

ANDREAS SCHUH

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aschuh.com

Research Engineer

Highly accomplished, patented Research Engineer leverages a PHD in Electrical Engineering alongside 10+ years of significant achievements in the field of Engineering, Nanotechnology and Physics, specifically instrument and sensor development, optimization, circuit design and algorithm development. Strong demonstrated interdisciplinary background in Electrical, Mechanical and Software Engineering, author of numerous publications and articles. Highly analytical, detail-oriented and committed to continuous improvement; a creative problem solver who thrives in highly collaborative, innovative research arenas.

Professional Experience

PALO ALTO RESEARCH CENTER (PARC), PALO ALTO, CA JAN 2015 – PRESENT
SYSTEM SCIENCES LAB, ELECTRONIC MATERIALS AND DEVICES
POST-DOCTORAL RESEARCHER

- Conducts professional research-based project work within a team environment, contributing to a variety of projects and initiatives.
- Demonstrates an exceptionally high level of research and testing capabilities, identifying thresholds, capacities and failure modes in a variety of prototypes.
- Demonstrates a high level of collaboration and teamwork, consulting and engaging with team members on project-related matters.

Achievements:

- Achieved product maturity with a fiber-optics based battery-testing system for a major auto manufacturer, moving from initial in-house prototype to a larger scale, full-system evaluation. Fiber-optics resulted in higher reliability of State-of-Charge and State-of-Health estimation in Li-Ion batteries.
- Achieved algorithmic improvements in an ongoing project that lead to higher reliability of flow cytometry-based mammal sperm sorting.
- Successfully developed an optical fiber technology-based testing system for detecting and analyzing failure modes in rail systems.

ILMENAU UNIVERSITY OF TECHNOLOGY, ILMENAU, GERMANY SEP 2012 – OCT 2014
DEPARTMENT OF MICRO AND NANOELECTRONIC SYSTEMS
RESEARCH ASSOCIATE AND RESEARCH AFFILIATE

- Successfully developed, in cooperation with MIT, novel atomic force microscope (AFM) measurement strategies through hardware, software and algorithm development.
- Improved the material imaging sensitivities of atomic force microscopes through micro-electro mechanical system (MEMS) sensor optimization.
- Implemented novel control algorithms into commercially available AFM lithography systems, achieving optimized performance.
- Authored numerous published research papers, a patent submission and dissertation.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT), CAMBRIDGE, MA APR 2010 – AUG 2012
DEPARTMENT OF MECHANICAL ENGINEERING
RESEARCH ASSISTANT AND VISITING STUDENT

- Achieved the development of novel atomic force microscope measurement strategies through hardware, software and algorithm development.
- Developed a laser and imaging sensor-based robot localization and tracking system that led to a granted international patent.

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ILMENAU UNIVERSITY OF TECHNOLOGY, ILMENAU, GERMANY MAR 2009 – MAR 2010
DEPARTMENT OF MICRO- AND NANOELECTRONIC SYSTEMS
RESEARCH ASSOCIATE

- Achieved improvements in control and mechanical designs for AFM-based nanometer lithographic applications.
- Key participant in developing a successful funding grant proposal, worth over \$200,000

LAWRENCE BERKELEY NATIONAL LABORATORY, BERKELEY, CA OCT 2007 – OCT 2008
QUANTUM COMPUTING INITIATIVE
ACCELERATOR AND FUSION RESEARCH DIVISION
RESEARCH SCHOLAR

- Developed a fully automatic, single ion implanter based on an existing ion implantation system, a key piece in the creation of future quantum computing devices.

ILMENAU UNIVERSITY OF TECHNOLOGY, ILMENAU, GERMANY NOV 2006 – SEP 2007
DEPARTMENT OF MICRO- AND NANOELECTRONIC SYSTEMS
AND DEPARTMENT OF MICRO- AND NANOTECHNOLOGY
RESEARCH ASSISTANT

- Collaborated on the creation of an AFM-probe manufacturing laboratory environment.
- Collaborated on the development of novel High Electron Mobility Transistors.
- Created user friendly Matlab GUIs for AFM controllers.

ROBERT BOSCH, GMBH, REUTLINGEN, GERMANY MAR 2006 – AUG 2006
DIVISION OF AUTOMOTIVE ELECTRONICS
INTERNSHIP AND UNDERGRADUATE THESIS

- Developed a novel hardware and software co-design approach for car alternators, based on dividing tasks appropriately between an FPGA and microprocessor.

Education & Training

Ph.D. in Electrical Engineering – Summa Cum Laude
Department of Micro- and Nanoelectronic Systems
Ilmenau University of Technology
(In collaboration with the Massachusetts Institute of Technology,
Mechatronics Research Laboratory, Department of Mechanical Engineering)
Ilmenau, Germany 2015

Masters of Science in Electrical Engineering – Honors
Specializing in Micro- and Nanoelectronic Systems
Ilmenau University of Technology
Ilmenau, Germany 2009

Diplom-Ingenieur, Electrical Engineering - Honors
Specializing in Microelectronics
University of Applied Sciences (FH)
Trier, Germany 2006

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Patents

Localization and Tracking System for Mobile Robots

US 8818723 B2 (US 20140058667 A1, WO014035741 A1)
A. Schuh and K. Youcef-Toumi.

