

Prof. Dr.-Ing. Klemens Gintner  
Faculty of Mechanical Engineering and Mechatronics (MMT)  
University of Applied Sciences  
Moltkestr. 30  
76133 Karlsruhe, GERMANY  
Tel. ++49-721-925-1744  
[klemens.gintner@h-ka.de](mailto:klemens.gintner@h-ka.de)

### **Projects at UAS Karlsruhe in summer 2022:**

Students of the UAS-Karlsruhe are currently working on all the topics mentioned below, so that a cooperation with students of the Cooper Union would be possible. However, an exact description of the tasks is difficult, because at the moment we do not know exactly what will be needed next summer; the summer semester starts in the middle of March. Interested students are kindly asked to contact the respective colleagues directly. Thank you in advance!

### **Project - supervised by Prof. Fahmi Bellalouna ([fahmi.bellalouna@h-ka.de](mailto:fahmi.bellalouna@h-ka.de) )**

#### **Student Projects in the area of Virtual und Augmented Reality (VR/AR)**

##### **Motivation**

Virtual and Augmented Reality Technology (VR/AR) is one of the key technologies in digitization. Through the rapid development of display hardware, new interaction devices and tracking systems, innovative applications are being developed today that were simply unimaginable until now. The VR/AR technologies can be used to represent complex functionalities of a technical system by showing additional digital data, for example in sales or maintenance in tangible and understandable way. As part of various student projects, concrete VR and AR applications will be implemented to show the potential and benefits of VR/AR technology for the process digitization.

##### **Tasks:**

As part of several student projects, AR and VR applications for different technical systems will be developed. The VR and AR applications can be used for the following purposes:

- Presentation of 3D data on physical technical systems.
- Handling functions of the displayed 3D data (generation of sections, Visibilities).
- Presentation of technical data on the physical technical systems (part number, material, Function, etc.).
- Presentation of the assembly and disassembly sequence of the technical systems.
- Representation of system functions (e.g. through animations).
- Training applications (manufacturing, assembly, maintenance processes, security) for complex technical Systems.
- Planning activities (factory and plant planning).

##### **Requirements:**

- Interest in interdisciplinary problems and tasks (mechanical engineering, technical IT, VR, AR,
- CAD, ...).
- Interest in new VR and AR topics and applications (e.g. the game engine: Unity3D, Blender,
- Cinema4D. ...).

##### **Contact:**

Prof. Dr.-Ing. Fahmi Bellalouna, Email: [fahmi.bellalouna@h-ka.de](mailto:fahmi.bellalouna@h-ka.de)  
Further details: [https://www.youtube.com/watch?v=r0\\_UPntn0Ms](https://www.youtube.com/watch?v=r0_UPntn0Ms)

**Projects - supervised by Prof. Maurice Kettner at UAS Karlsruhe ([Maurice.kettner@h-ka.de](mailto:Maurice.kettner@h-ka.de)):**

**International Students Projects on Cyber-Physical Systems to Remote-Control Lab Equipment between different Countries via the Internet.**

The students in different countries develop a cyber-physical “driver robot”, that is able to drive a car on a chassis dyno. HMI and the robot are connected via the Internet, so that the operator (test engineer) is able to run the driving tests from abroad. The long term target is the development of a universal driving robot, which is able to operate the accelerator pedal, the clutch pedal and the manual gear box, so it will be possible to run individual or official driving cycles. The implementation of different maneuvers like start-up and gear change will be necessary, further the influence of latencies in the internet connection need to be taken into account.

Project work: Hardware, Software, Actuators, Sensors, Cloud-Servers, Internet protocols, control engineering, Automotive Engineering, Design Engineering, ...

The development of the robot is already in progress in collaboration between HKA and Universiti Malaysia Pahang [https://www.ump.edu.my/en](https://www ump.edu.my/en)

**Projects - supervised by Prof. Jens Denecke ([jens.denecke@h-ka.de](mailto:jens.denecke@h-ka.de))**

**Workflow for the Evaluation of Safety Scenarios using the Fire Dynamics Simulator**

In a hazard analysis the consequence of leakages has to be evaluated. Typical scenarios could be that  
**a)** a Hydrogen supply to a cogeneration engine fails and the explosion hazard in a laboratory hall and the optimal placement of gas sensors is to be evaluated.

**b)** the safety valve of a Propane cooling unit activates and the resulting cloud is ignited. The atmospheric wind boundary layer dilutes the Propane cloud. The cloud mass within the lower and upper explosion limit of the resulting gas cloud, possibly pressure waves and radiation are to be evaluated.

As a result of the project variants of software toolchain for the Fire Dynamics Simulator (FDS)

<https://pages.nist.gov/fds-smv/>

from geometry generation, grid generation, and result analysis are to be tested and evaluated.

Validation and verification test cases using the selected toolchain will document the reliability of the results. Scripts for typical result analysis requirements are to be developed.

**Projects - supervised by Prof. Klemens Gintner ([klemens.gintner@h-ka.de](mailto:klemens.gintner@h-ka.de))**

**Sensors for different applications like energy efficient sensor systems**

A) "**Artificial Sensor Egg**" for the evaluation of the breeding process of birds in eggs (sensors, microcontrollers, Blue Tooth Low Energy, ...) in cooperation with the Zoo in Karlsruhe; the project work can be about electronics and/or mechanical issues (design of sensor eggs with at least two printed circuit boards)

B) **Sensors for measuring the properties of snow** (sensors for temperature, humidity, hardness, ...) in cooperation with the Karlsruhe Institute of Technology (KIT) - electronics and mechanics; The idea is to determine the snow characteristics in order to prepare the ski surface optimally – waxing the skis

C) "**Intelligent toys**" for animals at the zoo: In cooperation with the zoo in Karlsruhe, toys for animals are to be developed that stimulate the animals mentally and serve as a distraction. Application e.g. for polar bears, carnivores, mammals ...

D) **Energy efficient sensors for intelligent room monitoring** (temperature, air pressure, air quality, humidity, ...)