Multifunctional CAVE Concept for engineering education in the XR Lab @ University of Applied Sciences, Iserlohn

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We give impulses

Fachhochschule Südwestfalen
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Agenda

- CAVE Conception
- CAVE Applications
- Resonance within the University
- Looking Ahead

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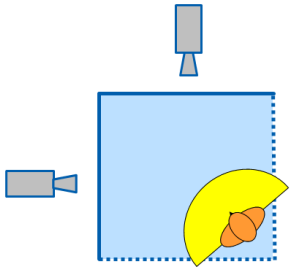
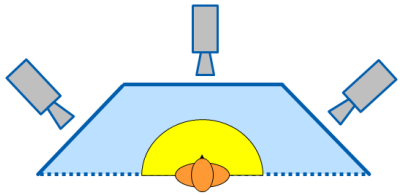
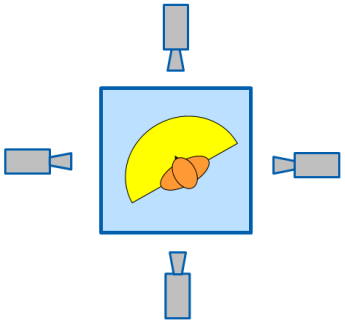
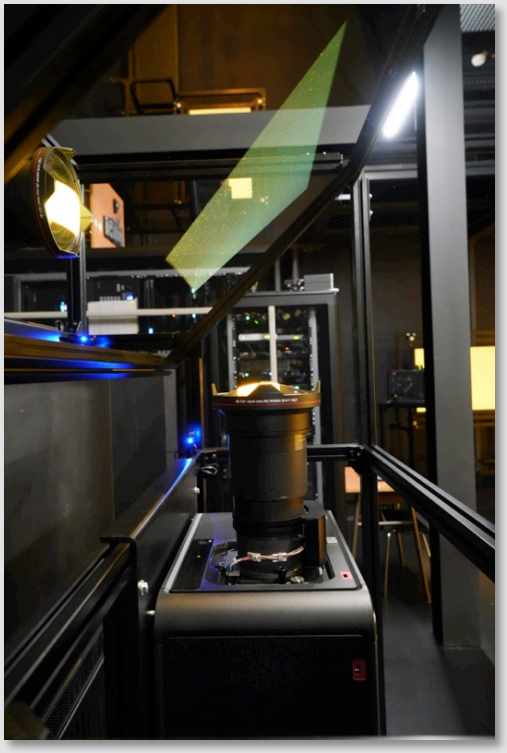
CAVE Concept, CAVE Setup

	3-sided CAVE	4-sided CAVE	5-sided CAVE
Configuration			
Level of Immersion	o	+	+ +
Group Suitability	o	+ +	o
Multifunction-ality	-	+	-
++ very good + good o average - bad			



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CAVE Concept, Presentation Scenarios

CAVE Presentation Capability with separate Lecture Hall

- Combination of lecture hall with 2D-presentations & 3D-CAVE operation during the same lesson
- Three projection screens for up to three different parallel projections
- Spontaneous switching between 2D- and 3D-applications
- Video conferences possible at any time

