3 ‘Interaction & Generic Multi Robot Control Interface (ROCON)’

3.1 ‘Introduction to AG Interaction & Generic Multi Robot Control Interface (ROCON)’ (II-T-01)

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Abstract

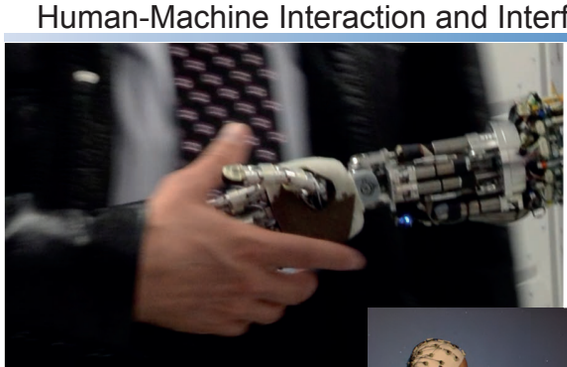
The work group “Interaction and ROCON” deals with the development of interfaces, robot control environments, human-machine interfaces and approaches for human state analysis. Most relevant for our developments are our high demands on the developed solutions to enable intuitive interaction. To this end different challenges are tackled with respect to three highly relevant areas: (1) behavior, appearance and effect of an interface or robot on the interacting human, (2) transfer of intentions between human and technical system, and (3) correctness and completeness of the approach to assure proper functioning. With respect to applications, we develop multi robot control approaches for space and industrial applications, solutions for close human-robot interaction as for example in the field of rehabilitation robotics or the support of elderly people. For the later, research questions of the field of social interaction must be considered. Hence, our work group deals not only with questions regarding the development of the targeted technical solution but does also consider questions from psychology, neuroscience, or social science and hence drives interdisciplinary discussion and cooperation.

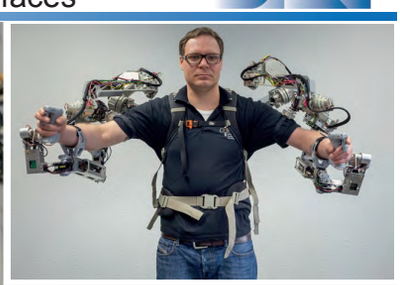
Work Group Interaction and ROCON
An Introduction

Project Day Work Group
Interaction &ROCON
Dr. Elsa A. Kirchner
Robotics Lab, University of Bremen and
DFKI RIC

Universität Bremen

Work Group Interaction and ROCON
Human-Machine Interaction and Interfaces





- Interface design & development
- Control environments
- Concepts for intuitive human-machine interaction
- Human state analysis

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Motivation

Motivation

Robots as intuitive, humanlike interaction partner

acceptance of robotic systems must be enhanced

improving

Challenge 1
behavior
appearance
effect

Van den Berg et al., 2011

Challenge 2
intention transfer
intuitiveness

Endres, 2012
Novak et al., 2013

Challenge 3
correct
functioning
completeness

[1]Clarke et al., 1999;
Drechsler and Große, 2005
[2]Abrial et al., 2010

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Motivation

Motivation

Robots as intuitive, humanlike interaction partner

acceptance of robotic systems must be enhanced

humanlike behavior
and **appearance**
behavior
appearance
effect

Van den Berg et al., 2011

(Photo by Yoshikazu Tsuno/AFP/
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Work Group Interaction and ROCON
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Robots as intuitive, humanlike interaction partner

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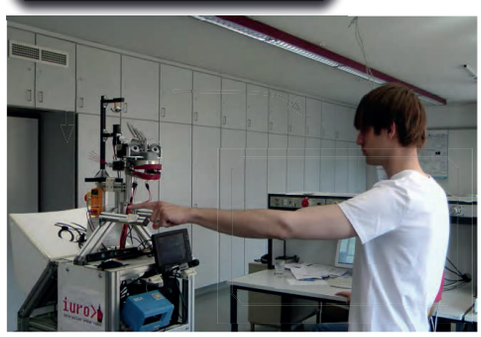

humanlike behavior and **appearance**

advanced control interfaces and **assistive devices**

Van den Berg et al., 2011

based on Van den Bergh et al., 2011

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advanced control interfaces and **assistive devices**

Van den Berg et al., 2011

covert physiological data

overt behavioral and situational data

Endres, 2012
Novak et al., 2013

Figure from Klamroth-Marganska et al., 2013

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Motivation

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Robots as intuitive, humanlike interaction partner

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covert physiological data

overt behavioral and situational data

Endres, 2012
Novak et al., 2013

formal description to enable **model checking**[1]

directly applying formal specification methods Event-B[2]

[1]Clarke et al., 1999; Drechsler and Große, 2005
[2]Abrial et al., 2010

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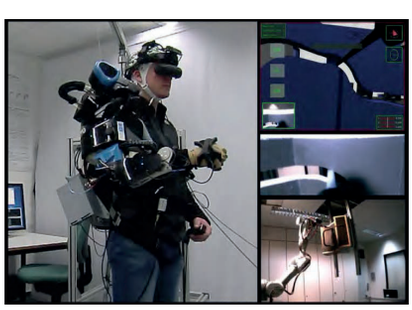
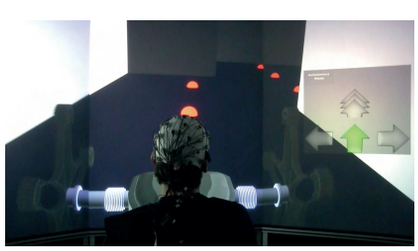
Relevant Projects Examples and Topics

