

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 close to 30 years
- second life as a roboticist/computer vision person
- way stations: Saarbrücken, Stuttgart, Boca Raton Florida, Bochum, Marseille, Bochum... (and Portugal)

Who am I

- Chair Theory of Cognitive Systems
- Director of the Institute for Neural Computation
- now part of the Faculty of Computer Science
- 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: perception/detection, motion perception, scene perception, attention, decision making, working memory, grounding of language, analogy
 - motor control: timing/coordination, sequences/initiation, obstacle avoidance, degree of freedom problem, reflexes and descending activation
- theoretical framework of dynamical systems theory and Dynamic Field Theory (DFT)

Lukas Bildheim

- will run the exercises
- also available for questions etc.
- lukas.bildheim@ini.rub.de
- doctoral student working on theoretical models of human motor control

Who you are...

- Angewandte Informatik
- Medical physics
- IT security
- ETIT
- Robotics and automation
- Master? (please complete info)

lectures

- lectures hybrid: in person but option to tune in by Zoom
- a video with the lecture will be made available online

exercise sessions

- held by Lukas Bildheim
- are also hybrid
- will not be recorded
- serve also as opportunity to ask questions

web page

■ <https://www.ini.rub.de/elearning/?eid=435>

■ all course material will be on this webpage

■ lecture slides

■ exercises

■ readings

discussion forum

- about lecture: to me
- about exercise: to Lukas Bildheim
- to your peers ...

Exercises

- are critical to the learning experience!
 - strong correlation between active participation in exercises and success!
- they use mathematical concepts, but are not primarily aimed at math skill
- instead: practice being precise, understanding precisely, grasping the concepts concretely/operationally

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 Lukas 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

Exam

- possibly oral
- but will decide later depending on number of participants

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