MA Project

6SWS/ 9ECTS, Wed. 14:00– 18:30, Mode: Hybrid

Content:
The project of the Chair of Building Realization and Robotics deals with the development and implementation of solution approaches in the fields of construction robotics and ambient assisted living and their combination.

Objective/learning outcome:
Research, design, develop: structure, coordinate and reflect on the complex design-engineering processes according to the chosen topic.

Learning Method: The processing of the task is largely self-study and students work together in an interdisciplinary group. In the project-related seminar, fundamentals will be imparted, which are in the context of the project and relevant to conduct the task. The obtained knowledge should be further studied through independent research of literature review and further material, so that the students gain a scientific foundation for their designs and concepts.

Images: Project workshops

Robot Oriented Design (ROD)

2SWS/ 3ECTS, Thurs. 13:15– 14:45, Mode: Online

Content:
- History of development and standardization of automation systems;
- Robotics und automation systems in construction;
- Automation and robot-oriented design of building systems and subsystems, compliant design;
- Design for assembly, design for logistics;
- Life cycle management;
- Technology oriented design appropriate for dynamic integration of technologies into built environment.

Objective/learning outcome:

After participating in the course, the students are able to understand the complementary interrelation between design, assembly methods, and life cycle product dynamics. Furthermore, the students understand the significance of an anticipating design approach, looking ahead to upcoming technologies.

Learning Method: Case studies are discussed and worked upon together with the students in order to discover correlations as well as possibilities

Images: Demonstrator of a façade processing robot developed by the Chair for the Construction Industry Council in Hong Kong.

Design of Robots in Architectural Context (DoRiAC)

2SWS/ 3ECTS, Mond. 08:00– 09:30, Mode: Online

Content:

- Automation Oriented Planning (Processes, Manufacturing);
- Historical development, standardization, and automation systems;
- Current and future automation systems in construction;
- Automation oriented planning and construction systems, compliant design, economization-oriented planning, prefabrication-oriented planning;
- Robot and assembly-oriented planning, logistics-oriented planning.

Objective/learning outcome:

After participating in the course, the students are able to understand the complementary interrelation between design, assembly methods, and life cycle product dynamics. Furthermore, the students understand the significance of an anticipating design approach, looking ahead to upcoming technologies.

Learning Method: Case studies are discussed and worked upon together with the students in order to discover correlations as well as possibilities. Generally, the issues are discussed in a problem-oriented manner.

Image: Cable-driven robot and robotic end-effector for the renovation of existing facades. Developed by the Chair in collaboration with other partners in the H2020 project Hephaestus.

Automation & Robotics in Construction (ARC)

4SWS/ 6ECTS, Thurs. 9:45 – 12:45, Mode: Online

Content:
- Construction automation and robotics systems;
- Automated sites, systems and typologies;
- Industrialized manufacturing for production;
- Automated deconstruction, urban mining, and recycling;
- Flexible manufacturing systems;
- Industrial construction logistics land, sea, air.

Objective/learning outcome:
By the end of this course, the students should be able to understand apply design, production and logistics methods in the area of wood/concrete, steel, brickwork components, distinguish between different types of prefabrication and judge automation strategy and automation degree. Additionally understand the working mechanisms of integrated automated construction sites and apply them in further projects

Image: Automated and Customized Production of Prefabricated Buildings and Modular Integrated Construction, Sekisui House, Japan.

Learning Method: Lecture with seminar work

Incubator (Inc)

4SWS/ 6ECTS, Wed. 14:00– 17:00, Mode: Online

Content:
The Incubator module focuses on the implementation of own ideas / concepts to functional models / demonstrators / test set-ups.

Objective/learning outcome:
After participating in the module, the students are able to:

- identify the requirements / goals, and draft their own ideas / concepts based on a given task,

- recognize and understand the necessary steps to build a functional model / test set-up / demonstrator, which are related to the implementation of their own ideas / concepts.

Learning Method: At the beginning of the semester, an appropriate task is introduced and all necessary requirements to conduct the task as well as to complete the module exam are defined. Afterwards, it is expected that the students develop their own solutions and concepts for the realization of the task.

