

Lueder Alexander Kahrs
born Feb 23, 1975 in Bremen, Germany

CURRICULUM VITAE

EDUCATION

Feb 2009	Dissertation (Dr.-Ing.) at the Department for Computer Science, Universität Karlsruhe (TH), Germany, title: "Laser bone ablation supported by image processing at human temporal bones" (in German, orig. title: "Bildverarbeitungsunterstützte Laserknochenablation am humanen Felsenbein")
Dec 2002	Diploma in physics, University of Bremen, Germany <ul style="list-style-type: none">• Emphasis: Solid state physics and applied optics• Diploma thesis: "Growth of $\text{In}_x\text{Ga}_{1-x}\text{N}$ on GaN for realization of quantum dots" (in German, orig. title: "Wachstum von $\text{In}_x\text{Ga}_{1-x}\text{N}$ auf GaN zur Realisierung von Quantenpunkten")• Student research project: "Investigation of thermal stress in group-III-N-hetero structures" (in German, orig. title: "Untersuchung thermisch induzierter Verspannungen in Gruppe-III-N-Heterostrukturen")

POSITIONS HELD

since Nov 2010	Research Fellow, CAOS Lab, Vanderbilt University, Nashville, TN, USA
Mar 2009 – Sep 2010	Postdoc for computer-assisted surgery, Department of Otorhinolaryngology, University Hospital Düsseldorf, Germany
Apr 2003 – Mar 2009	Research Associate, Institute for Process Control and Robotics (IPR), Medical Robotics Group, Universität Karlsruhe (TH), Germany
Feb – Apr 2000	Internship, Institute for Research and Development of Sports Equipment (FES), Berlin, Germany, topic: Experiments, CAD and FEM modeling of a turnbuckle sensor for the 470 dinghy
Aug 1994 – Oct 1995	Social Service: Individual caretaking service for severely physically handicapped children, Kindergarten Unser Lieben Frauen, Bremen, Germany
1995 – 2003	Freelancer and Lecturer, Olbers Planetarium, Bremen, Germany
1997 – 2002	Rowing coach (up to 18 athletes per year, 6 with gold and/or silver medals at German championships), Bremer Ruderverein von 1882, Bremen, Germany

RESEARCH GRANTS

May 2011 – Nov 2012	German Research Foundation, postdoctoral research fellowship: "Methods for optical inspection of the inner ear and visual control of electrode placement for percutaneous cochlear implantation" (orig. title: "Methoden der optischen Erkundung des Innenohr und bildbasierte Regelung der Elektrodeninsertion bei der perkutanen Cochlea-Implantation")
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PROJECTS INVOLVED

As research assistant or postdoctoral research fellow

since 2011	Project "Methods for optical inspection of the inner ear and visual control of electrode placement for percutaneous cochlear implantation", German Research Foundation
since 2010	Project "Endoscopic Evaluation of PCI Surgery", CAOS Lab
2006 – 2009	Project "Camera Based Navigation of a Laser Beam for Micro Surgery at the Lateral Skull Base", German Research Foundation
2004 – 2007	Project "Cognition in Sports", Robert Bosch Foundation
2003 – 2005	Project "Augmented Reality for (head) surgery", K4 – SFB 414, German Research Foundation

As mentor, advisor, proposal writer or researcher for initial experiments

2009 – 2010	Project "Multi-Port Bone Surgery using the Lateral Skull Base as an Example"
2007 – 2009	Project "High precision skull base surgery"
2007 – 2010	Project "Optical coherence tomography for control of laser bone ablation"
2006 – 2010	Project "Sonographic aided and targeted surgery for the neck region"
2006 – 2009	Project "CompuSurge/NEAR: Augmented reality in a navigated endoscope"
2005 – 2009	Project "Projector-based augmented reality for open liver surgery"
2006 – 2008	Project "Collision free path and location planning for a telemanipulation system"
2004 – 2008	Project "Miniaturized Laser projector for augmented reality"
2005 – 2007	Project "Accurate robot assistant"
2004 – 2007	Project "Atraumatic and Function-Preserving High Precision Surgery of the Human Temporal Bone"