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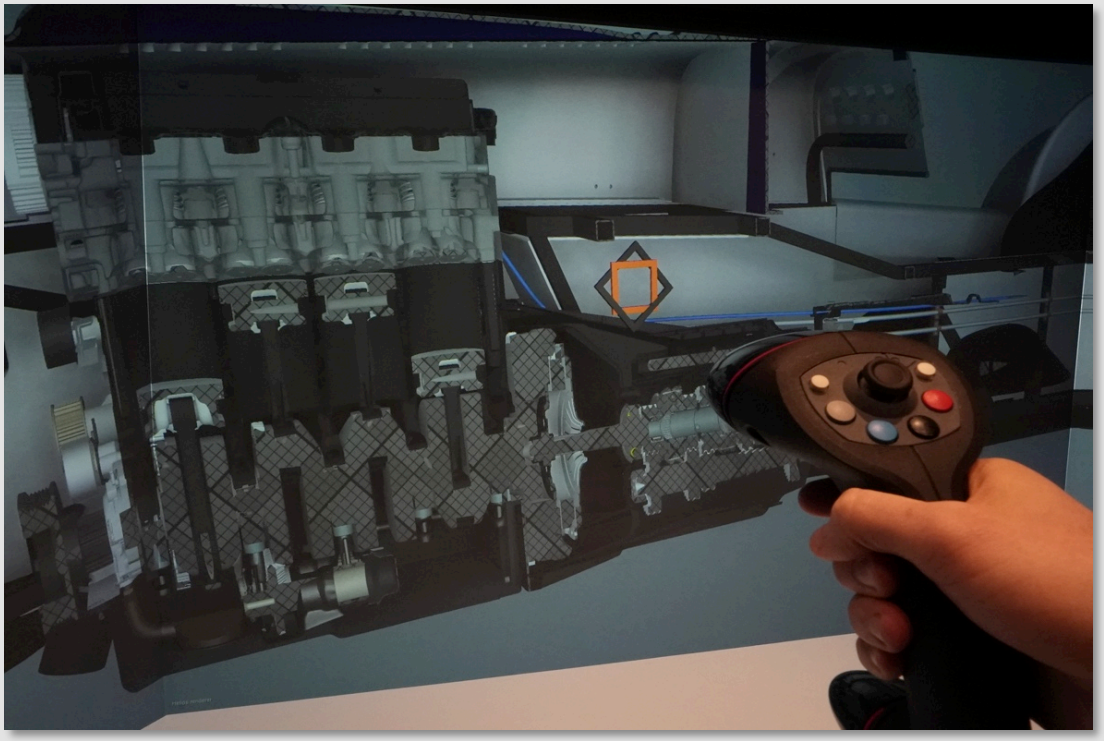
CAVE Concept, Presentation Scenarios

Virtual Model Experience

- Up to 10 people can experience virtual models simultaneously
- Shutter glasses for 3D visualization
- View of the model controlled by a person with a controller
- Data exchange between HMDs and the CAVE is possible
- 3-sided VR with an additional projection area for presentations



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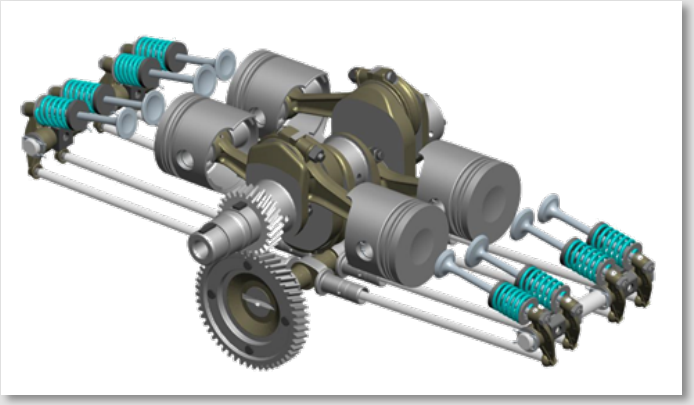
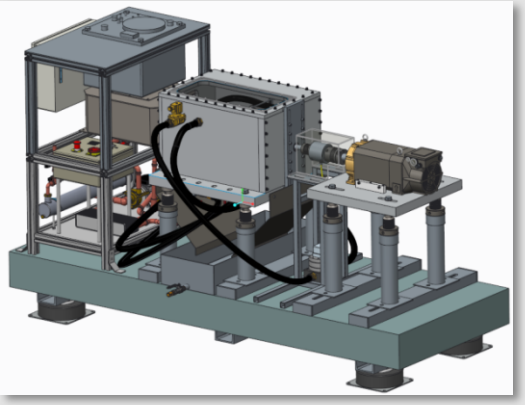
CAVE Application Examples in various Technical Lessons