F H Moreno, S Lemieux-Montminy
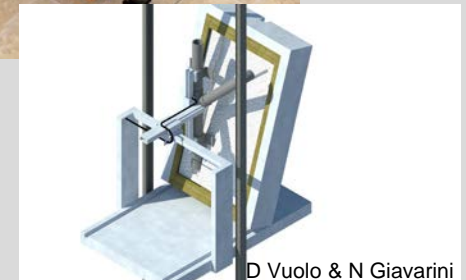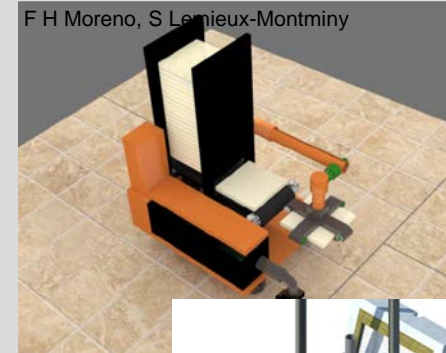
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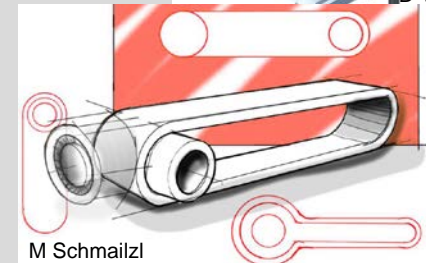
M Schmailzl

Images: Designs, models and demonstrators developed by previous students

Building System Performance
(BSP, Technology for an Aging Society)

*4SWS/ 6ECTS, Thurs. 15:00– 18:00, Mode: Online*

Content:

- Overview AAL-Application scenarios and AAL-
  Products/Assist systems;
- Age related diseases, cardiovascular problems and
  lifestyle diseases of industrial nations;
- Individual life style/individual domestic care, high-tech
  assist systems: Ambient Assisted Living (AAL);
- Customization/personalization of assistive living space.

Objective/learning outcome:

By the end of this course, the students understand the multidisciplinary and interdisciplinary value-added network, which is necessary to implement high-tech assistance systems in the living environment. Furthermore, the students will be able to develop own application and assistance concepts for the home environment.

Learning Method: Lecture with exercises
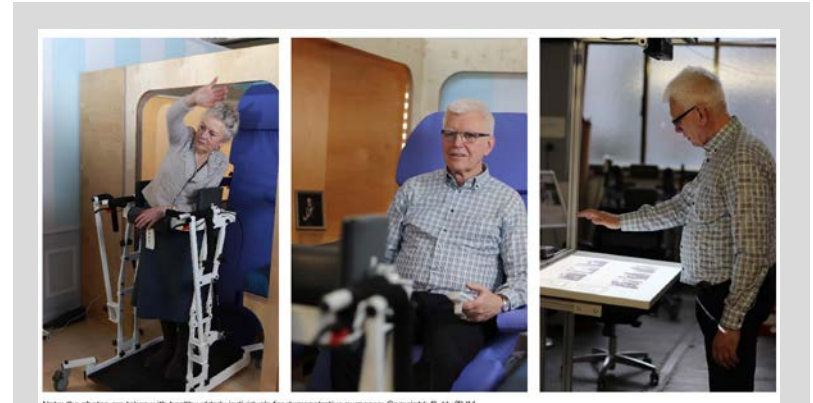
Note: the photos are taken with healthy elderly individuals for demonstrative purposes; Copyright: R. Hu/TUM

Images: Top: prototypes developed in the H2020 project REACH; bottom: prototypes developed in the BMBF project USA²

Microsystems for Assisted Living (MAL)

***4SWS/ 6ECTS, Mond. 13:15-16:30, Mode: Hybrid***

Content:

- Applications of Microcomputers in Assisted Living;
- Introduction to Microcontrollers & Single-Board Computers;
- Fundamentals of Digital Logic and Electronics;
- Software development for Single-Board Computers;
- Sensors Integration e.g. for Vital Data Measurement;
- Interfacing and Communication protocols.

Objective/learning outcome:

By the end of this course, the students should be able to understand and use development skills for sensors prototyping, sensor data acquisition, communication over serial/parallel/wireless interfaces. The students get to know the specifications, functionality and potential of modern Single-board computer. Furthermore, the students can apply acquired skills to develop/design embedded systems in Assisted Living applications.

