Chad M. Schneider — Mechanical Design Engineer

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PROFESSIONAL SUMMARY:

Chad Schneider is a senior mechanical engineer with experience in project management, product development, medical device development, and test equipment field work. Chad received a BSME from the University of Maryland and an MSE studying haptics and medical robotics at the Johns Hopkins University.

He enjoys the design of practical, efficient, and robust electro-mechanical systems as well as offers extensive knowledge of rapid prototyping and various manufacturing techniques, such as machining, plastic injection molding, thermoforming, and sheet metal. Mr. Schneider is motivated by the challenge of taking on new and difficult projects.

Chad's specialties include product development, medical device design, regulatory compliance, Solidworks, MathCAD, rapid prototyping, concept generation, micro-pump design, medical robotics, haptics, along with plastic, sheet metal, and machined part design. Hands-on expertise using a wide variety of fabrication tools, including mill, plasma arc cutter, sheet metal break, and all manner of home construction tools.

PROFESSIONAL EXPERIENCE:

Root3 Labs, Inc - Owings Mills, MD (2012 - present)

Root3 Labs is a technology engineering company specializing in the design of complex mechanical devices. We are focused on helping clients transform research projects into commercial products - from the development of one-off research fixtures and early stage prototypes through manufacturing.

Key Technologies – Baltimore, MD (2004-2012)

As a Senior Engineer and Project Manager, Mr. Schneider supported the product development efforts of large- and medium-sized businesses by supplementing their current engineering staff and providing new technical skill-sets. Key Tech is an ISO13485-certified engineering services and product development firm specializing in the design of technically challenging devices in the medical, commercial, and industrial fields.

Lab-on-a-Chip DNA Analyzer Concepts: Member of the design team responsible for generating and developing preliminary prototypes for the embodiment of a single-use device to perform DNA analysis. Generated engineering concepts to introduce the microfluidic sample to the sensing region within the design constraints of the sensor technology and fabricated prototypes for testing. Worked with industrial designers to develop various user interfaces to provide a means to introduce sample fluid to the device and fluidic channels.

Applied Research Fixture Design: Member of the design team responsible for the design of an optical platform to facilitate applied research related to the biology of fruit flies. Designed the mounting hardware to position electrical components, fly subjects, cameras, lighting, and multiple linear stages as well as ensure stable alignment. Managed and reviewed the mechanical and industrial design team.

DNA Analyzer Development: Member of the cross-disciplinary team of engineers responsible for designing a microfluidic diagnostic medical device to analyze fluid samples using PCR in the lab. Evaluated fabrication techniques to be used in either proof-of-concept prototyping or high-volume manufacturing of single-use microfluidic chips. Assisted in the design of a manufacturing fixture to validate pre-production chips at each stage of fabrication.

Related Publications:

- C. M. Schneider, "Modeling, prototyping are essential to microfluidic design". MICROmanufacturing Magazine, January/February 2010.
- C. M. Schneider, “Meeting the challenges of micropart design". MICROmanufacturing Magazine, Summer 2009.

Optical Calibration Fixture: Project Manager and member of a design team responsible for completely redesigning a calibration fixture to accurately determine proper alignment of an optical medical device. Analyzed the micron-scale tolerances and design constraints to achieve reliable positioning, orientation, and optical coupling. Designed and prototyped several concepts for multiple embodiments.

Precision Syringe Control Unit: A member of the design team responsible for creating a device to accurately inject a drug for a medical procedure. Designed an IPx1-rated enclosure that rotates, tilts, and locks while providing a wire-path between two electrical control boards and a display unit and the main hardware enclosure. Integrated a highly-accurate syringe-driver to meet strict volumetric accuracy requirements. Created verification and validation protocols and conducted environmental and safety testing to show compliance with IEC 60601 and FDA medical device standards.

High Accuracy Blood Hematocrit Measurement Device. Member of the design team during the development of the Ultracrit™ device. Designed a high-tolerance micro-pump capable of moving microliters of fluid in production. Successfully integrated shape memory alloy wire into the actuator design which dramatically reduced the overall manufacturing cost and increased battery life. Built working devices using several rapid prototyping techniques including SLA and poured urethane. Conducted life-cycle testing and improved performance over the operational temperature range of the device. Initially funded by an NIH Grant through the National Heart, Lung, and Blood Institute.

