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Fundamental pedagogical view and resulting methods

"Thus he who has raised himself above the alms-basket, and, not content to live lazily on scraps of begged opinions, sets his own thoughts on work, to find and follow truth, will (whatever he lights on) not miss the hunter's satisfaction; every moment of his pursuit will reward his pains with some delight; and he will have reason to think his time not ill spent, even when he cannot much boast of any great acquisition."
1690, John Locke: "An Essay Concerning Humane Understanding"

Application-oriented, relevant knowledge with depth and precision. In my teaching activities, I try to impart my own high motivation and aim at stimulating and facilitating excellent young academics. From my point of view, teaching is a highly responsible task, since students are continuously transporting ideas from academia into the world and thus are life-long representatives of their universities. One key aspect of supporting them in this sense is to provide and train them with relevant methods and tools to prepare them for prospective workplaces. On the one hand, I aim at exposing students to industrial standards but also to de facto standard libraries in robotics research, e.g. ROS. On the other hand, this means to establish and maintain partnerships with manufacturers of typical engineering tools, e.g. Autodesk or MathWorks. Although sometimes proscribed in pure research, I appreciate applied examples and hands-on experiences as invaluable in teaching science and thus, I try to accompany lectures and tutorials with lab courses for programming, robot programming, simulation etc. Guided hands-on lab help to build up pools of students from various disciplines with the right set of skills to make relevant contributions to interdisciplinary research. Plus, hands-on experiences ignite the motivation and support the endurance to work on tenacious problems.

3D models, animations and simulations are one cornerstone of modern engineering and hence are directly available from ongoing projects and effective in teaching as well. I am thus enhancing conventional lecture materials (text books and slides) with videos and interactive examples. Supported by such "e-Learning" materials, students tend to get a better grip on complex facts and relations – especially in robotics, where animations and simulations in 3D help to build up sound mental models. Providing public access to high quality materials online also increases the visibility of the institution.

Teaching experience

2017-19, SDU: Kinematics
50-75 bachelor students per semester, 3h lecture + 1h tutorials per week
Responsible lecturer and tutor
Full course organization (content, schedule, materials, communication)
Oral exams and evaluation

2018-19, SDU: Automation
50-75 diplom students per semester, 3h lecture + 1h tutorials per week
Responsible lecturer and tutor
Full course organization (content, schedule, materials, communication)
Written exams and evaluation

2018-19, SDU: Semester project, 2nd semester
5 groups of 3-5 bachelor students, 1h meeting per week
Supervision, oral exams and evaluation

2017, SDU: Robotics and computer vision I
50-75 master students per semester, 3h lecture + 1h tutorials per week
Special lecturer on Inverse Kinematics and Motion Planning
Oral exam censor with Prof. Petersen

2006-16, RWTH: Robotics and Man-Machine Interaction I/II
80-100 master students per semester, 2h lecture + 1h tutorials per week
Supporting lecturer for Prof. Roßmann / responsible tutor
Course organization (schedule, materials, communication)
Written exam design and evaluation

2008-16, RWTH: Human Engineering in Robotics, Vehicle and Process Control
5-10 master students per year, 2d lecture + 1d tutorials
Supporting lecturer for Prof. Roßmann / responsible tutor
Course organization (schedule, materials, communication)
Oral exam censor with Prof. Roßmann

2006-07, RWTH: Seminar Virtual Human I/II
8-12 bachelor students per semester, 1h mentoring per week
Responsible mentor and organizer

2002-05, University of Dortmund, Fundamentals of Robotics I/II
25-50 students per semester, 2h lecture + 1h tutorials per week
Responsible lecturer and tutor
Course organization (schedule, materials, communication)
Oral exam censor with Prof. Freund

Additional pedagogical experiences

PhD evaluator
2020, JSI, T. Gaspar: “Technologies for fast reconfiguration of adaptive robotic workcells”
2018, SDU, L.C. Sørensen: “Data efficient action learning for optimizing execution of industrial assembly tasks”
2017, SDU, J.S. Laursen: “A software structure for control and monitoring of flexible automation”
2017, SDU, L. Kiforenko: “Exploiting higher order and multi-modal features for 3D object detection”
2016, SDU, T.N. Thulesen: “Dynamic simulation of manipulation & assembly actions”

2017-18, SDU: Supervision of degree theses
2018, BA, D.G. Søholm, C.O. Røn, J.N. Steen: “Digital Twins for industrial robots”
2018, BA, E. Seerup, C. Engelund: “Cube controller for human-robot collaboration”
2018, BA, N.L. Ottosen: “An educational robot, optimized for easy automated assembly”
2017, ISA, N.W. Leth: “Simulation-based design and planning of an automated production lab”

2012-16, RWTH: Supervision and mentoring of PhD students
5 PhD students, 1h mentoring per week
Concept development, scientific writing and academic mentoring

2006-16, RWTH: Supervision of degree theses
2016, MA, M. Hüpkes: “Dynamic simulation of ‘Peg in Hole’ processes in assembly”
2016, MA, S. Roggendorf: “Simulation-based planning of grasping processes for assembly robots”
2015, BA, D.P. Nowok: “Virtual Commissioning of assembly stations based on scripting languages”
2014, BA, F. Wolf: “Motion Capturing for the transfer of manual tasks to anthropomorphic multi agent systems”
2014, BA, M. Hüpkes: “Concept and implementation of new methods for robot motion design based on ‘DMPs’”
2014, BA, S. Roggendorf: “Concepts for multimodal interaction in 3D simulations”
2014, MA, T. Opitz: “New methods of '3D simulation-based control' based on the 'Robot Operating System (ROS)'”
2012, MA, R. Rolser: “Hardware-based analysis for process and path visualization of robot-guided laser brazing”
2012, MA, C. Klas: “Design of a controller for autonomous vehicle lateral guidance”
2012, BA, T. Menne: “Simulation and control of highly redundant combined kinematics”
2011, MA, M. Hennings: “Haptic feedback mechanisms supporting multimodal UIs of production systems”
2011, MA, C. Blömer: “Design and implementation of a multi agent control system for automated environments”
2010, MA, S. Haag: “Manipulation of virtual kinematics based on cooperative multi-robot systems”
2010, BA, C. Blömer: “Automated planning for multi agent systems based on general problem solvers”
2010, MA, P. Schmidt: “Methods for the easy setup of Fuzzy Controls for 3D simulation systems”
2009, BA, N. Wantia: “Design and implementation of an automated planning system with GNU Prolog”
2009, BA, S. Haag: “A class library for real-time capable and collision detecting controlling of delta-kinematics”
2009, MA, T. Höfer: “Comparison of advanced control methods applied to a multivariable system”
2008: MA, M. Thull: “Integration of external driver assistance system models into traffic simulations”
2008: MA, V. Darius: “A systematic approach to test and evaluate the performance of mobile robot agents”
2008, BA, P. Tietjen: “Development of a software tool for modeling the kinematics of manufacturing processes”
2008, BA, S. Engel: “Cognitive architectures for robot control - Exemplification with Soar”
2007, BA, D. Meike: “Recording of Motion Capture using COSIMIR 5”
2007, MA, J. Gaida: “Design and implementation of configurable motion planners to be used in multi agent systems”

2006-16, RWTH: Supervision and mentoring of student assistants
2-4 bachelor and master students per semester

2002-05, University of Dortmund: Supervision of degree theses and student assistants