RESEARCH INTERESTS AND EXPERIENCES

- Computer assisted surgery (ENT, CMF, general surgery)
- Laser bone ablation
- Image processing, camera calibration
- Registration, navigation, tracking
- Medical Robotics
- Augmented and virtual reality (AR/VR)
- Laser projection (MEMS)
- 3d modeling
- Confocal microscopy
- Atomic force microscopy (AFM)
- High resolution X-ray diffraction (HRXRD) and simulation
- Photoluminescence spectroscopy (PL)
- Molecular-beam epitaxy (MBE)
- Vacuum technology
- Clean room
- Programming language: C++

PUBLICATIONS, CONFERENCE PROCEEDINGS

2010

O. Burgert, **L.A. Kahrs**, et al. (Eds.): "Proceeding of the 9th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery" (orig. German title: curac2010@MEDICA. Chirurgische Interventionen: vom Neanderthaler zur Roboterassistenz. Tagungsband zur 9. Jahrestagung der Deutschen Gesellschaft für Computer- und Roboterassistierte Chirurgie e.V., Der Andere Verlag, ISBN 978-3-86247-078-5

L. Colter, **L.A. Kahrs**, et al.: "Functional Model of Rotation Dependent Movement of Human Neck Structures: Data Acquisition, Methods and First Results" (orig. German title: "Funktionelles Modell der rotationsabhängigen Strukturverschieblichkeiten im humanen Hals: Datenakquisition, Methoden und erste Ergebnisse"), Proceedings of the 9th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, ISBN 978-3-86247-078-5, 153-157

T. Klenzner, **L.A. Kahrs**, et al.: "Boundary Detection in the Temporal Bone" (orig. German title: "Grenzflächendetektion im Felsenbein"), Proceedings of the 9th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, ISBN 978-3-86247-078-5, 169-172

T. Brennecke, J. Burgner, **L.A. Kahrs**, et al.: "An 3D Ultrasound Navigation System for Computer Aided Surgery at the Head and Neck Region – Visions and Concepts (orig. German title: "Ein 3D-Ultraschallnavigationssystem für die computer-assistierte Chirurgie im Kopf-Halsbereich – Visionen und Konzepte"), Proceedings of the 9th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, ISBN 978-3-86247-078-5, 203-206

J. Burgner, **L.A. Kahrs**, et al.: "Robotic Guidance for Microsurgical Laser Bone Processing in ENT Surgery", Proceedings of the Workshop on Enabling Technologies for Image-Guided Interventional Procedures (Robotics Science and Systems 2010), 18-21

L.A. Kahrs, et al.: "Planning and simulation of microsurgical laser bone ablation", International Journal of Computer Assisted Radiology and Surgery, Vol. 5(2), 155-162, DOI 10.1007/s11548-009-0303-4

L.A. Kahrs: "Laser bone ablation supported by image processing at human temporal bones" (orig. German title: "Bildverarbeitungsunterstützte Laserknochenablation am humanen Felsenbein"), Dissertation, KIT Scientific Publishing, ISBN 978-3-86644-458-4

2009

T. Klenzner, F.B. Knapp, J. Schipper, J. Raczkowski, H. Woern, **L.A. Kahrs**, et al.: "High precision cochleostomy by use of a pulsed CO₂ laser - an experimental approach", Cochlear Implants International, Vol. 10(S1), 58-62

J. Burgner, F.B. Knapp, **L.A. Kahrs**, et al.: "Setup and experimental trial for robot-assisted laser cochleostomy", International Journal of Computer Assisted Radiology and Surgery, Vol. 4(S1), 1864-1865

J. Burgner, **L.A. Kahrs**, et al.: "Including parameterization of the discrete ablation process into a planning and simulation environment for robot-assisted laser osteotomy", Studies in Health Technology and Informatics, Vol. 142, 43-48

M. Ciucci, **L. Kahrs**, et al.: "The NEAR Project: Active endoscopes in the operating room", IEEE – Proceedings of Virtual Environments, Human-Computer Interfaces and Measurements Systems, 47-52

2008

L.A. Kahrs, et al.: "Visual servoing of a laser ablation based cochleostomy", SPIE Medical Imaging, Vol. 6918, 69182C, DOI 10.1117/12.770863

C. Schönfelder, N. Belherazem, T. Stark, **L.A. Kahrs**, et al.: "Port visualization for laparoscopic surgery - setup and first intraoperative evaluation", International Journal of Computer Assisted Radiology and Surgery, Vol. 3(S1), S141-142

L.A. Kahrs, et al.: "Planning and simulation of microsurgical laser bone ablation". (orig. German title: "Planung und Simulation mikrochirurgischer Laserknochenablation"), Proceedings of the 7th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, ISBN 978-3-86805-008-0, 229-232

