

Probabilistic Robotics

Overview

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

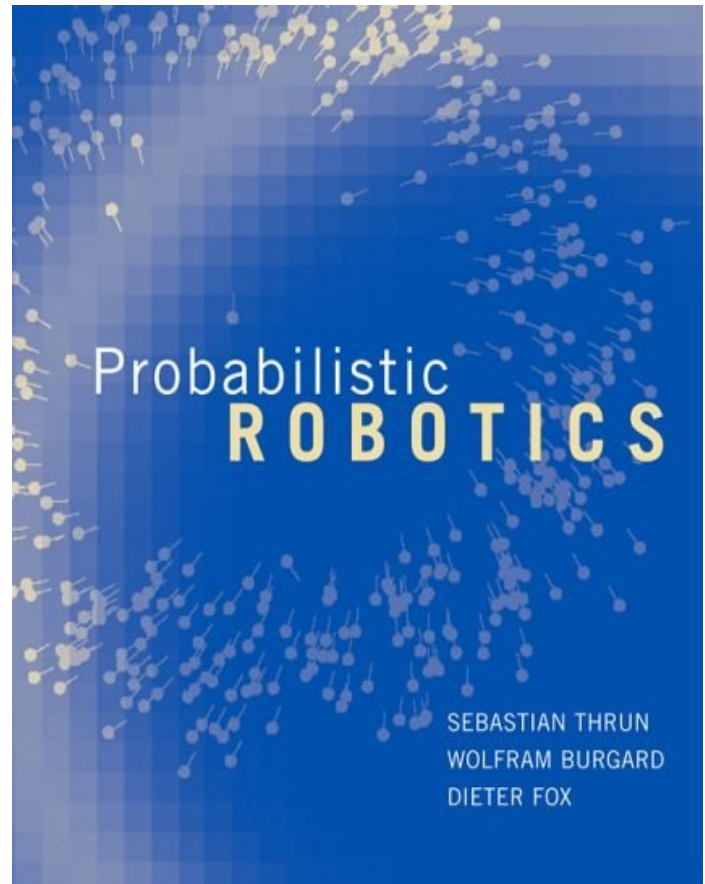
- Lectures
on Monday & Wednesday
- Practical Session
on Tuesday & Thursday

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

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



Grading

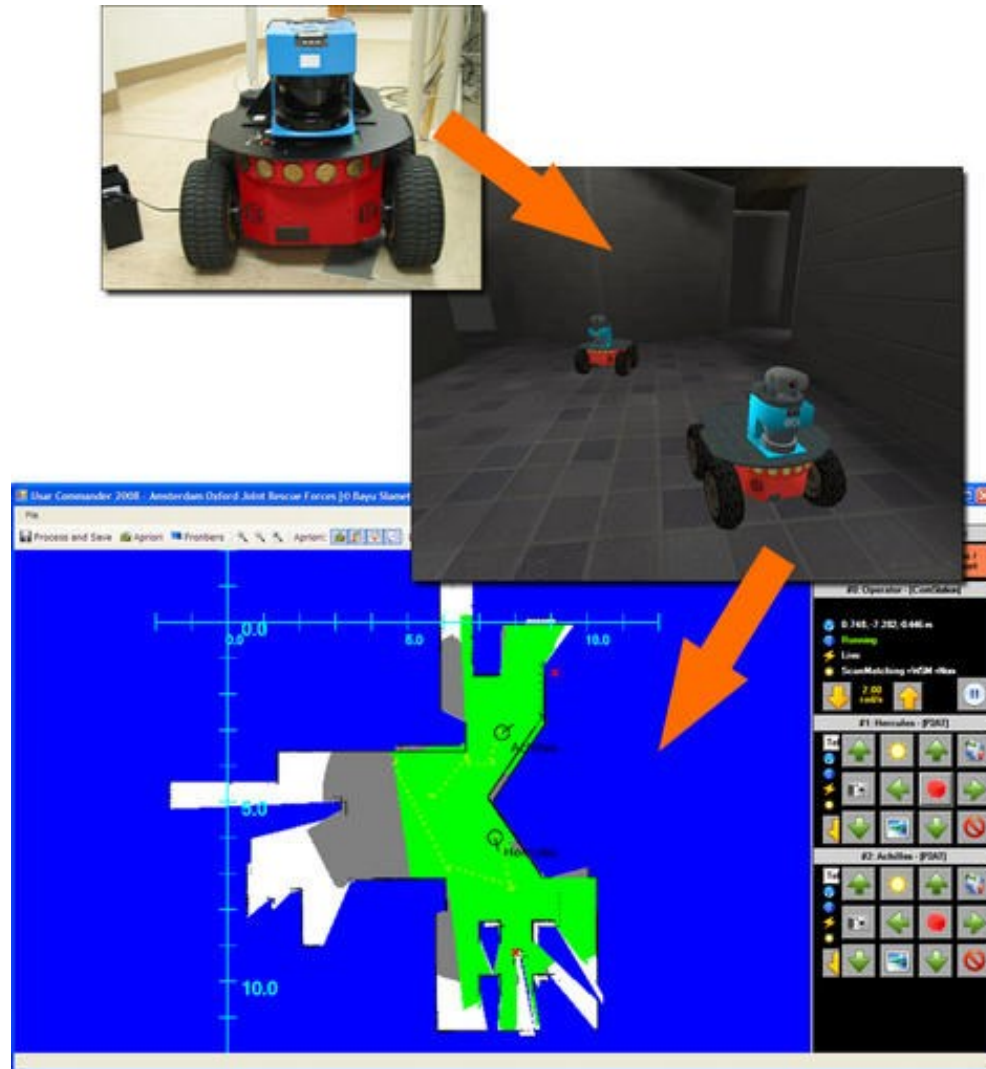
- 1/2 exam grades, 1/2 assignments grade
- Exam grade: final exam
- Exams will be “open-book”

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

Mapping & Exploration @ RoboCup



UNIVERSITY OF OXFORD
COMPUTING LABORATORY

UNIVERSITY OF AMSTERDAM
INTELLIGENT SYSTEMS LAB



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

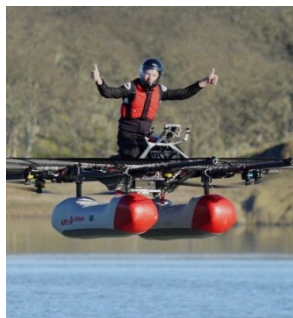
Sebastian Thrun

- 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



Kitty Hawk

ABOUT KITTY HAWK

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

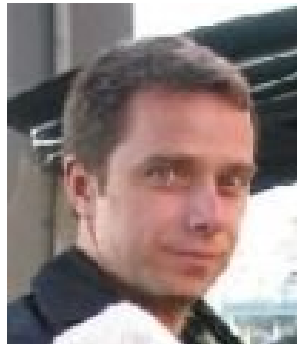
- Head of the research lab for Autonomous Intelligent Systems at the Universität Freiburg



- 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

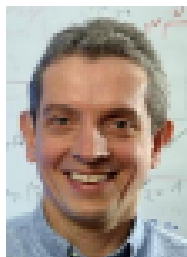


- Student of Sebastian Thrun
- Programmer of the interactive museum tour-guide robot Rhino / Minerva
- RoboCup Aibo League veteran

Impact



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Common background: Museum Tour-guides



Rhino, Bonn, 1997



Minerva, Washington, 1998

