

CSC752 Autonomous Robotic Systems

Ubbo Visser

Department of Computer Science
University of Miami

August 23, 2022

UNIVERSITY
OF MIAMI



Outline

- 1 RoboCanes Team UM
- 2 What are your expectations?
- 3 General Information



Ubbo Visser

Short introduction



Research interest

- Artificial Intelligence with the focus on knowledge representation and reasoning.
- **Application areas:** Semantic Web and Multi-Agent Systems (Games, Robots, RoboCup).

Position

- Associate Professor

Stations

- Münster, Brisbane, Bremen
- Miami

Contact information

- Office: Ungar Building, Room No 330A
- Phone: 305-284-2254
- Email: visser@cs.miami.edu (preferred)
- Office Hours: by appointment

May we know who you are?

Short introduction

- Are you a MS or a PhD student?
- Which area would you like to specialize in?
- Why did you select this course?

*hmm, I am not sure;
my advisor told me so;
fascinating topic;
this is what I want to specialize in;
I see a big future ahead of this field; ...*

Grading & general issues

- **Grading:**
 - 50% - Assignments based on the lectures and short talks in class
 - 50% - Project
- **Class attendance and participation:** Class attendance is mandatory, since a lot of practical work is required and especially the final project would be too difficult without attending the class. Class participation is also important. Active interest in lectures is the easiest way to learn.

Always keep these in mind

- **Plagiarism:** The penalty for copied homework of any kind can be immediate failure in the course. Our policy on programs is as follows: There is no reason for two (or more) people handing in identical or nearly identical programs. We will regard such programs as either group-written or simply copied. If we have no hard evidence of copying, such programs will receive NO credit. More serious actions will be taken in cases where there is evidence of cheating.
- **Late programs:** Unless otherwise stated, programs will lose 20% of their value for each weekday (Monday through Friday that they are late, down to a minimum value of 20%. The due date of a program is the latest date on which it can be run to get full credit.

and also these ...

- **Dropping the course:** Unless there are extreme extenuating circumstances, we will not allow anyone to drop a course after the drop date. Poor academic performance will never be an acceptable reason for a late drop.
- **Incompleteness:** Unless there has been a documentable illness that caused you to miss substantial amounts of class and computer time, we will not give an incomplete grade in this course. Therefore, please do NOT waste our time asking about an incomplete grade unless you have a remarkably good reason.

Content

Part 1 (Introduction)

- 1 Introduction to autonomous systems, autonomous robots, RoboCup.
- 2 Overview of typical components of an autonomous robot.
- 3 ROS

Part 2 (Modeling)

- 1 Perception, noise, modeling.
- 2 Recursive state estimation, Bayes' filter, particle filter.
- 3 Self-localization.

Part 3 (Control and motion)

- 1 PID-control, calibration of parameters.
- 2 Kinematics, controlling a wheeled robot, controlling joints.
- 3 Motions.

Part 4 (Learning)[optional, if time permits]

- 1 Overview, different types of learning.
- 2 Reinforcement learning.

More information ...

• **Final project:**

- The project can be any addition to the RoboCanes agent.
- Proposal, progress report, final presentation, paper (min. 8 pages LNCS).
- More information will be on the course website.

• **Recommended books:**

- Roland Siegwart, Illah R. Nourbakhsh, and Davide Scaramuzza. *Introduction to Autonomous Mobile Robots*. MIT Press 2011, 2nd edition.
- Mark Spong, Seth Hutchinson, and M. Vidyasagar. *Robot Modeling and Control*. Wiley 2006.
- Sebastian Thrun, Wolfram Burgard, and Dieter Fox. *Probabilistic Robotics*. MIT Press, 2005.
- Richard S. Sutton and Andrew G. Barto. *Reinforcement Learning: An Introduction*. MIT Press, 2nd edition 2018.
- Stuart Russell and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Prentice Hall, 4th edition, 2020.

Do you know ... ?

- Linux/Docker
- C++/Python
- Debugging C++ in Linux
- Matlab
- Repositories (SVN, GIT)
- ROS
- Doxygen
- Profiling
- LaTeX