- Multi robot control for space and industrial applications (IMMI, TransTerrA, Moonwalk)
  - Intuitive interfaces – operator immersion
  - Cognitive & behavioral state analysis
  - Teaching of new staff





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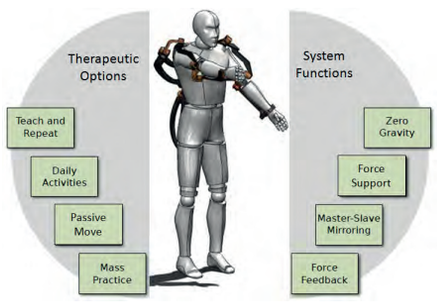
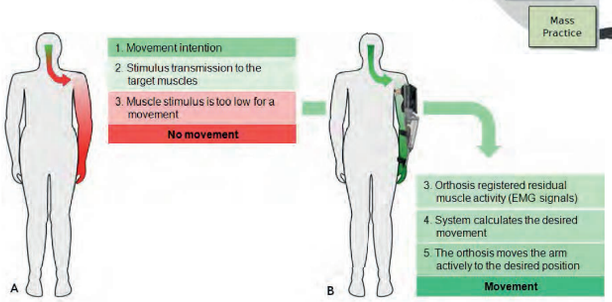
Relevant Projects Examples and Topics

- Rehabilitation (Recupera-Reha, TransTerrA)
  - Embedded & secure BCI control
  - Adaptive & mobile exoskeleton support
  - Long term supervision & progress analysis





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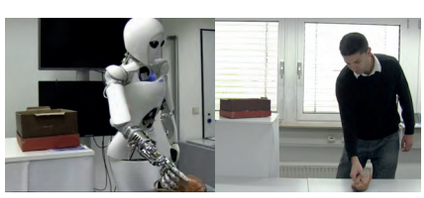
Relevant Projects Examples and Topics

- Support of (elderly) people at work and at home (BesMan, Limes)
  - Orthotic and exoskeleton support with multimodal biosignal and sensor analysis
  - Cooperative robots for industrial applications



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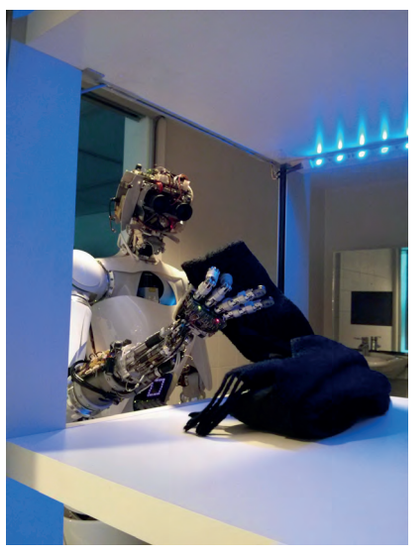
Relevant Projects Examples and Topics

- Social interaction
  - Robots as companion for elderly people
  - Robots as therapeutic tool (interaction partner for humans with emotional, expressional difficulties)
  - Robots as guide



Work Group Interaction and ROCON

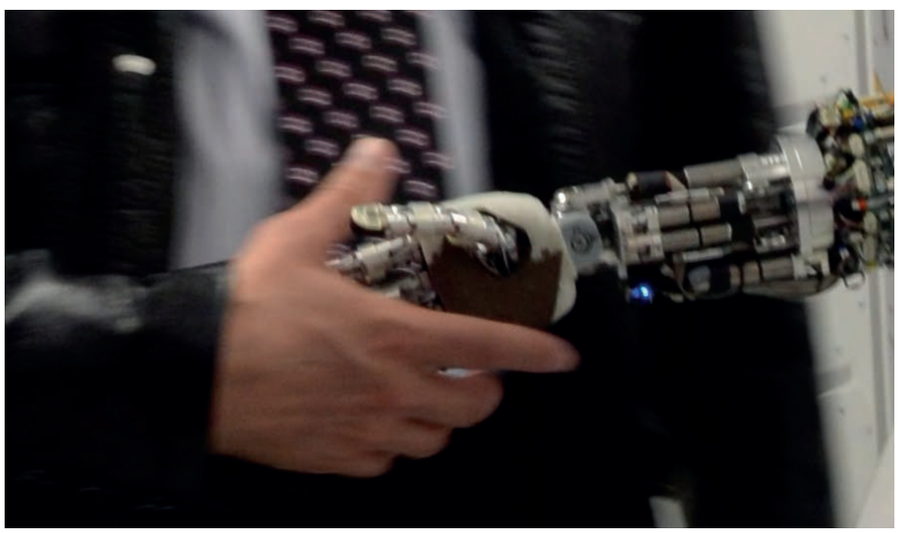
Meetings and Agendas

- We meet second Wednesday of each month at 4.00 pm.
- Meeting Topics:
  - Current state in development of relevant systems and software for interaction
  - Talks about relevant research topics
  - Discussions and presentation of new research ideas

- **Next Meeting:** 10.12.2014, 4.00 pm RH1 Room 1.03
  - Talk by Prof. Dr. Rüdiger Ehlers:

    "Correctness proof explained on abstract examples"

Come and Join ;)



Literature

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