

Autonomous robotics: Action, Perception, and Cognition

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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...

Who 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)

Rachid Ramadan

- will run the exercises
- also available for questions etc.
- rachid.ramadan@ini.rub.de
- master thesis done on using muscle/reflex models to estimate motor commands
- doctoral student working on a neural dynamic model of bipedal locomotion with balance control... very ambitious

Who you are...

- angewandte Informatik
- cognitive science
- robotics and automation
- electrical engineering and information technology
- physics, medical physics
- philosophy
- biology

web page

- <https://www.ini.rub.de/elearning/?eid=315>
- all course material will be on this webpage
 - lecture slides
 - exercises
 - readings

lectures

- will be “live”
- but will also be recorded
- link available (to participants only) for asynchronous viewing after live session

exercise sessions

- are also live sessions
- held by Rachid Ramadan (or a colleague)
- will not be recorded
- serve also as opportunity to ask questions

written exercises

- sheets are available on webpage, with deadline
- you can upload your solutions on the web page
- you will see your corrected exams there and the marks

peer discussion and questions

- about lecture: to me
- about exercise: to Rachid Ramadan and others
- to your peers ...

Exercises

- are critical to the learning experience!
 - strong correlation between active participation in exercises and success!
- they are somewhat mathematical, but not primarily aimed at math skill
 - more at being precise, understanding precisely, grasping the concepts

Exercises

- there will be readings for many lectures..
read ahead of time!
 - understanding technical texts from diverse fields is part of the learning
 - some readings will be topics of exercises
- writing scientifically is part of the learning
 - making drawings, documenting thought
 - here will be an essay exercise to practice writing and organizing text

Exercises

- hand-outs and hand-ins via the web page
- hand-ins will be corrected by a team, led by Rachid and will receive a “grade”
- !! a real luxury...make use of it

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

What learning experience does this course offer?

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