



Munich - Linköping Joint Workshop 29. September 2016

11.00 – 12.45 Scientific Talks: [Lecture Hall 2770](#), Arcisstrasse 21

Dr. Fredrik Heintz - Dept. of Computer and Information Science, Linköping

The Wallenberg Autonomous Systems Program - Research and Education for the Future

Dr. Emmanuel Carlos Dean Leon - Institute of Cognitive Systems, TUM

Tactile Interaction: Compliance on Non-Compliant Robots

Abstract: In this talk, we will introduce a multi-modal control framework to provide fully-compliant behaviors on standard robots, even when the robots are not designed for compliant tasks. This is obtained by fusing multi-modal sensor signals from artificial skin and joint sensors with different control approaches. One advantage of these compliant behaviors is to allow safe kinesthetic demonstrations to teach robots new skills. The presented framework is able to bridge these kinesthetically demonstrated activities with low-level robot commands using a state-of-the-art teaching by demonstration method based on semantic descriptions. A key component of our framework is a robot parametric modeling based on the artificial skin multi-modal sensors. These generated models are used to control the robot improving and even changing its dynamic behavior, thus enhancing the physical interaction with the robot.

<http://www.ics.ei.tum.de/en/people/dean/>

Prof. Dr.-Ing. Sandra Hirche - Chair of Information-Oriented Control, TUM

Control Challenges in Physical Human-Robot Interaction

Abstract: Physical human-robot interaction (pHRI) is relevant for many societally important application domains such as machine-based physical rehabilitation, mobility and manipulation aids for elderly, and collaborative human-machine production systems. Intuitive and goal-oriented interaction is one of the key challenges of current research. From psychological studies it is well-known, that anticipation and behavior prediction of the interaction partner are key to joint action. A human behavior model is also needed for any model-based control design. However, any prediction based on a human behavior model will be uncertain, due to



sparsely available training data and inherent human variability. This uncertainty in prediction is quite crucial to be considered when designing control mechanisms for pHRI. In addition, because of the physical contact between the human and the machine not only information, but also energy is exchanged posing fundamental challenges for real-time human-adaptive and safe decision making/control. In this talk we will discuss some of the main control challenges for pHRI, introduce human behavior modeling paradigms and propose a class of control algorithms suitable for assistive control in pHRI.

<https://www.itr.ei.tum.de/?id=51>

Dipl.-Ing. Gerold Huber - Chair of Automatic Control Engineering, TUM

Human-Robot Collaboration within Industrial Assembly Processes

Abstract: The demands on production automation have been changing rapidly in many industries in recent years. The reasons are due to the increase in the variations of manufactured products and the shorter product life cycles. In many cases, the classic mass production in the strict sense is no longer appropriate.

In this talk I will highlight two ideas in our approach towards the adaptive robot-co-worker:

- Proactive Collision Avoidance
- Autonomous Task Allocation

<https://www.lsr.ei.tum.de/?id=425>

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| 12.45 – 13:45 | Lunch break: Joint lunch at Mensa, Arcisstrasse 17 |
| 13.45 – 15:30 | Poster Session with Teaser Presentations,
Immatrikulationshalle, Arcisstrasse 21 |
| 15.30 – 17:30 | Labtours ITR + ICS
Meeting Point: Immatrikulationshalle at 15.30 |
| | Labtour LSR
Meeting Point: Foyer Building N5 at 16:45 |
| 18.00 | Joint dinner at Max Emanuel Brauerei, Adalbertstrasse 33
Meeting Point: Foyer Building N5 at 17:45 |