Learning Method: Seminar/Lecture with exercises, Practical systems Implementation in Laboratory.
Basic prior knowledge of programming is appreciated.
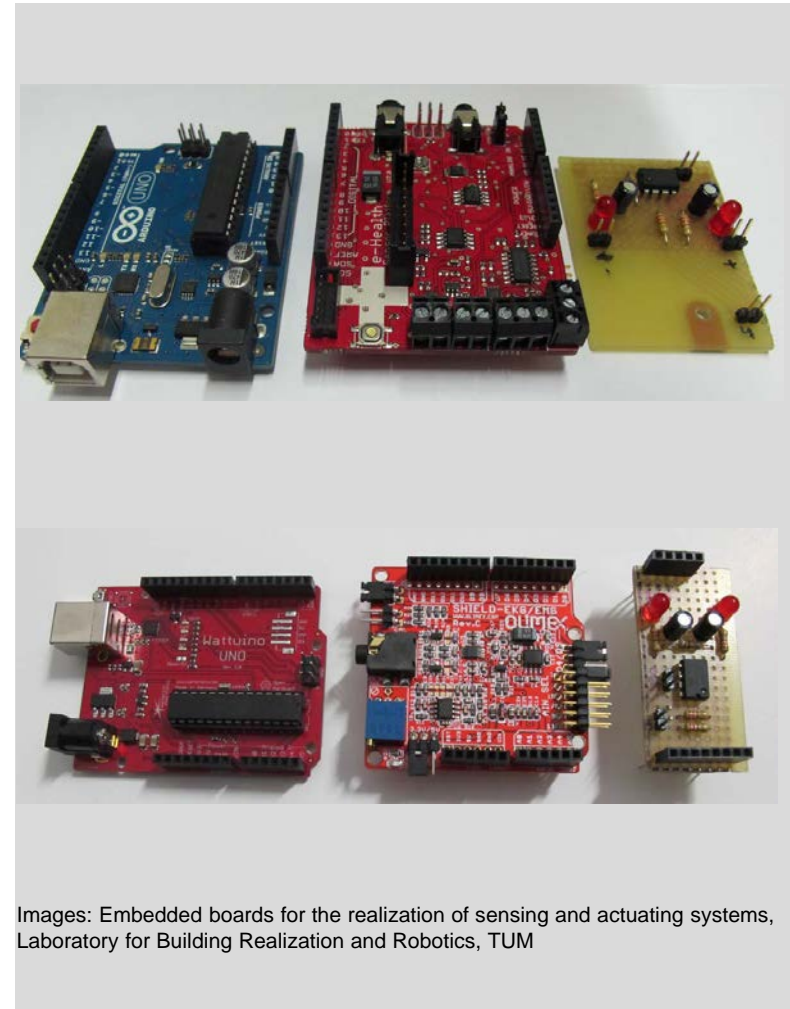
Images: Embedded boards for the realization of sensing and actuating systems, Laboratory for Building Realization and Robotics, TUM

Lectures/Courses WS 2020/21

1. <u>MA Project</u>
   Thomas Linner, Thomas Bock; Start: 04.11.2020, Wednesdays: 14.00 – 18.30, Mode: Hybrid

2. <u>Robot Oriented Design (ROD):</u>
   Thomas Linner, Thomas Bock; Start: 05.11.2020, Thursdays: 13.15 – 14.45, Mode: Online

3. <u>Design of Robots in an Architectural Context (DoRiAC)</u>
   Kepa Iturralde, Thomas Bock; Start: 02.11.2020, Mondays: 08.00 – 09.30, Mode: Online

4. <u>Automation & Robotics in Construction (ARC):</u>
   Wen Pan, Kepa Iturralde, Thomas Bock; Start: 05.11.2020, Thursdays: 09.45 – 12.45, Mode: Online

5. <u>Incubator (Inc)</u>
   Thomas Linner, Jörg Güttler, Thomas Bock; Start: 04.11.2020, Wednesdays: 14.00 – 17.00, Mode: Online

6. <u>Building System Performance (BSP, Technology for an Aging Society):</u>
   Jörg Güttler, Thomas Bock; Start: 05.11.2020, Thursdays: 15.00 – 18.00, Mode: Online

7. <u>Microsystems for Assisted Living (MAL):</u>
   Jörg Güttler, Thomas Bock; Start: 02.11.2020, Mondays: 13:15 – 16.30, Mode: Hybrid