

Eric Schweikardt Curriculum Vitae

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Research Interests

My research is focused on explaining, representing and improving the design of robotic systems. I use my background in design and computation, combined with knowledge of robotics and rapid prototyping methods, to explore the space of robot design by building real, physical systems. I attempt to understand how different representations and languages can support or constrain designs and the intent behind them. I'm also interested in how people interact with robots once they've been built – particularly in how modular robots can be used as effective models for other complex systems.

Education

Ph.D, Computational Design 2008
Carnegie Mellon University, Pittsburgh, PA, USA
Thesis: Designing Modular Robotics
GPA: 4.0/4.0
Advisory Committee:
Mark D. Gross, Architecture
Illah Nourbakhsh, CREATE Lab, Robotics Institute
Metin Sitti, NanoRobotics Laboratory, Robotics Institute

Bachelor of Environmental Design, Special Honors, 1998
University of Colorado, College of Architecture and Planning, Boulder, CO, USA
Major: Design Studies
Minor: Computer Science

Professional Experience

Design Director, Founder 2007 – present
Modular Robotics LLC, Boulder, CO, USA
Started a small business to bring roBlocks, one of my research projects, to market. Received over \$600,000 in grant funding from the National Science Foundation (SBIR) and the Heinz endowments. Managed product design, engineering, user testing, marketing, intellectual property, and business development. Worked with Carnegie Mellon Office of Technology Transfer on a licensing agreement and to refine the business strategy. We're planning to ship our first modular robotic construction kit in Summer 2010.

Visiting Scientist September 2008 – August 2009

Cornell Computational Synthesis Lab, Cornell University, NY, USA

Built interactive 3D graphics tools to explore the reconfiguration possibilities of heterogeneous modular robotics. Worked with Hod Lipson to explore the idea of Machine Metabolism, in which robots built out of an optimized kit of parts consume other robots.

Research Assistant 2005 - 2008

Computational Design Lab, Carnegie Mellon University, Pittsburgh, PA, USA

roBlocks is a robotic construction kit created to scaffold children's understanding of math and science concepts. By snapping together the plastic modules, kids can create interesting, dynamic systems that encourage them to think about real-world complexity. I designed and built the system, tested with children and supervised project assistants.

StickyBricks is a modular robotic system I am designing to act as a physical substrate on which children can explore the relationships between local interaction and global behavior. The modules are 30mm square, reconfigure on a tabletop, and connect using dry adhesion and magnets. With Metin Sitti.

The **Egklet** is a hardware/software system designed to encourage musicians to experiment with sensor fusion concepts. It's modular design lets musicians plug in several sensors and easily send MIDI commands. With Tina Blaine.

Sporto is a little expanding robot designed to encourage users to meet their exercise goals. With Vincent Crossley and Min Kyung Lee.

Triboingus is an inexpensive, robust three-wheeled robot base intended for remote exploration and land mine detection.

Flexy is a computationally enhanced hub and spoke construction kit with real-time graphic feedback. With Michael Weller.

Director of Web Development 1999 - 2005

Allegory Design Group, Boulder, CO, USA

I formed the Allegory Design Group to design, build, and maintain small and medium sized corporate web sites. I designed innovative graphics and animation while also incorporating commerce and database applications. Oversaw project teams up to 10 people, and worked directly on most projects completed by the company.

Designer 2003 - 2004

Tavel Weise Architects, Denver, CO, USA

Worked on Solar Village, a mixed-use sustainable city block in Prospect, a new town outside of Longmont, CO. Created accurate digital models, renderings and AutoCAD drawings to assist in the design process and present our work.

Instructor 2003 - 2004

College of Architecture, University of Colorado, Boulder, CO, USA

Developed a digital modeling applications class for undergraduate architecture students. The course focused on creating professional-level models, animations, and renderings for use in design reviews and presentations. I taught and refined the course for four semesters and consistently rated in the 95th percentile in student evaluations.

Research Assistant 1996 - 1998

Sundance Laboratory for Computing in Design and Planning, University of Colorado, Boulder, CO, USA

At the Sundance Lab, I designed and built Digital Clay, a 3D sketch recognition application. Written in Lisp and Quickdraw3D, it used the Huffman-Clowes algorithm to extract depth information from a designer's isometric sketches.

Teaching Experience

Teaching Assistant Spring 2006
Architectural Robotics, Carnegie Mellon University

Instructor Spring 2003, Summer 2003, Fall 2003 (two sections)
Digital Modeling, Rendering and Animation, University of Colorado at Boulder

Publications

2010 Schweikardt, E. and M. D. Gross, *Experiments in Design Synthesis When Behavior is Determined by Shape* Journal of Personal and Ubiquitous Computing Special Issue on Material Computing. **In press.**

2009 Schweikardt, E. "User Centered Is Off Centered" *Interactions*, May/June 2009(3), ACM Press.

2009 Schweikardt, E., Elumeze, N., Eisenberg, M., and M. D. Gross, "A Tangible Construction Kit for Exploring Graph Theory" TEI 2009: Third International Conference on Tangible and Embedded Interaction, Cambridge, UK, ACM Press.

