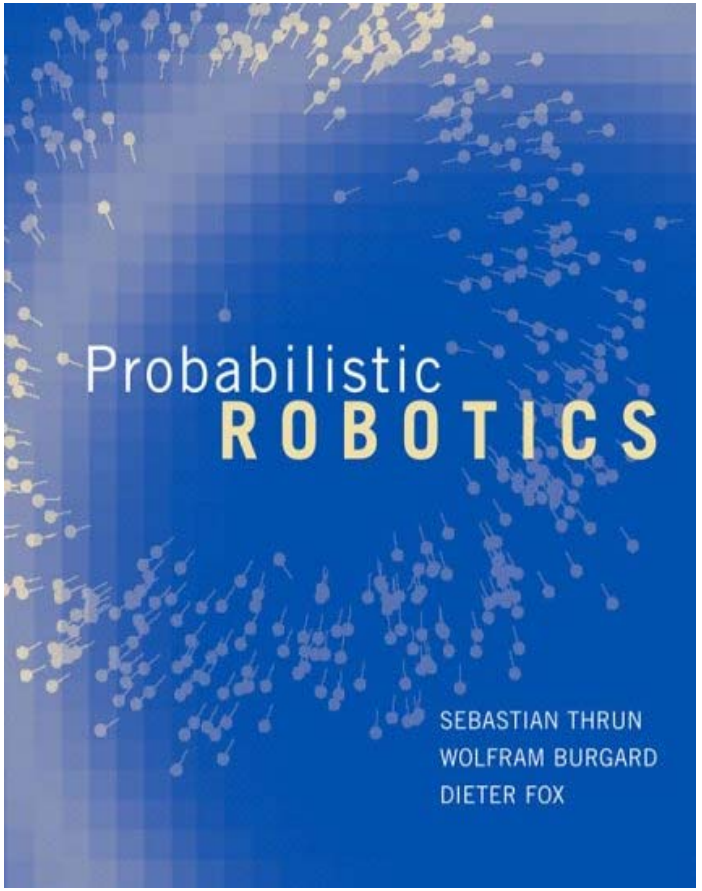
- Insight in the mathematical foundation
  of the techniques and algorithms applied in the field

- Experience with the derivation of models
  from clear problem descriptions

- Practical experience with applying the techniques
  to “real robots” in a virtual world

Literature

- Sebastian Thrun, Wolfram Burgard and Dieter Fox, Probabilistic Robotics, The MIT Press, 2005.
- http://www.probabilistic-robotics.org/