Method for High Speed Imaging of Sample Surfaces by Atomic Force Microscopy

Original Title: Verfahren zur Abbildung von Oberflaechen mittels eines Rasterkraftmikroskops mit hoher Geschwindigkeit

Submitted to the German Patent and Trade Mark Office
A. Ahmad, A. Schuh and I. W. Rangelow.

Technical Skills

Programming Languages: NI LabVIEW (G), Python, C/C++, Visual C#, Assembler, Basic

Hardware Description: VHDL, NI LabVIEW FPGA

Hardware Synthesis: Xilinx ISE, Synopsys DesignCompiler

Simulation Environments: Comsol Multiphysics, Modelsim, Electronics Workbench / MultiSIM and other SPICE derivatives

CAD Software: Autodesk AutoCAD / Inventor

Math Environments: Matlab / Simulink, Scilab, Octave

Layout-Design: ISIS / ARES, Eagle

Analytical Tools: Atomic Force Microscopy, Dual Focused Ion Beam, Electron Beam Microscopy / Lithography

General PC Software: LATEX, Microsoft Office, Origin

Volunteer

Reviewer for the IEEE Industrial Electronics Society
Reviewer for the IEEE Control Systems Society
San Francisco Neighborhood Emergency Response Team

Languages

German - Native proficiency
English - Full professional proficiency

Fellowships

German Academic Exchange Service (DAAD) fellowship for conducting research at MIT
Quantum Computing Initiative scholarship at the AFRD, LBNL

Core Courses

Programming, Control System Design, (Digital) Signal Processing, Image Processing, Hardware Description, Electronics, MEMS Micromachining, (Semiconductor) Physics, Mechanics, Statistics, Mathematics.

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Publications

THESES

A. Schuh
Multi-Eigenmode Control for Improved Tracking Speed in Multifrequency Atomic Force Microscopy
PhD Dissertation, December 2015

A. Schuh
Detection and imaging of single ion impact arrays in field effect transistors
Master Thesis, January 2009

JOURNALS

A. Schuh, I. S. Bozchalooi, I. W. Rangelow, and K. Youcef-Toumi.
Multi-eigenmode control for high material contrast in bimodal and higher harmonic atomic force microscopy, *Nanotechnology*, vol. 26, no. 23, p. 235706, May 2015.
DOI: 10.1088/0957-4484/26/23/235706

A. Schuh, M. Hofer, T. Ivanov, and I. W. Rangelow.
Active microcantilevers for high material contrast in harmonic atomic force microscopy.
Journal of Microelectromechanical Systems, vol.24, no.5, pp.1622-1631, Oct. 2015.
DOI:10.1109/JMEMS.2015.2428677

A. Ahmad, A. Schuh and I. W. Rangelow.
Adaptive afm scan speed control for high aspect ratio fast structure tracking.
Review of Scientific Instruments, vol. 85, p. 103706, 2014. DOI: 10.1063/1.4897141

M. Kästner, Tzv. Ivanov, A. Schuh, A. Ahmad, T. Angelov, M. Budden, M. Hofer, A. Reum, S. Lenk, Y. Krivoschapkina, E.Guliyev, M. Holz, J-P. Zollner, and I.W. Rangelow.
Scanning probes in nanostructure fabrication.
Journal of Vacuum Science and Technology B 32, 06F101, 2014. DOI: 10.1116/1.4897500

T. Schenkel, C.C. Lo, C. D. Weis, A. Schuh, A. Persaud and J. Bokor.
Critical issues in the formation of quantum computer test structures by ion implantation.
Nuclear Instruments and Methods in Physics Research Section B, 267 (8-9), 2563, 2009.
DOI:10.1016/j.nimb.2009.05.061

C.D. Weis, A. Schuh, A. Batra, A. Persaud, I.W. Rangelow, J. Bokor,
C.C. Lo, S. Cabrini, D. Olynick, S. Duhey, T. Schenkel.
Mapping of ion beam induced current changes in FinFETs.
Nuclear Instruments and Methods in Physics Research B 267, 2009, pp. 1222-1225.
DOI: 10.1016/j.nimb.2009.01.019

C.D. Weis, A. Schuh, A. Batra, A. Persaud, I.W. Rangelow, J. Bokor, C.C. Lo, S. Cabrini,
Sideras-Haddad, G.D. Fuchs, R. Hanson, D.D. Awschalom and T. Schenkel.
Single atom doping for quantum device development in diamond and silicon.
Journal of Vacuum Science and Technology B 26, 2596, 2008. DOI: 10.1116/1.2968614

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CONFERENCES

A. Schuh, I. W. Rangelow, and K. Youcef-Toumi.

Control of First and Higher Transverse Eigenmodes of Active Atomic Force Microscope Cantilevers.
Accepted for presentation at the American Control Conference (ACC) 2016.