Related Publications:

- C. M. Schneider, “SMA’s Don’t Like It Hot” Machine Design, Volume 79 – Issue 18, Sept 27, 2007.

Endoscopic Infrared Coagulator. Performed benchmarking and feasibility research during the preliminary development phase of a fiber-optic infrared coagulator for use with a colonoscope or flexible sigmoidoscope. Analyzed a broad range of commercial light engines and fiber-optic cables for compatibility with the demanding power and thermal requirements of the medical procedure. Also studied a variety of lamps, reflector materials and shapes, focusing lenses, and fiber-optic materials to determine the feasibility of custom components to meet the required optical characteristics.

Robotic Arm for Cancer Therapy. Designed a quiet, point-of-care air-cooling system to replace a high-power floor blower on a redesigned set of robotic arms for microwave ablation of cancerous cell within the breast. Designed and drafted the electrical enclosure, sourced the fan-controller, fans, and components, and integrated the system into the dual-arm system.

High-Precision Laser-Steering Systems. Designed multiple systems for pointing a laser at a specific part on a client component to support the research and development efforts of a large computer hard-drive OEM. The four degree-of-freedom systems all fit within very small physical constraints and have the capability of changing the angle of the incident laser with micro-radian precision while still maintaining the position of the spot to less than one micron. This work included the design of high-tolerance machined parts, integration with ultra high-precision optical and motion actuators in clean room environments, development of kinematic models of the laser path, design of the control system, and system integration and testing.

Quantitative Respiratory Flow Meter. Designed an enclosure to house the electronics as well as provide quick disconnects for differential air-volume inputs. Funded by an NIH Grant through the National Heart, Lung, and Blood Institute.

Vein Location Feasibility Study. Managed and conducted a research project to identify and evaluate the feasible, inexpensive methods of accurately visualizing veins under the skin surface for needle insertion.

Industrial Mixture Concentration Sensor. Designed an extremely rugged inline diagnostic instrument to detect the ingredient concentration in a liquid slurry and alert the user to deviations in real time. Created the waterproof, aluminum enclosure to house and protect the sensing hardware and electronic data collection/transmission boards for use in a harsh environment. The instrument can survive a 3 foot drop and 1000 psi line pressure. Also designed the central control box to house the data analysis computer and user interface. Converted a rough working prototype into a production-capable sensor.

Prior to joining Key Tech in 2004, Mr. Schneider spent two years performing research in the Haptics Exploration Laboratory at the Johns Hopkins University in Baltimore, MD where he earned his Masters of Science in Engineering in the Robotics program. Chad had returned to academia after working for three years as a project engineer, project manager, and survey director at ENSCO, Inc. in Springfield, VA. Personal accomplishments include:

The Johns Hopkins University – Baltimore, MD (2002-2004)

A Robotic System for Transrectal Needle Insertion into the Prostate with Integrated Ultrasound: Lead Designer. Designed and fabricated a prototype robotic device to precisely insert a needle into the human prostate under trans-rectal ultrasound guidance. Modeled soft-tissue deformation of the prostate to enhance open-loop accuracy. Work was performed in collaboration with the JHU Engineering Research Center for Computer Integrated Surgical Systems and Technology.

Related Peer-Reviewed Publications: (All papers available online from my LinkedIn profile)

- J. R. Crouch, C. M. Schneider, J. Wainer, and A. M. Okamura, "A Velocity-Dependent Model for Needle Insertion in Soft Tissue," Proceedings of the Eighth International Conference on Medical Image Computing and Computer Assisted Intervention -- MICCAI 2005, Lecture Notes in Computer Science (Vol. 3750), 2005, pp. 624-632.
- C. M. Schneider, J. R. Crouch and A. M. Okamura, "Modeling and Measuring the Dynamic 3D Effects of Needle Insertion in Soft Tissue," Haptic Exploration Lab Technical Report 04-1, The Johns Hopkins University, June 1, 2004.
- C. Schneider, "Systems for Robotic Needle Insertion and Tool-Tissue Interaction Modeling", M.S. Thesis, Dept of Mechanical Engineering, The Johns Hopkins University, May 2004.
- C. Schneider, A. M. Okamura and G. Fichtinger, "A Robotic System for Transrectal Needle Insertion into the Prostate with Integrated Ultrasound," IEEE International Conference on Robotics and Automation, 2004, pp. 365-370.