R. Krempien, H Hoppe, **L. Kahrs**, et al.: "Projector-Based Augmented Reality for Intuitive Intraoperative Guidance in Image-Guided 3D Interstitial Brachytherapy", Int. Journal of Radiation Oncology* Biology*Physics, Vol. 70(3), 944-952

2007

L.A. Kahrs, et al.: "Image processing system for detection of boundary layers during cochleostomy". (orig. German title: „Bildverarbeitungssystem für die Erkennung von Grenzflächen bei einer Cochleostomie“), Proceedings of the 6th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, ISBN 978-3-86805-008-0, 69-71

L.A. Kahrs, et al.: "Consideration of fiducial marker screw poses for intraoperative registration in robot-assisted surgery" (orig. German title: "Berücksichtigung der Pose von Markerschrauben bei der intraoperativen Registrierung in der roboterassistierten Chirurgie"), Methods for Automation Engineering in Medicine - 7. Workshop, ISBN 978-3-18-326717-0, 45-46

S.-F. Lu, **L.A. Kahrs**, et al.: "First Study on Laser Bone Ablation System at the Skull Base for Micro Surgery Based on Vision Navigation", IEEE - Proceeding of the Chinese Control Conference (CCC), 602-604

L.A. Kahrs, et al.: "Miniaturized Laser Projector for Mixed Reality – Augmentation Scenarios for Medical and Industrial Robot Programming", Virtuelle und Erweiterte Realität - 4th Workshop der GI-Fachgruppe VR/AR, ISBN 978-3-8322-6367-6, 93-100

C. Schönfelder, **L.A. Kahrs**, et al.: "Calculation and visualization of trocar positions for abdominal minimally invasive surgery", International Journal of Computer Assisted Radiology and Surgery, Vol. 2(S1), 506

S.-F. Lu, **L.A. Kahrs**, et al.: "First results of the detection of the boundary between soft tissue and bone with a video controlled laser ablation system", Proceedings of the 4th International CAS-H Conference, ISBN 978-3-939533-91-7, 103-105

L.A. Kahrs, et al.: "Video Camera Based Navigation of a Laser Beam for Micro Surgery Bone Ablation at the Skull Base - Setup and Initial Experiments", Advances in Medical Engineering, Springer Proceedings in Physics 114, ISBN 978-3-540-68763-4, 219-223

2006

L.A. Kahrs, et al.: „Augmented reality for supporting basketball players in free throw situations“ (orig. German title: „Erweiterte Realität zur Unterstützung des Basketballspielers in Freiwurf-Situationen“), Sports and Computer Science IX, Shaker Verlag, ISBN 3-8322-5197-9, 145-150

L.A. Kahrs, et al.: „Optical measurement with structured light for variable reflecting surfaces for registration or documentation“ (orig. German title: „Optische Vermessung mittels kodierten Lichts von variabel reflektierenden Oberflächen zur Registrierung oder Dokumentation“), Informatik aktuell, Image Processing for Medicine 2006, Springer, ISBN 3-540-32136-5, 340-344

M. Riechmann, **L.A. Kahrs**, et al.: „Visualization concept for projector based augmented reality in liver surgery“ (orig. German title: „Visualisierungskonzept für die projektorbasierte Erweiterte Realität in der Leberchirurgie“), Proceedings of the Joined Annual Meeting of the German, Austrian and Swiss Society for Biomedical Engineering, ISSN 0939-4990, V209

L.A. Kahrs, et al.: „Setup of a miniaturized laser projector for augmented reality in surgery“ (orig. German title: „Aufbau eines miniaturisierten Laserprojektors für die Erweiterte Realität in der Chirurgie“), Proceedings of the Joined Annual Meeting of the German, Austrian and Swiss Society for Biomedical Engineering, ISSN 0939-4990, V207

J. Burgner, **L.A. Kahrs**, et al.: „Evaluation of ultrasound-based registration with a multimodal abdomen phantom“ (orig. German title: „Evaluierung einer ultraschallbasierten Registrierung am

Multimodal-Abdomen-Phantom"), Proceedings of the Joined Annual Meeting of the German, Austrian and Swiss Society for Biomedical Engineering, ISSN 0939-4990, V210

L.A. Kahrs, et al.: "Supporting Free Throw Situations of Basketball Players with Augmented Reality", International Journal of Computer Science in Sport - ISSN 1684-4769 - Vol. 5/Ed. 2, 72-75

