

Haptic Methods and Technologies for Virtual Assembly Simulations

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Example: Modern Car Assembly Lines



From the Idea to the Product

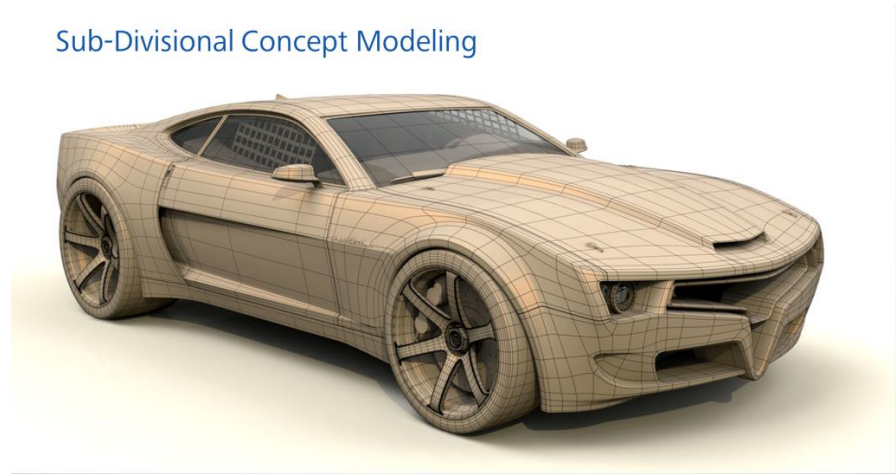
Concept Sketch



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Sub-Divisional Concept Modeling



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Clay



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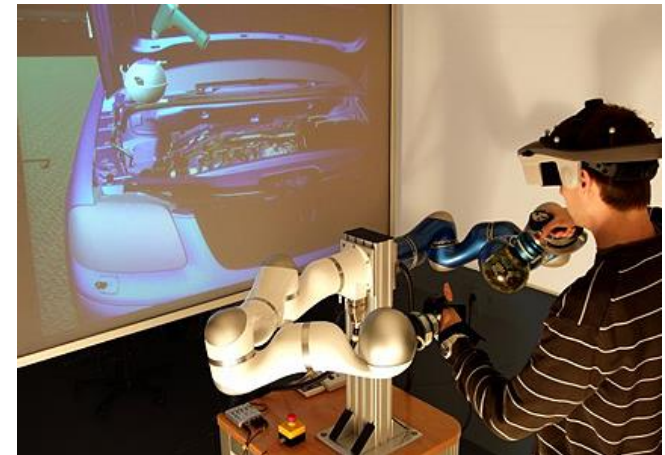
Virtual Assembly Simulation

- Idea:
 - Re-use CAD models from the design process for assembly planning
- Questions in assembly planning:
 - Can it be assembled?
 - Can it be serviced/maintained?
 - What is the physical stress on the worker?
- Challenges:
 - Involvement of humans
 - Real-time simulation/VR technology
- Advantages
 - Saves time and cost