Magnetically-Actuated Friction-Feedback Mouse: Lead Designer. Designed a haptic device to perform psycho-physical experiments and improve user performance in a targeting task. Presented to the haptics community at Eurohaptics 2004 in Munich, Germany.

Related Peer-Reviewed Publications:

- C. Schneider, T. Mustufa and A. M. Okamura, "A Magnetically-Actuated Friction Feedback Mouse," Eurohaptics, 2004, pp. 330-337.

ENSCO, Inc. – Springfield, VA (1999-2002)

Noise and Vibration Testing of Railcars: Project Engineer. Collected and analyzed vibration data for quality assurance and acceptance testing of refurbished railcars.

Rail Corrugation Measurement System: Project Engineer. Designed and built a system to translate linear motion between a high-speed rail geometry system and a high-speed rail corrugation system. Design challenges included isolating the laser sensors from anticipated

50g shock loads.

Gage-Restraint Measurement System: Served as project manager, survey director, and project engineer for a testing and enforcement system capable of continuously measuring the ability of a given railroad track to hold gage. Monitored real-time data output and instrumentation during a survey, insuring the quality of the data. Performed field maintenance on and troubleshooting of any and all electrical and mechanical systems on the test vehicles, including a valve-actuated, hydraulically driven Split-axle system, two data collection systems, strain gages, transducers, and wiring. Designed a linkage to allow vertical motion without horizontal or rotational motion about a single rail axle.

Managed and performed the refurbishment of this and several commercial versions of the test equipment, supervising seven people. Prepared the budget, presentation, and proposal for a substantial equipment renovation and managed the project through completion. Solely managed seven track surveys for private railroad customers.

EDUCATION/CERTIFICATION:

MS Engineering, Robotics Program, *The Johns Hopkins University*, Baltimore, MD, 2004

BS Mechanical Engineering, *University of Maryland*, College Park, MD, 1999;

University Honors Program;

Pi Tau Sigma Mechanical Engineering Honor Society

"Fundamentals of Project Management", Harvard Pinnacle Group, 2000

Forklift Operator and Operator Trainer Certification

PATENTS ISSUED AND PENDING

US 20110091877 (A1) "Systems and Methods for Minimization or Elimination of Diffusion Effects in a Microfluidic System", Application Pending.

US 20050203413 (A1) "Transcavital Needle Insertion Device", Application Pending.

US 7,837,095 and WO ZA200805906 (A1), "Secure Bag Assembly for a Lockable Removable Cassette", Issued Nov 2010.

US 7,082,881 “Mount apparatus for mounting a measurement device on a rail car”, Issued 2006

AWARDS, AFFILIATIONS:

Member, American Society of Mechanical Engineers

Medical Device Excellence Award, 2007

Tibbetts Award Winner, 2007

Top Innovator of the Year, 2004 - Md Daily Record (Chad was on the design team)

ENSCO’s "Outstanding Performance Award”, 2000, 2001, and 2002

RELEVANT SKILLS:

SolidWorks, CosmosWorks FEA, Pro/Engineer, Matlab, MathCAD, Visual Basic

Plastic part design, rapid prototyping, machining, sheet-metal, thermoforming, micro-manufacturing

Hydraulics, pneumatics, electrical/mechanical troubleshooting, soldering, cable assembly, sensors, motor control, computer hardware

Hand tools, wood/metal power tools, Forklift, Plasma ARC Cutter, Laser Cutter, Band Saw, Drill Press, Angle Grinder, Table Saw, Sheet-metal Break & Punch, Chop Saw, CNC Mill, Lathe, Dremel