2009 Yun, Seung-kook , David Alan Hjelle, Eric Schweikardt, Hod Lipson and Daniela Rus, "Planning the Reconfiguration of Grounded Truss Structures with Truss Climbing Robots that Carry Truss Elements" ICRA 2009: IEEE International Conference on Robotics and Automation. May 12-17, 2009, Kobe, Japan. IEEE Press.

2009 Schweikardt, E. and M. D. Gross, "Designing Systems to Design Themselves" CHI 2009 Workshop: Programming Reality, Boston, MA.

2008 Schweikardt, E. and M. D. Gross, "Learning About Complexity With Modular Robots" DIGITEL 2008: The Second IEEE International Workshop on Digital Game and Intelligent Toy Enhanced Learning, Banff, Canada. **Best Full Paper – Honorable Mention.**

2008 Schweikardt, E. and M. D. Gross, "The Robot is the Program: Interacting with roBlocks" TEI 2008: Second International Conference on Tangible and Embedded Interaction, Bonn, Germany, ACM Press.

2007 Schweikardt, E. and M.D. Gross, "roBlocks: Understanding Emergent Complexity from the Bottom Up" RSS 2007: Robotics Science and Systems Workshop on Research in Robots for Education, June 27-30, 2007, Atlanta, GA.

2007 Schweikardt, E., "Envisioning the Robot Design Studio" CHI 2007 Workshop: Supporting Design Studio Culture in HCI, San Jose, CA.

2007 Schweikardt, E., "Modular Robotics as Tools for Design" in *Creativity and Cognition 2007*, June 13-15, Washington, DC, ACM Press.

2007 Schweikardt, E. and M. D. Gross, "A Brief Survey of Distributed Computational Toys" DIGITEL 2007: The First IEEE International Workshop on Digital Game and Intelligent Toy Enhanced Learning, Jhongli, Taiwan.

2006 Schweikardt, E., and Gross, M.D., "roBlocks: A Robotic Construction Kit for Mathematics and Science Education," Proceedings ACM International Conference on Multimedia Interaction, Banff, Canada, Nov 2-4 2006, pp. 72-75.

2000 Schweikardt, E., and Gross, M.D., "Digital Clay: Deriving Digital Models from Freehand Sketches." *Journal of Automation in Construction* 9:107-115. (first appeared in Proceedings of ACADIA '98 , Quebec City) **Google Scholar: Cited by 85.**

1998 Schweikardt, E. and M.D. Gross. Digital Clay: Deriving Digital Models from Freehand Sketches. Published in 'Digital Design Studios: Do Computers Make A Difference?', Proceedings of ACADIA '98, Quebec City, Canada, October 22-25, 1998 pp. 202-211.

Invited Talks

Thousands and Thousands of Tiny Robots October 25, 2008
Ithaca Sciencenter

Designing Modular Robots April 28, 2008
Computational Synthesis Lab, Cornell University

roBlocks April 24, 2008
Dorkbot Pittsburgh

Tips on Being a Deliberate Comprehensivist March 20, 2008
Making Things Interactive, Carnegie Mellon University

Press Coverage

CMU startup builds learning kits for kids with \$100K NSF grant December 18, 2008
Keystone Edge

Pittsburgh Innovates November 19, 2008
Pop City

At CMU, Building Fun Toys That Also Teach May 14, 2008
Pittsburgh Post-Gazette

Children Experiment with roBlocks April 7, 2008
The Tartan

The Dawn of Robo-Blocks April 3, 2008
GadgetLeak

roBlocks: Simple Blocks to Make Robots April 3, 2008
O'Reilly Radar

Plugged In: CMU's Robotic Toys February 28, 2008
WTAE TV: The Pittsburgh Channel

Academic Service

2010 **Publicity Chair** TEI 2010: ACM Fourth International Conference on Tangible and Embedded Interaction

2010 **Reviewer** UIST 2010: ACM 23rd Symposium on User Interface Software and Technology

2009 **Program Committee** ACM Creativity and Cognition

2009 **Reviewer** TEI 2009: ACM Third International Conference on Tangible and Embedded Interaction

2009 **Reviewer** Journal of Personal and Ubiquitous Computing Special Issue on Material Computing

2008 **Program Committee** Digitel 2008: 2nd IEEE International Conference on Digital Game and Intelligent Toy Enhanced Learning

Studio Critic

2008 Making Things Interactive, Carnegie Mellon University, Instructor: Mark D. Gross

2007 Making Interactive Furniture, Carnegie Mellon University, Instructor: Mark D. Gross

2007 Design Research Workshop, Carnegie Mellon University, Instructors: Gross, Herbsleb, Shaw, Finger

2006 Architectural Robotics, Carnegie Mellon University, Instructor: Mark D. Gross

2004 Design Studio IV, University of Colorado at Boulder, Instructor: Vaughn Moyer

2003 Sustainable Design Studio at Aspen, University of Colorado at Boulder, Instructor: Fred Andreas

2001 Design Studio II, University of Colorado at Boulder, Instructor: Fred Andreas

Workshops Organized

Architectural Robotics: Human Hive, sponsored by Robot250 and part of the *Meet the Made* exhibit at the Mattress Factory Museum, Pittsburgh, PA, USA. July 20, 2008.

Design Review Committee 2005 - 2007

Carnegie Mellon University, Pittsburgh, PA, USA