MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS
Autonomous Motion Department

MAX-PLANCK-GESELLSCHAFT

Master Thesis Project

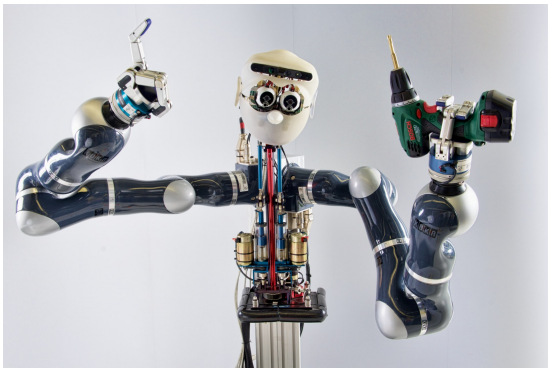
Distributed Wireless Control

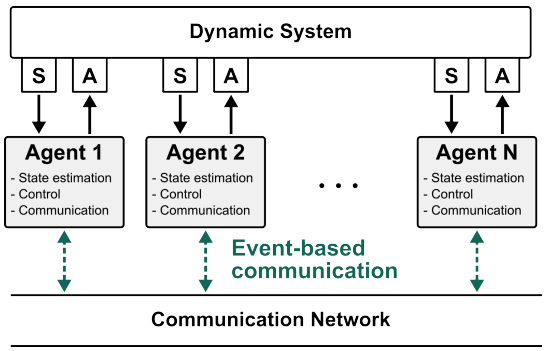
Reliable and economic wireless control for cyber-physical systems

The next generation of engineered systems will tightly integrate the physical world with computing and communication systems. These cyber-physical systems (CPSs) will exceed present day systems in complexity, performance, and their level of autonomy, and they are widely anticipated to play a major role in future applications such as transportation, smart grid, or autonomous robotics. In CPSs, estimation and control is distributed among multiple agents that interconnect to form large-scale networks. Wireless communication will be a key enabling technology allowing the different control and sensing units to flexibly and easily exchange information with each other. Still, there is no satisfactory solution today for reliable real-time control over wireless networks.

In a recently established collaboration with Dr. Marco Zimmerling (TU Dresden, Networked Embedded Systems Group), we plan to integrate recent advances in wireless communication and networked control to develop a reliable and economic solution for distributed control over wireless networks. We aim at a tightly integrated system design, where the control system informs the communication system in real-time about its feedback requirements, allowing the wireless network to reconfigure, while still guaranteeing end-to-end real-time communication. The benefits of this design will be evaluated on a real-world CPS demonstrator involving multiple distributed processes being controlled over a multi-hop low-power wireless network.

We are looking for outstanding students who are eager to do their Master thesis on a challenging research project in the area of distributed wireless control. Given the broad scope of this research, the project can involve various aspects ranging from fundamental theoretical developments in the area of networked and distributed control, over extensive simulation studies, to applied work around developing a novel CPS demonstrator. The project can be adapted to the interest and background of the student.





MPI for Intelligent Systems, Autonomous Motion Dept. (`http://am.is.tuebingen.mpg.de`)

The project will be carried out at the Autonomous Motion Department (AMD) of the Max Planck Institute for Intelligent Systems (MPI-IS) located in Tübingen, Germany (near Stuttgart). The MPI-IS is a young, highly dynamic, and internationally oriented research institution with close ties to several national and international partners (e.g University of Stuttgart, ETH Zürich, University of Southern California). This project is open to students from any institution. Accommodation at the institute's guest house may be available for the duration of the project, and the AMD can support travel to international conferences if the project leads to such publications.

Prerequisites: High motivation and excellent theoretical and/or technical skills. Programming experience (C/C++, Matlab). Background in control.

Contact: Do not hesitate to contact us if you are interested in this project. When applying, please include your CV, grade transcript, and optionally other documents helpful to evaluate your background.

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