Grading

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

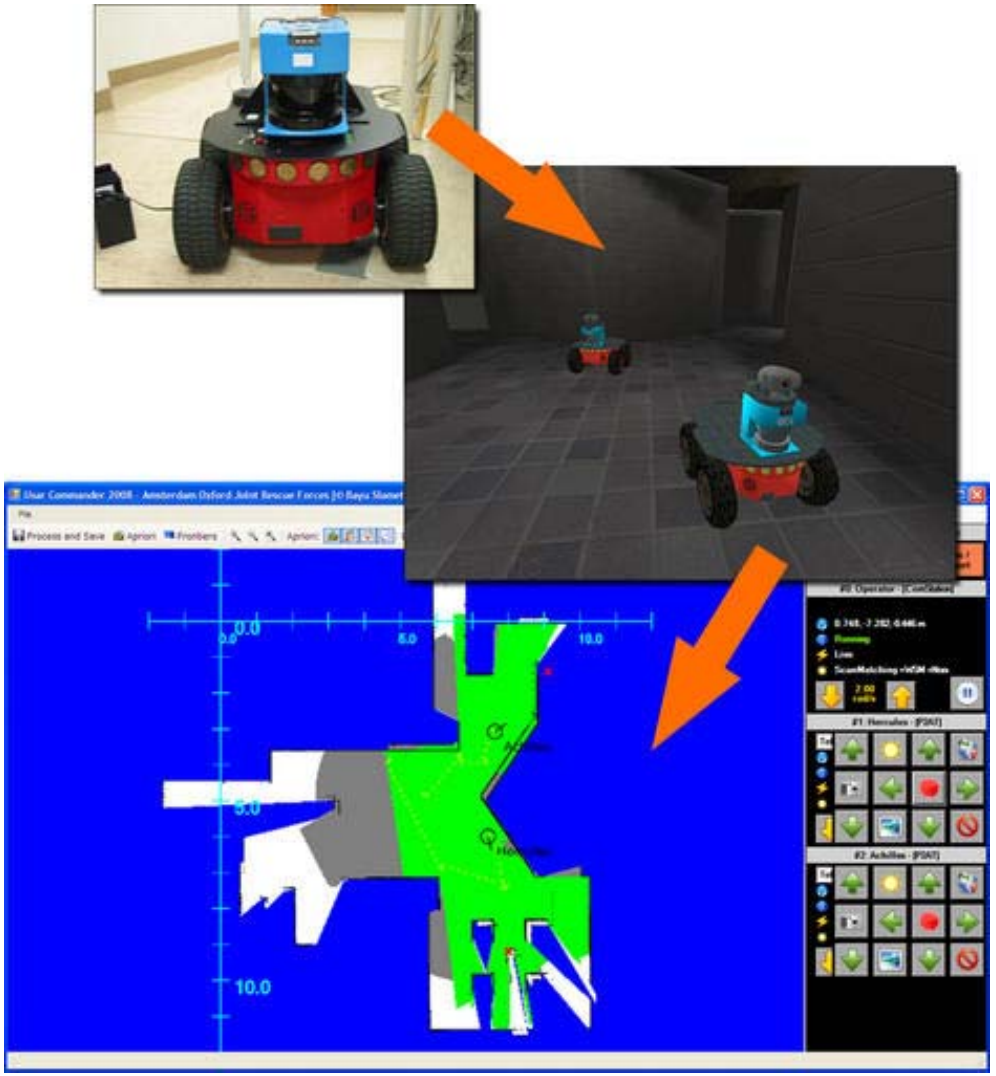
Some practical issues

- 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.science.uva.nl/~arnoud/education/ProbabilisticRobotics

Assignments

- Exercises from the book
- Matlab-exercises
- UsarSim-exercises



Topics covered in the course

- Robot Motion and Perception
- Localization
- Mapping
- Exploration

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

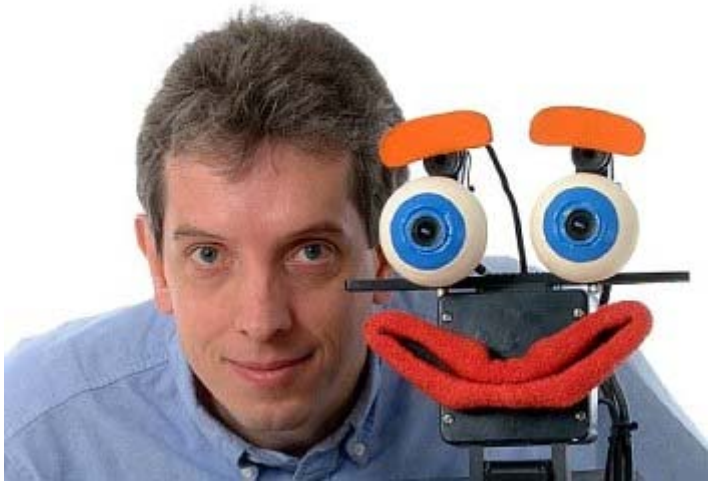
Sebastian Thrun

- Director of the Stanford AI Lab

- Winner of the DARPA Grand Challenge 2005
- Primary author of CARMEN – The Robot Navigation Toolkit
- Builder of the interactive museum tour-guide robot Rhino - Minerva

Wolfram Burgard

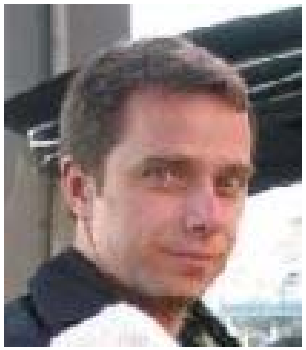
- Head of the research lab for Autonomous Intelligent Systems at the Universität Freiburg



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

Dieter Fox

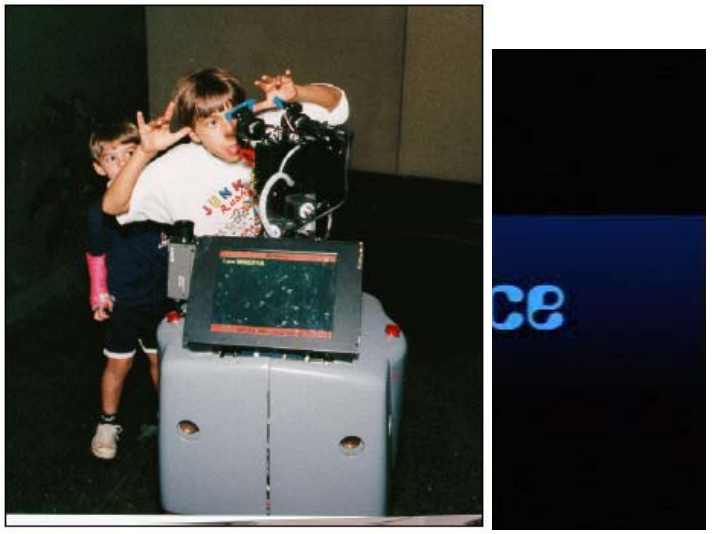
- Director of the Intel Labs Seattle and the Robotics and State Estimation Lab at the University of Washington



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

Common background: Museum Tour-guides

Rhino, Bonn, 1997



Minerva, Washington, 1998