



Industrial applications of haptic devices

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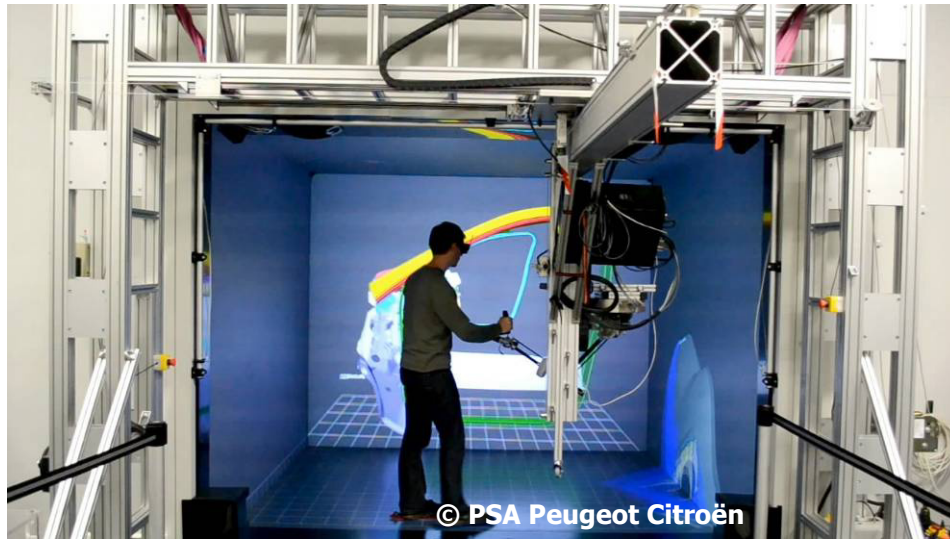




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HAPTION Company Profile

- Core business
Interactive solutions based on 6D Haptic/Force-Feedback
- Located in Laval, Frankreich
Home to the "Laval Virtual" tradeshow and the VRIC Conference
- Spin-off of CEA LIST (Research Center for Atomic Energy)
- Dassault Systemes CAAV5 partner since 2004

- Founded 2001
- Employees: 12
- Turnover 2011: 1,165 M€
- Resellers in
 - France, Germany, Russia
 - USA, Canada, Brazil
 - China, Japan, South Korea
 - Australia, Singapore



■ Industry

- France: Renault, PSA Peugeot Citroën, Airbus, Dassault Aviation, EADS, AREVA
- Europa: BMW, Airbus Deutschland, Volkswagen Nutzfahrzeuge, Daimler, Airbus UK (UK), Thales Alenia Space (IT)
- USA: Lockheed Martin, Boeing, Sikorsky, NASA Marshall, United Space Alliance
- Asia: Toyota (Japan & Australia), AVIC (China), Mitsubishi Motors (Japan), ADD (South Korea), Chengdu Aircraft Design Institute 611 (China)

■ Academic

- France: CNRS/LIMSI, INRIA/IRISA, ISIR, CEA LIST, ENIT, ENISE, INP Grenoble
- Europa: Uni Karlsruhe, Uni Hannover, IIT (IT), Politecnico di Milano (IT), ITER-NL (NL)
- USA: Iowa State University
- Asia: Univ Beihang (China), Univ Shanghai (China), Univ Deakin (Australia), DMI (South Korea)





