Movement generation by Humans and Robots: a dynamical systems perspective

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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)

Oliver Lomp

- will run the exercises
- also available for questions etc.
- Oliver.Lomp@ini.rub.de
- is a AI master himself, now doctoral student at INI in his final year…
  - developer CEDAR framework
  - higher cognition and perception in DFT

Would your present yourself, please?

- Name
- which discipline
- which semester
- taking this course
  - as course in Angewandte Informatik Master program
  - as “nicht-X Nebenfach”
  - as “Vertiefungsfach”
  - for fun...

Please send this information

- to Oliver.Lomp@ini.rub.de
- Name, First name
- Studienfach
- Fachsemester
- Prüfungsordnung
- Matrikelnummer

Exercises

- exercises published on web page
- handed in a week later
- will be corrected by a team of assistants
- and discussed by Oliver Lomp in the exercise session
- will include readings!
- a longer exercise as an essay!

Rules

- rules => pdf

Schedule

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

Schedule

- 14 Apr Organization/Introduction
- 21 Apr From Braitenberg to the attractor dynamics for vehicle motion
- 28 Apr Dynamic field theory (DFT) delivers targets to the attractor dynamics of a vehicle
- [5 May holiday]
- 12 May Movement preparation: DFT

Schedule

- [19 May Pentecost] Essay
- [26 May Fronleichnam] Essay
- 2 Jun Coordination dynamics
- 9 Jun [Mathis Richter] Behavioral organization and sequence generation
- 16 Jun [Jean-Stéphane Jokeit] Reaching movements with obstacle avoidance

Schedule

- 23 Jun [Jean-Stéphane Jokeit] Kinematics of (robot) arms
- 30 Jun [Hendrik Reimann?] The uncontrolled manifold … and posture
- 7 Jul Synergies and the uncontrolled manifold
- 14 Jul Muscles
- 21 Jul Integration: how it all works together

What learning experience does this course offer?

- interdisciplinary experience: theoretical ideas to understand the nervous systems
- using robotics to demonstrate/illustrate/ explore such theoretical ideas
- learn concepts from dynamical systems theory
- learn about human movement generation
- experience the reading and writing of mathematica/technical material