A. Schuh, I. S. Bozchalooi, I. W. Rangelow, and K. Youcef-Toumi.

Estimator based multieigenmode control of cantilevers in multifrequency Atomic Force Microscopy.
In American Control Conference (ACC) 2015, pp.1905-1910, 1-3 July 2015.
DOI: 10.1109/ACC.2015.7171011

A. Schuh, A. Hegyi, A. Raghavan, A. Lochbaum, J. Schwartz, P. Kiesel.

High-resolution, high-frequency wavelength shift detection of optical signals with low-cost, compact readouts. Proc. SPIE 9480, Fiber Optic Sensors and Applications XII, 94800B, June 3, 2015.
DOI: 10.1117/12.2177478

A. Ahmad, Tz. Ivanov, A. Reum, E. Guliyev, T. Angelov, A. Schuh, M. Kaestner,
I. Atanasov, M. Hofer, M. Holz, I. W. Rangelow

Self-actuated, self-sensing cantilever for fast CD measurement
Proc. SPIE 9424, Metrology, Inspection, and Process Control for Microlithography XXIX, 94240P,
March 2015, doi:10.1117/12.2085760

N. Vorbringer-Doroshovets, F. Balzer, E. Manske, M. Kästner, A. Schuh, J.-P. Zöllner,
M. Hofer, E. Guliyev, A. Ahmad, Tzv. Ivanov and I.W. Rangelow.

0.1-nanometer resolution positioning stage for sub-10nm scanning probe lithography.
Advanced Lithography, Proc. SPIE - Int. Soc. Opt. Eng. 2013. DOI: 10.1117/12.2012324

I.W. Rangelow, Tz. Ivanov, Y. Sarov, A. Schuh, A. Frank, H. Hartmann, J.-P. Zöllner, D. Olynick, V. Kalchenko.
Nanoprobe maskless lithography.

Proc. SPIE, 7637, 76370V-1-10, 2010. DOI: 10.1117/12.852265

REPORTS

A. Schuh, I. S. Bozchalooi, I. W. Rangelow, K. Youcef-Toumi.

Multi-Eigenmode Compensator for Multifrequency Atomic Force Microscopy.
Biannual Report 2013/2014, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

A. Schuh, I. S. Bozchalooi, I. W. Rangelow, K. Youcef-Toumi.

Control of Higher Cantilever Eigenmodes for High Speed Atomic Force Microscopy.
Biannual Report 2013/2014, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

A. Schuh, M. Hofer, T. Ivanov and I. W. Rangelow.

Harmonic Active Atomic Force Microscope Cantilevers for Improved Material Contrast.
Biannual Report 2013/2014, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

A. Schuh, K. Youcef-Toumi and I.W. Rangelow.

Active Q Control in Atomic Force Microscopy for Speed and Sensitivity Enhancement.
Biannual Report 2011/2012, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

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M. Hofer, T. Angelov, L. Chervenkov, M. Kästner, A. Schuh, N. Nikolov and I.W. Rangelow.
Femto- to Atto-Gram Mass Sensor.

Biannual Report 2011/2012, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

T. Angelov, L. Chervenkov, M. Hofer, M. Kästner, A. Schuh, N. Nikolov, and I.W. Rangelow.

Ultra-Low Noise and High Gain Amplifier for High Frequency NEMS-Resonator with 2DEG-Read Out.
Biannual Report 2011/2012, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

A. Schuh, Y. Sarov, Tzv. Ivanov, I.W. Rangelow, C.D.Weis, A. Batra, A. Persaud, T. Schenkel.
Self-actuated Piezoresistive Cantilever based AFM for Single Ion Implantation.

In PRONANO- Proceedings of the Integrated Project on Massively Parallel Intelligent Cantilever Probe
Platforms for Nanoscale Analysis and Synthesis, ISBN 978-386991-177-9,
Verlagshaus Monsenstein und Vannerdat OHGMuenster (2010), 299-306.

A. Schuh, C. D. Weis, A. Persaud, Y. Sarov, Tzv. Ivanov, T. Schenkel, I. W. Rangelow.

AFM Based Method for the Detection of Single Ion Hit Events in Field Effect Transistors.
Biannual Report 2009/2010, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.

Y. Sarov, T. Ivanov, C.D. Weis, A. Schuh, I. W. Rangelow, A. Persaud, J. Bokor, T. Schenkel, J. Meijer.

Tool for positioning of Atoms and Clusters with Nano-resolution.
Biannual Report 2007/2008, Institute of Micro- and Nanotechnologies, Ilmenau University of Technology.