HAPTION – Retrospec



2001

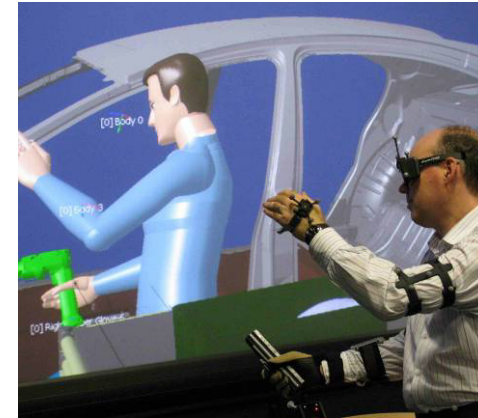
2002

2003





HAPTION – Retrospec



2006

2007

2008

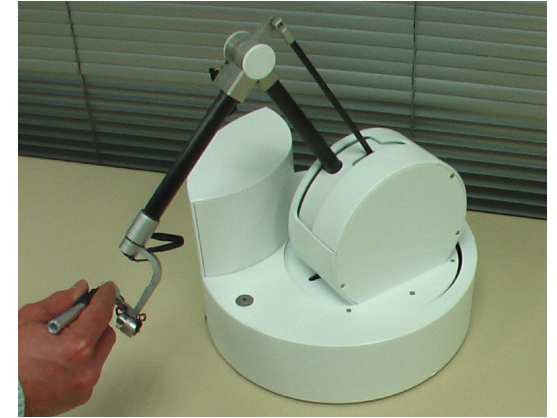
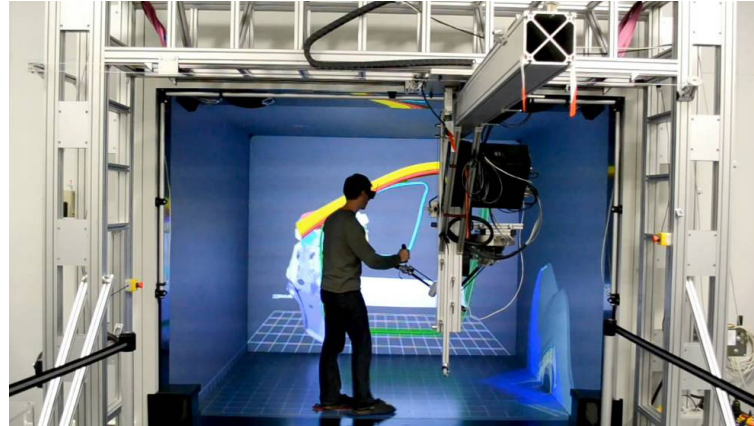


TOYOTA





HAPTION – Retrospec



2010

2011

2012



DAIMLER





Today's products



Virtuose 6DDesktop



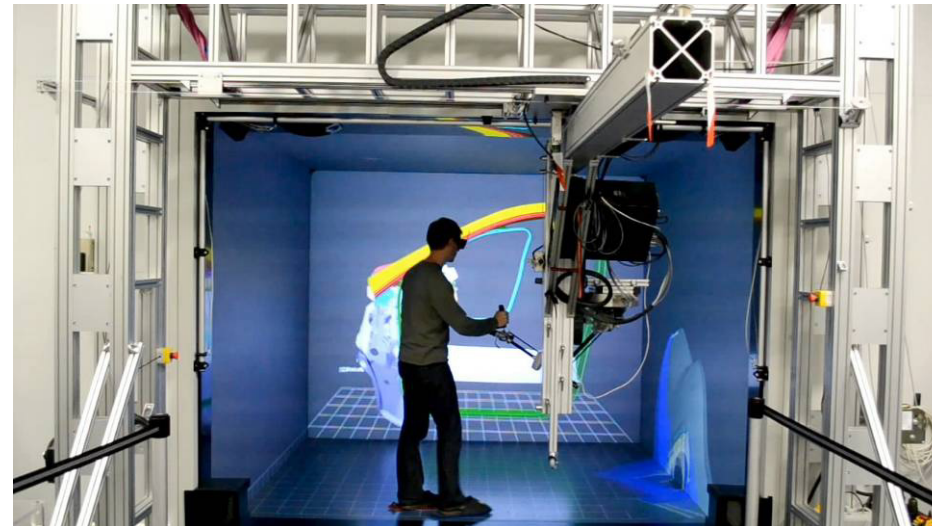
Virtuose 6D



Inca 6D



Virtuose 3DDesktop



Scale1



MAT 6D



Our strengths

- 6D-haptic technology fit for professional use
- Product-oriented and independent
- More than 8 years experience in the industry
- Over 60 products Virtuose 6D sold worldwide

