Autonomous robotics: Action, Perception, and Cognition

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Language

- slides will be in English
- lectures will be in English, sometimes German

Who am I

- theoretical physicist by training, but working in theoretical neuroscience/ cognitive science and motor control for over 20 years
- second life as a roboticist/computer vision person
- way stations: Saarbrücken, Stuttgart, Boca Raton Florida, Bochum, Marseille, Bochum...

What am I?

- Chair Theory of Cognitive Systems
- Director of the Institut für Neuroinformatik
- joint appointment in the Faculty of Physics and Astronomy and in the Faculty of Electrical Engineering and Information Technology

My research

- research in two related areas
  - embodied cognition: motor control, movement planning and representation, decision making, action and spatial memory, visual working memory, perceptual representations, motion perception, grounding of language
  - autonomous robotics: scene representation, object recognition, behavioral organization, reaching and grasping, timing, learning
- based on the theoretical approach of “DST” (dynamical systems theory) and “DFT” (dynamical field theory)

Dr. Mathis Richter

- will run the exercises
- also available for questions etc.
- mathis.richter@ini.rub.de
- postdoc at the INI who works on the perceptual grounding of concepts and the generation of conceptual descriptions from perception

Who are you?

Please send this information

- to mathis.richter@ini.rub.de
- Name, First name
- Studienfach
- Fachsemester
- (Prüfungsordnung)
- Matrikelnummer

Schedule

- every Thursday 14:15 to 16:00
- exercise from 16:15 to 17:00

- 11 Apr 2019 Introduction
- 18 Apr 2019 Mathis Richter: dynamical systems tutorial
- 25 Apr 2019 Attractor dynamics basic and sub-symbolic
- 2 May 2019 Attractor dynamics: sub-symbolic and Warren
- 9 May 2019 Mathis Richter: Hands-on work on robotic vehicles in simulation/hardware
- 16 May2019 Jean-Stéphane: arm kinematics, attractor dynamics on arms

- 23 May 2019 timing, coordination, DMP
- 30 May2019 [Feiertag]
- 6 Jun 2019 sequence generation
- 13 Jun 2019 [Pfingstferien]
- 20 Jun 2019 [Feiertag]
- 27 Jun 2019 probabilistic thinking
- 4 Jul 2019 probabilistic thinking
- 11 Jul 2019 Mathis Richter: summary, exam preparation

Web page

- www.ini.rub.de
- then search for course under teaching/ courses…
- check regularly: there will be news there all the time…

Exercises

- are critical to the learning experience!
  - reading… understanding technical texts, understanding problem descriptions
  - =>there will be readings, to which exercise sheets will be directed
  - writing technically, making drawings, documenting thought
  - >=there will be an essay exercise to practice writing and organized text

Exercises

- hand-outs via the web page
- ... hand-ins on paper or by email to Mathis Richter
- hand-ins will be corrected by a team, led by Mathis and will receive a “grade”

Rules

- graded hand-ins will provide bonus point that can improve your final mark by 10% or more
- => see “rules” sheet on the web page

“Hands-on” sessions

- we will have a few“hands-on” sessions “life” in the exercise hour…
- to do simulations, to analyze equations, practice drawings etc.
- you work in groups/alone and we interact with you…

Matlab

- some exercises will make use of Matlab (the “matrix laboratory”), an interpreted language for numerical simulation.
- a free license is available for RUB students… go to
  - http://it-services.ruhr-uni-bochum.de/software/matlab

What learning experience does this course offer?

- interdisciplinary experience: using analogies with nervous systems to design cognitive robots
- learn concepts from dynamical systems theory and from neural dynamics
- experience the reading and writing of mathematical/technical material