2005

L.A. Kahrs, et al.: "Visualization of Surgical 3D Information with Projector-based Augmented Reality", Studies in Health Technology and Informatics, Vol. 111, 243-246

G. Eggers, T. Salb, H. Hoppe, **L. Kahrs**, et al.: "Intraoperative Augmented Reality: The Surgeons View", Studies in Health Technology and Informatics, Vol. 111, 123-125

H. Wörn, M. Aschke, **L.A. Kahrs**: "New augmented reality and robotic based methods for head surgery", International Journal of Medical Robotics and Computer Assisted Surgery, 49-56

G. Eggers, G. Sudra, **L. Kahrs**, et al.: "A comparison of intraoperative augmented reality systems", Biomedizinische Technik, Vol. 50, Supplement 1 Part 2, ISSN 0939-4990, 907-908

2004

L.A. Kahrs, et al.: „Results of a novel calibration algorithm for augmented reality systems with high accuracy demands“ (orig. German title: „Ergebnisse eines neuen Kalibrier-Algorithmus für Augmented-Reality-Systeme mit hohen Genauigkeits-Anforderungen“), Informatik aktuell "Bildverarbeitung für die Medizin 2004", 376-380

L.A. Kahrs, et al.: „First results of contact-free surface detection for marker less registration for a robot system in head surgery“ (orig. German title: „Erste Ergebnisse einer berührungslosen Oberflächenerfassung zur markerlosen Registrierung eines Kopfchirurgie-Robotersystem“), Biomedizinische Technik, Issue 49, Supplement 2, 66-67

L.A. Kahrs, et al.: „Recent results und new approaches in augmented reality in surgery“ (orig. German title: "Neuste Ergebnisse und neue Ansätze für die erweiterte Realität in der Chirurgie", Proceedings of the 3th Annual Meeting of the German Society for Computer- and Robot-assisted Surgery, SFB-8

2003

A. Vennemann, **L.A. Kahrs**, et al.: „Investigation of the morphology in $\text{In}_x\text{Ga}_{1-x}\text{N}$ on GaN pseudo substrates“, (orig. German title: „Untersuchung der Morphologie von $\text{In}_x\text{Ga}_{1-x}\text{N}$ auf GaN-Pseudosubstraten“), E-Verhandlungen der DPG-Frühjahrstagung 2003, HL 14.89

2002

L.A. Kahrs, et al.: „Molecular-beam epitaxy of InGaN quantum dots on MOVPE-GaN pseudo substrates“ (orig. German title: „Molekularstrahlepitaxie von InGaN-Quantenpunkten auf MOVPE-GaN-Pseudosubstraten“), E-Verhandlungen der DPG-Frühjahrstagung 2002, HL 38.20

SUPERVISED STUDENTS

Medical Doctoral Thesis

- Lena Colter: Modeling of deformation of neck structures based on MR images (ongoing)

Diploma Thesis

- Bernhard Wissinger: Augmented reality in surgery with a retina scanning display
- Matthias Riechmann: Visualization concepts for projector based augmented reality in liver surgery
- Eugen Keilmann: Ultrasound based registration for computer-assisted endoprosthesis

- Jessica Burgner: Initial registration of anatomical landmarks in soft tissue using navigated ultrasound
- Markus Mehrwald: Image based detection of bone thickness for laser ablation

Student Research Project

- Ramin Norousi: Investigation of light intensity for projector based surface scanning
- Thomas Stark: Visualization of trocar positions using augmented reality on an abdomen phantom for minimally invasive surgery
- Martin Pfeffer: Camera based documentation system for an operating microscope

COURSES TAUGHT

2003 – 2009	Algorithms in Medicine, Student internship Diploma thesis seminar Computer Science in Medicine, Seminar Robotics and Medicine, Seminar
2005 – 2006	Cognition in Sports, Scholar internship

MEMBERSHIPS

since 2010	German Society for Computer- and Robot-assisted Surgery (CURAC)
since 2004	German Society for Biomedical Engineering (DGBMT im VDE)
since 2002	German Society for Physics (DPG)

PROFESSIONAL SERVICE

Reviews

since 2010	Annual Meeting of the German Society for Computer- and Robot-assisted Surgery (CURAC)
since 2011	International Journal of Computer Assisted Radiology and Surgery (JCARS)
2011	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)