Our objectives

- New applications (robotics, medical, ergonomics, training)
- Promote haptics to a “must-have” of Virtual Reality systems



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Application domains (covered by Haption)

- Teleoperation
- Assembly simulation
- Ergonomic analysis





Teleoperation



Reference customers

- AREVA (fuel reprocessing, dismantling)
- CEA (dismantling)
- ITER (remote handling for construction and maintenance)



Video: Evolution at AREVA La Hague, from mechanical devices MT200 to telerobotic systems

Drives (with respect to mechanical devices)

- Less friction, more transparency
- Better control of forces at the slave robot
- Shared control (e.g. virtual guides, weight compensation)
- Larger distance from radiation zone
- Better work position
- Reduction of maintenance costs





Barriers

- High costs for the upgrade of existing devices (e.g. AREVA La Hague: 500 mechanical devices MT200)
- Training of operators necessary
- No standard for the master/slave interface
- Problem: who's responsible when an incident occurs?
 - Supplier of haptic device
 - Supplier of slave robot
 - Facility management
 - End-user



Perspectives

- Change of generation of operators: younger personnel does not want to work with high forces, and is open to new technology
- Standard: Working Group on ISO 17874 “Remote handling devices for radioactive materials”
 - Members: CEA, La Calhène, Wälischmiller, Areva, AEA, ITER, Oxford Technologies, Haption, Stäubli, ...
 - Objective: Propose a standard for telerobotic systems
 - Problem: several members do not want to standardize the communication protocols, because they supply integrated systems!
- Large projects are coming closer: ITER, dismantling of research reactors, etc.



Market

- Small number of customers (e.g. 3 in France: AREVA, CEA, EDF)
- One master arm can drive many slave robots

