

Curriculum Vitae

CHRISTIAN KLAUER

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I am an engineer in automation and related fields with a multidisciplinary background in biomedical- and electrical engineering. After I finished my Ph.D., I stayed abroad as a Postdoctoral researcher at Politecnico di Milano. My focus is on control application and theory, robotics, and sensor fusion as well as the implementation and design of real-time capable algorithms.

You might find a summarizing overview of some of my past projects at www.christianklauer.com.

EDUCATION

- 2/2010 – 1/2018 Ph.D. in Neuroprosthetics and Control: *Feedback-Controlled Functional Electrical Stimulation to Restore Upper Extremity Functions* – magna cum laude, Control Systems Group (Prof. Dr. Ing.- Jörg Raisch), Technische Universität Berlin
- 21 contributions to international conferences; 8 journal articles [\[list\]](#)
 - Feedback control for neuroprosthetic devices (mostly motion control) to the restore motor functions in paralyzed people – e.g. supporting the arm elevation in persons who had a stroke
 - Strong focus on non-linear discrete-time control, cascaded control-schemes, non-linear optimization, and self-adapting systems
 - New methods for time-discretization and control of irregularly sampled systems
 - Biosignal processing (Electromyography)
 - Tests in healthy subjects and patients, cooperation with medical scientists
 - Design and main development (C, C++, Scilab) of OpenRTDynamics.github.io: An open-source framework for implementing real-time control systems on Linux (similar to Simulink); Implementation of a real-time capable interpreter (C, C++)
 - Responsible for the development (Python) of [PaPI](#): Visualization and user-control of real-time software; A generic GUI for Simulink and OpenRTDynamics.
- 26.2.2010 Diploma thesis on *Multivariable Control of a Neuro-Prosthesis for Generation of Upper-Limb Movements induced by Neuro-Muscular Electrical Stimulation (NMES)* – With distinction
- Motion feedback-control, sensor fusion of Inertial Measurement Units and an ultrasound marker tracking system
- 02/2009 Student project (pre-diploma thesis) on building a dynamic model for a distillation column (*Modellierung einer Destillationskolonne zur Auslegung von Regelungskonzepten*) in cooperation with BASF-AG, Ludwigshafen, Germany
- Dynamic systems, thermodynamics, simulation
- SINCE 10/2006 Focus on automation and control
- 11.10.2006 Intermediate diploma
- 10/2004 – 3/2010 Studies of electrical engineering, Technische Universität Berlin

PROFESSIONAL EXPERIENCE

- 2/2018 – 7/2018 Postdoctoral research fellow, Neuro-engineering and Robotics Laboratory (NearLab), Politecnico di Milano, Italy, funded by DAAD (German Academic Exchange Service)
- Investigation of control schemes for a neuroprosthesis for hand-function restoration
 - Discrete-time feedback-control, real-time signal-processing, Inertial Motion Units, tests in healthy subjects, statistical evaluation
 - The publication of the results is ongoing.
- 8/2017 – 1/2018 Finalization of the doctoral thesis
- 8/2014 – 7/2017 Research associate, Technische Universität Berlin
- Researcher involved in the research cluster www.BeMobil.net (**B**ewegungsfähigkeit und **M**obilität wiedererlangen) funded by BMBF (German Federal Ministry of Education and Research)
 - Feedback-control, digital signal processing for an arm elevation supporting neuroprosthesis
 - Design/implementation of a fully-automatic calibration procedure
 - A Graphical User Interface (html/node.js), three.js for 3d visualization
- 4/2014 – 7/2014 Embedded software development, HASOMED GmbH, Magdeburg, Germany
- STM32F4: Design/implementation of a Bluetooth-based communication protocol (C)
 - Transfer of an algorithm for gait-phase detection that uses Inertial Motion Units
- 5/2013 – 12/2013 Research associate, Technische Universität Berlin
- Contract research for Berlin Heart GmbH, Berlin, Germany
 - Sensor fusion for orientation estimation using a Kalman filter
 - Real-time classification
 - Statistical analysis of data obtained from experiments in test persons
- 4/2010 – 4/2013 Research associate, Technische Universität Berlin
- Researcher involved in the project www.MUNDUS-project.eu (**M**ultimodal Neuroprosthesis for **D**aily upper **L**imb **S**upport) funded by the European commission's 7th framework program.
 - Motion control design for Functional Electrical Stimulation (FES)
 - A kinematic model for an exoskeleton
 - Model-based sensor fusion and non-linear parameter optimization for motion estimation of an exoskeleton (Inertial Motion Units (IMU), angle-encoders, and Microsoft Kinect)
 - C/C++ (hardware drivers)
 - Main cooperation with TU-Wien – Politecnico di Milano – Fraunhofer IESE, Kaiserslautern, Germany – Hocoma AG, Volketswil, Switzerland
- 1/2008 – 3/2010 Student employee, Control Systems Group, TU-Berlin
- Control design for lab-demonstrations
 - Research on modeling of a process plant
 - Supervision of students

SKILLS

METHODS	<ul style="list-style-type: none">- Feedback-control: Discrete-time and non-linear control, theory and application, simulation of complex non-linear systems, dynamic systems, and system identification (e.g. using non-linear optimization)- Linear and non-linear optimization- Sensor fusion: Kalman filter for model-based fusion- Motion estimation using Inertial Measurement Units (IMU)- Digital signal processing- Design and review of real-time software systems- System integration- Mathematics: Linear algebra, Laplace- and Z-transform, Analysis
PROGRAMMING	Matlab/Simulink: Code generation, simulation, data-analysis C/C++: Implementation of software for real-time systems, hardware drivers Scilab: Control design, data-analysis Javascript/HTML/Node.js: GUI-development for real-time systems Python (basic knowledge) Java and ADA (during studies)
EMBEDDED SYSTEMS	ARM-based Linux e.g. Raspberry PI: I ² C, Linux-based real-time control STM32F4-microcontroller: C, Bluetooth Arduino, Android
SOFTWARE	Linux: General experience, BASH, Docker Version control: Git, Subversion Symbolic math: Maple, Maxima Text-processing: Latex, MS-Office
LANGUAGES	German (native), English (fluent)

AWARDS

25.10.2011	2 nd place <i>Robert-Wischer-Preis</i> awarded by the Foundation of Public Health, TU-Berlin (Stiftung Public Health)
30.10.2010	3 rd place best paper award, Conference AUTOMED 2010, Dresden, Germany
20.7.2003	Invitation to the Junior Water Prize awarded by Stockholm International Water Institute (SIWI), Stockholm, Sweden
25.5.2003	4 th place in the national competition of the German young scientists' award <i>Jugend Forscht</i> , category physics
26.5.2002	2 nd place in the national competition of <i>Jugend Forscht</i> , category physics