Automobile Structure / Car Body



Internal Combustion Engines



Tribology

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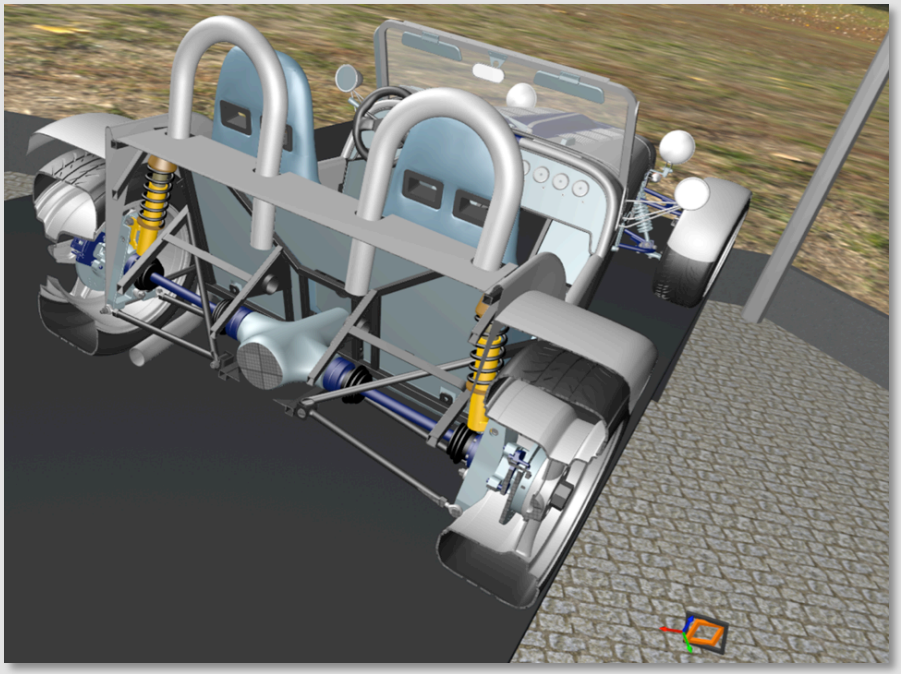
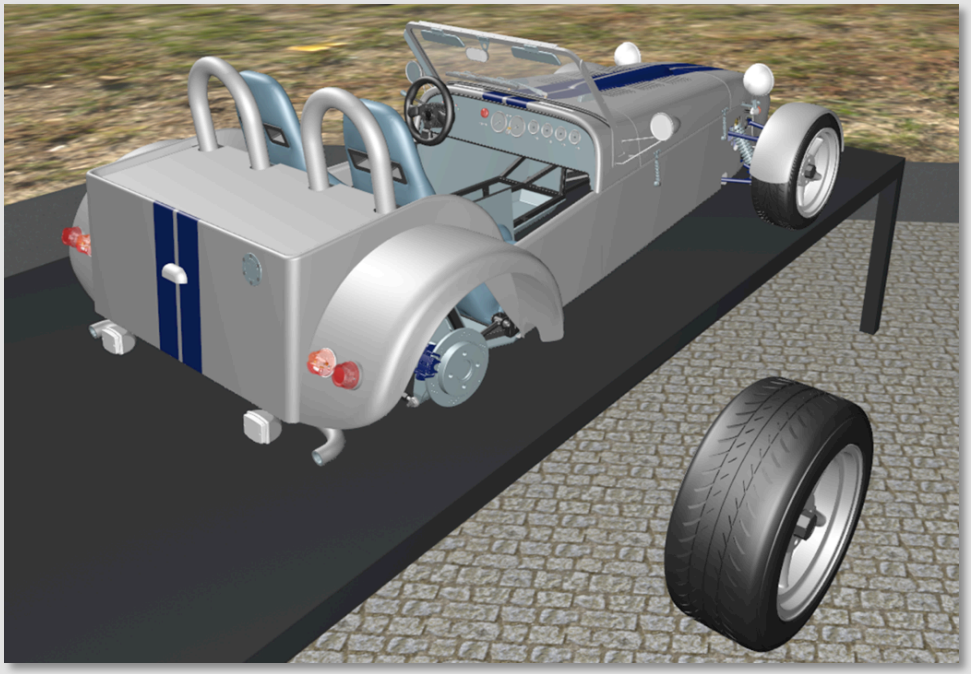
CAVE Applications in various Technical Lessons



Creation of dynamic Component Cross-Sections



Disassembling Components

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Resonance within the University