*It's a big market for slave robots,
but not for haptic devices*

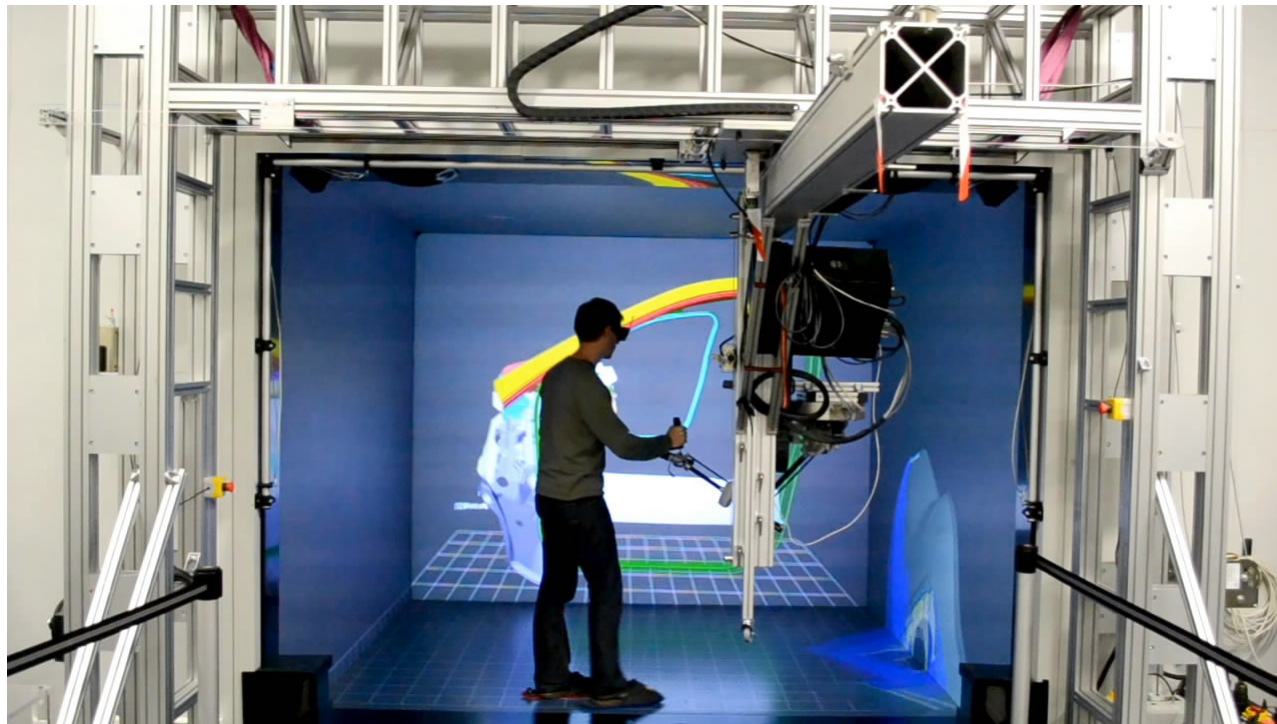


Assembly simulation



Reference customers

- PSA Peugeot Citroën (Paris, Sochaux)
- Airbus (Toulouse, Broughton, Hamburg)
- Toyota (Nagoya)
- BMW (Munich)



Video: Use of the Scale1 workspace extension system in the CAVE at PSA Peugeot Citroën



Assembly simulation

Drives (with respect to automatic path planning)

- First-hand experience of the complexity of the task, e.g.
 - What's in the way?
 - How much room is left for the tools?
 - How long will it take?
 - Can a worker perform the task without changing hands?
- Easy to use (e.g. by an assembly line worker)
- Strong demonstrative impact (e.g. to decision-making personnel)



Assembly simulation

Barriers

- High price
- Some products lack dependability and safety
- No integration into standard PLM software
- Data preparation necessary
- Implies an evolution of design processes
- In order to maximize the use of the haptic device, dedicated personnel is necessary



Assembly simulation

Perspectives

- Better data formats are becoming available (e.g. JTOpen, COLLADA)
- More computing power in each workstation (GPU Computing)

Market

- The big software editors are not yet interested in haptic technology
- Even intermittent use can lead to huge cost savings

*Still a promising niche market
for agile high-tech SMEs*



Ergonomic studies



© Lockheed Martin Aeronautics

Reference customers

- Lockheed Martin Aeronautics (Fort Worth, Denver)
- BMW Nutzfahrzeuge (Hannover)
- Politecnico di Milano (Mailand)



Video: Product ergonomics simulation at PoliMi (contract of INDESIT)

Drives

- Design the “haptic feeling” of future products
- Achieve a more realistic simulation of work activities
- Optimize workcells
- Reduce the risks of repetitive strain injuries



Video: Production ergonomics simulation, early results



Ergonomic studies

Barriers

- Most ergonomic studies are still done on the shop-floor with a camera
- Lack of scenario-building (authoring) tools
- Complexity of simulation set-up

Perspectives

- Huge interest from industrial companies, who are desperately looking for solutions
- Awakening interest from software editors
- High research activity

Market

- Almost null today, it can only grow



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Conclusion

- There are solid applications for haptics in the industry, but...
- The Return-On-Investment is difficult to demonstrate
 - Existing barriers can jeopardize the effective use of the technology
 - Savings in time and costs are not measured as easily in design processes as in manufacturing
 - Subjective gains are impossible to evaluate
- More research is needed
 - In core technology (e.g. collision detection)
 - In usage procedures (e.g. scenario-building tools)
- The market is (yet) too small for big players
 - Good niche for agile high-tech SMEs



Conclusion

Thank you for your attention!

Further reading: www.haption.com

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