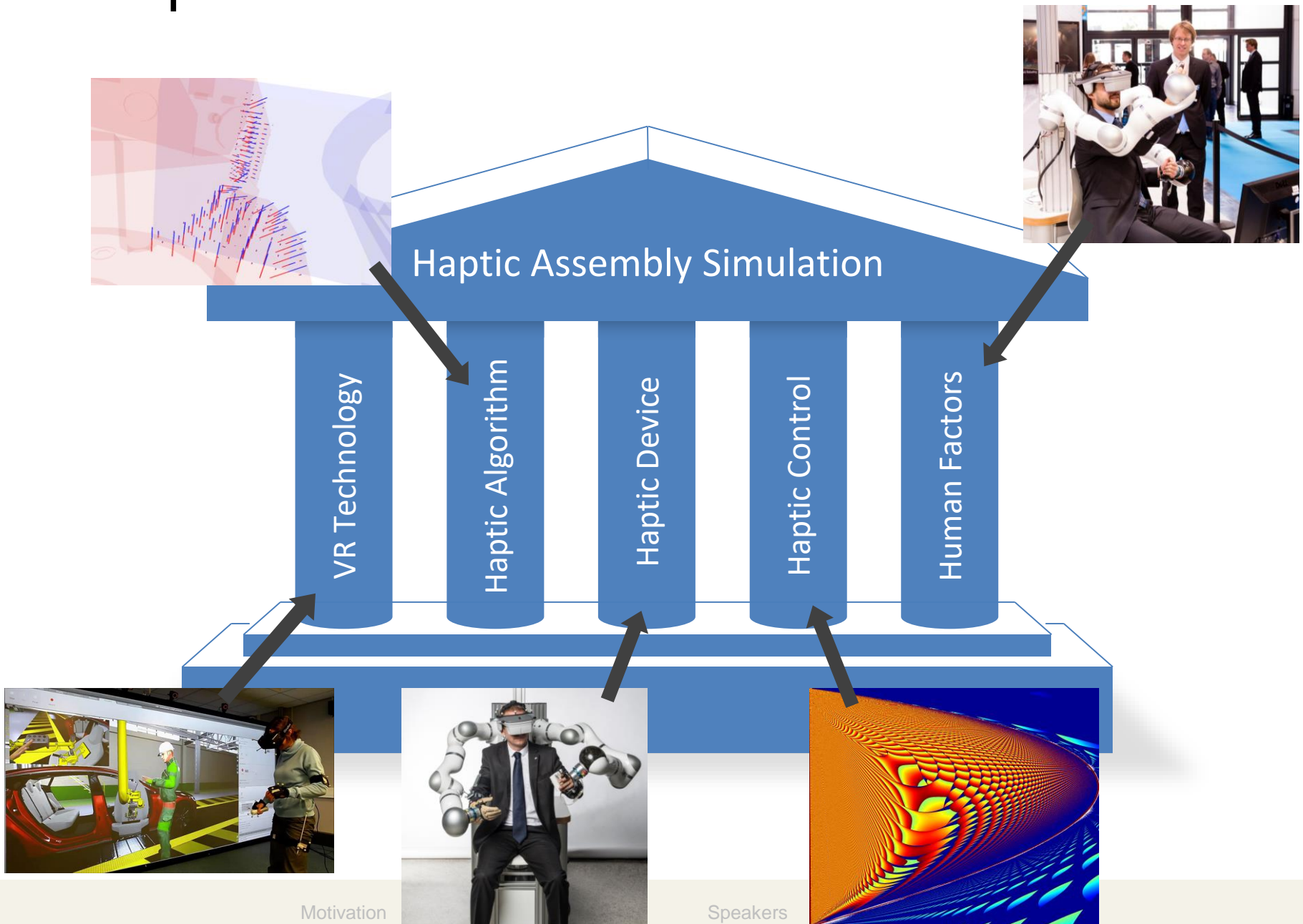


Advantages of Haptics

- Improved immersion and realism
- Overcome problem of poorly visible parts or completely occluded objects
- Faster and more reliable decisions
- Less workload
- Simultaneously training of mechanics



Topics

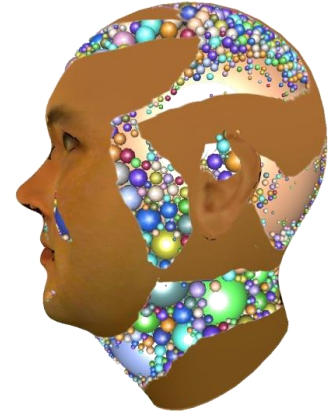


Dr. Ralf Rabätje

- PhD thesis about VR based assembly simulation at the University of Hannover
- 2006-2011: leader of the research team in Volkswagen Group Research, which was dedicated to VR and AR.
- 2011-2014: managing director at ART
- 2014-2016: leader of a VR/AR development team at Dassault Group
- 2016: he founded vr-on GmbH together with Mathias Wochmig where he acts as a CTO



Dr. René Weller



- Received his PhD 2012 from the University of Bremen
 - Awarded with the Eurohaptics PhD award
- 12 years of experience in research projects, including AVILUS
- Published numerous papers at international conferences and journals such as SIGGRAPH Asia and Eurographics
- Research interests: collision detection, haptic rendering, natural interaction in VR and sphere packings.

Dr. Jérôme Perret

- Holds a PhD degree in Robotics and Artificial Intelligence
- He co-founded the company Haption SA in 2001
 - Created the German subsidiary Haption GmbH in 2013
- He is an active Executive Committee member of the EuroVR association and of the EuroHaptics Society.



Dr. Thomas Hulin

- Received his PhD from the Leibniz University Hannover
- Works at the Institute of Robotics and Mechatronics, German Aerospace Center (DLR), since 2003
- He was involved in the development of
 - the vibrotactile device VibroTac
 - the bimanual haptic device HUG
- He co-authored more than 40 papers and is a recipient of several innovation, technology transfer, and conference awards.
- Research interests: control, devices and algorithms for haptic rendering, physical human-robot interaction, and virtual reality applications



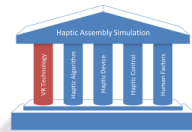
Dr. Bernhard Weber

- He received his PhD degree from the University of Würzburg in 2008.
- He joined the Human Factors Department of the Institute of Flight Guidance of the DLR in 2008
- Since 2010, he works as the human factors expert at the Institute of Robotics and Mechatronics of the DLR
- His main research interests are human-robot-interaction and evaluation of human-machine-interfaces for surgical, space robotic and virtual reality applications.
- Since 2016, he is leading the project “Kontur-2” investigating force feedback teleoperation from the International Space Station (ISS).



Schedule

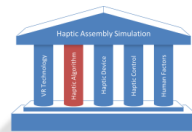
9:30 – 10:00



Ralf Rabätje, CTO of vr-on GmbH

Title: New Challenges in VR using Game Engines?

10:00 – 10:30



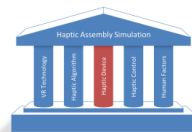
René Weller, University of Bremen

Title: Continuous Volumetric Collision Detection and Response for Haptic Rendering

11:00 – 11:30

Coffee Break

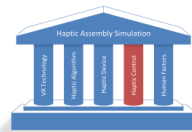
11:00 – 11:30



Jérôme Perret, CEO of Haption S.A.

Title: Haptic virtual assembly testing: what are the requirements for the physics engine?

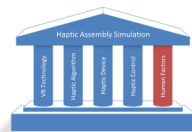
11:30 – 12:00



Thomas Hulin, DLR

Title: Control in Haptics: Towards Optimal Haptic Feedback

12:00 – 12:30



Bernhard Weber, DLR

Title: Force feedback in virtual assembly scenarios: A human factors evaluation