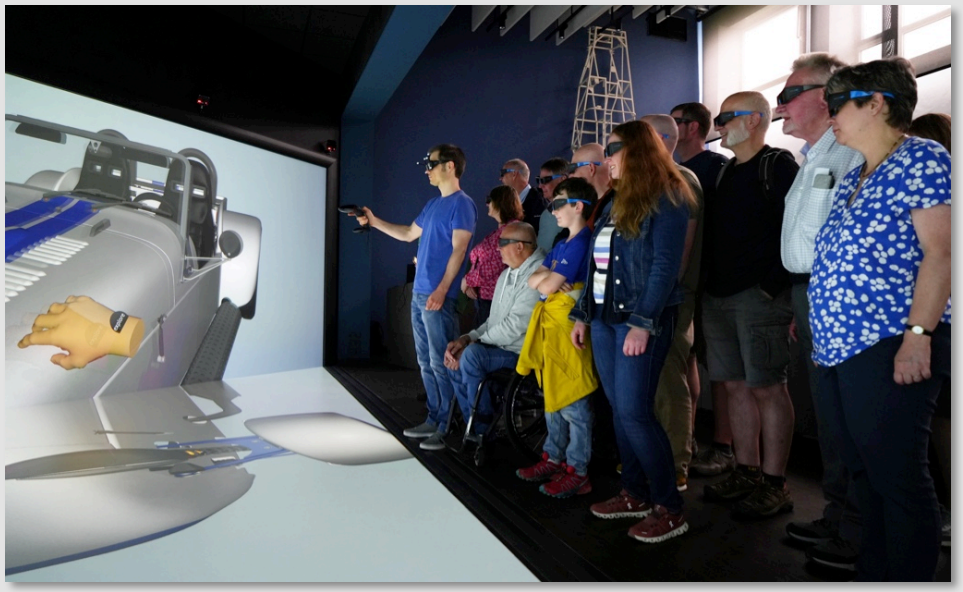
Previous Events in the XR Lab

- Over 100 events were already held in the XR Lab during the first year.

Diverse User Groups

Participants come from a variety of sectors:

- Lecturers and Students
- University Administration
- Business and Industry
- Associations
- Politics and Public Administration
- Schools



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Resonance within the University

Advantages of the XR Lab:

- **Promotion of Technical Understanding**
  The 3D visualization of complex products enhances students' technical comprehension.

- **Efficient Knowledge Transfer**
  As multiple people can experience a virtual model simultaneously in the CAVE, learning content can be conveyed more quickly and effectively.

- **Reduction of "Motion Sickness"**
  Compared to Head-Mounted Displays (HMD), CAVE technology helps minimize motion sickness.

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Resonance within the University

Advantages of the XR Lab:

- **User-Friendly Operation**
  The intuitive interface allows visitors to quickly and independently run presentations.

- **Hybrid Learning**
  The setup enables the delivery of hybrid courses across multiple locations, e.g., via Microsoft Teams or Zoom.

- **Inspiring Interest in Technology**
  Virtual methods spark the interest of prospective students in technical subjects.

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Resonance within the University

Disadvantages of the XR Lab:

- **Required Expertise**
  Full utilization of all features requires support from a trained staff member.

- **Technical Challenges**
  During operation, occasional technical issues may arise that can only be resolved by the lab technician.

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Looking Ahead

Future Perspectives of the XR Lab

- **Expansion of Educational Content**
  Additional 3D models will be developed to establish Virtual Reality as a standard tool in education.

- **VR Collaborations**
  Collaboration with other universities will be intensified to further advance VR applications.

- **Research at the XR Lab**
  In the coming years, new research topics related to XR technologies and applications will be explored at the XR Lab.

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Looking Ahead

Future Perspectives of the XR Lab

- **Expanded Applications of the CAVE**
  The CAVE can be used for applications in architecture (e.g., virtual walkthroughs of buildings) and in medicine.

- **Space for Businesses**
  The XR Lab provides a space for companies to develop or present products.

- …

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Summary

Lessons learned

- The CAVE applications are mainly of mechanical engineering purpose
- Up to 10 people can be trained simultaneously and effectively on complex 3D geometries
- Between the various presentation modes and the CAVE operation used in the XR Lab can be switched at any time. This multifunctional concept allows a very cost-effective engineering education.

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Exchange of Experience after one year CAVE Applications

Thank you for your Attention

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