

Ben Axelrod

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<http://www.linkedin.com/in/benaxelrod>

See: <http://www.benaxelrod.com> for pics and videos

Overview: I am a data-driven, pragmatic, and hands-on robotics software engineer with a broad background and life-long love of robots looking for the next step in my career.

Skills: Navigation, planning, sensor characterization, inverse and forward kinematics, control, grasping/grasp planning

Experience: iRobot Corporation

Bedford, MA

Principal Robotics Software Engineer:

2018 – Present

Senior Robotics Software Engineer:

2012 – 2018

Research Scientist:

June 2010 – 2012

Launched consumer robot Roomba J7. Wrote the robot-side software to manage keep-out-zones for obstacles detected during the mission and perform secure transmission to cloud.

Almost launched consumer robotic lawn mower. In charge of much of the UWB beacon system used to localize the robot. Robot-side software, beacon firmware, and factory calibration fixtures and scripts. Distance, power, temperature, and bandwidth calibration.

Developed a prototype 7 DoF low-cost arm for a household helper robot. Extensive research and analysis for optimal arm morphology. Lots of arm kinematics, and firmware development.

Autonomous door opening with Packbot. Added a tactile sensing gripper with a break-away wrist to open both push and pull doors with knobs, levers, and self-closing mechanisms.

Worked with academics at UCF to conduct a human-robot-interaction study. Wrote robot code to exhibit different assertive/passive behaviors. Created LIDAR-based tracking system.

Created an autonomous surface craft with deployable ROV. Used MOOS-IvP for control. Integrated multiple sensors, reverse engineered electric outboard motors.

ARM-H DARPA program: Primary SW engineer on team which created a new 5 DoF robot hand with novel sensing and actuation. Networked 7 microcontrollers and a Gumstix.

ARM-S DARPA program: Performed autonomous grasping and manipulation with standardized hardware. Tasks ranged from pick-and-place of common objects to unlocking and opening a door and operating a drill.

Integrated a haptic feedback gripper on PackBot and ran performance experiments.

Performed dozens of STEM outreach events with school aged children from kindergarten to high-school.

Helped launch Create2 STEM platform by contributing documentation and providing technical support.

CoroWare, Inc.

Redmond, WA (remote from Atlanta, GA)

Robotics Software Engineer:

August 2007 – May 2010

Created a realistic 93 DoF human avatar for a 3D visualizer / physics simulator. Walking, rotation, and side-step gaits, inverse kinematics, and lifelike mesh files. High level behaviors include hand, body, and arm gestures, gaze tracking, walking, and grasping.

Ported a custom GUI to Linux using Qt for a mainstream video conferencing application.

Project lead using Concurrency and Coordination Runtime (CCR) & Decentralized Software Services (DSS) to parallelize client's sequential legacy code.

Created a 3D visualizer / physical simulator tool using OpenGL in C++. Highly flexible, it supports user plugins for objects and engines, loose binding, and serialization. Integrates with customer's build system. Responsible for plug-in infrastructure, serialization, inter-thread communication, GUI, graphics, VRML parser, and much of the internals.

Created a data visualization and analysis tool in Python. Includes 8 plot types that interact with each other through a back-end database. Responsible for the GUI front-end of system.
Created a simulated CoroBot for the Microsoft Robotics Developer Studio (MRDS) PhysX simulator. Interfaced a license manager.
Wrote an automatic MRDS service code generator for .NET Remoting clients. Wrote automatic WSDL and XSLT generators for MRDS services. Tested on BarrettHand.
Wrote tools to manipulate .OBJ files and automate import to MRDS.

Microsoft Research

Redmond, WA

Intern Software Developer:

May – July 2006

Wrote the majority of the Lego NXT, fischertechnik, and text-to-speech services for MRDS.
Also contributed heavily to the generic robot data contracts.

Iguana Robotics, Inc.

Champaign, IL

Mechanical Engineer / Robotacist:

May 2003 – June 2004

Intern Mechanical Engineer:

June – August 2002

3D CAD mechanical design for two ¼ scale biped robots and one quadruped. Designed and implemented robot power / sensor systems. Stereo lithography, assistive devices.
PIC programming for embedded devices. Educational electronics, PCB design and fabrication.

Education: Georgia Institute of Technology, College of Computing

Atlanta, GA

MS in Computer Science: GPA: 3.72

May 2007

Specialization: robotics and intelligent systems. Focus: mobile robots, multi-agent systems, rescue robots, educational robots, and distributed sensor networks. Master's project: team leader for RoboCupRescue, designed, machined, and competed with a 300 pound, remotely operated, treaded robot.

University of Illinois at Urbana-Champaign

Urbana, IL

Non-degree-seeking CS undergraduate student: GPA: 3.51

September 2004 – May 2005

Syracuse University, L.C. Smith College of Engineering

Syracuse, NY

BS in Mechanical Engineering: GPA: 3.81 (Summa Cum Laude)

May 2003

Senior design project: team leader, created an 8-legged hobby servo driven robot.

- Publications:** N. Banerjee, E. Amaral, B. Axelrod, S. Shamlan, M. Moseley, **Heuristically initialized motion planning in a low cost consumer robot.** *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2017.
- B. Axelrod, W. H. Huang. **Autonomous door opening and traversal.** *IEEE Technologies for Practical Robot Applications (TePRA)*, May 2015.
- J. Beal, A. Adler, F. Yaman, J. Cleveland, H. Mostafa, A. Mozeika, K. Usbeck, G. Markiewicz, B. Axelrod. **Managing Design Change with Functional Blueprints.** *Through-life Engineering Services*, 2015.
- S. M. Fiore, T. J. Wiltshire, E. J. C. Lobato, F. G. Jentsch, W. H. Huang, B. Axelrod. **Towards understanding social cues and signals in human-robot interaction: Effects of robot gaze and proxemic behavior.** *Frontiers in Cognitive Science*, 2013.
- Wiltshire, T. J., Lobato, E. J. C., Wedell, A., Huang, W., Axelrod, B., & Fiore, S. M. **Effects of robot gaze and proxemic behavior on perceived social presence during a hallway navigation scenario.** *Proceedings of the Human Factors and Ergonomics Society*, 2013.
- J. Beal, H. Mostafa, A. Mozeika, B. Axelrod, A. Adler, G. Markiewicz, K. Usbeck. **A Manifold Operator Representation for Adaptive Design,** *Genetic and Evolutionary Computation Conference (GECCO)*, July 2012.

- B. Axelrod, W. H. Huang. **Improving hand-eye calibration for robotic grasping and manipulation**, *IEEE Technologies for Practical Robot Applications (TePRA)*, April 2012.
- B. Axelrod. **The Next Big Thing – Service Oriented Architectures**. *Robot Magazine*, September/October, issue 24, 2010.
- C. Anderson, B. Axelrod, et al. **Mobile Manipulation – A Challenge in Integration**. *SPIE Defense & Security*, 2008.

Platforms: Linux (Ubuntu), Windows

Languages: C/C++, Python, Bash script, C#

Applications: VSCode, Emacs, Matlab, Visual Studio, MS Office, SolidWorks

Advanced Elective Coursework: Robotics: Estimation and Learning, Embedded Systems, Real Time Operating Systems, AI, Machine Learning, Genetic Algorithms, Distributed Systems, Computer Vision, Dynamics & Control, Robotics, Finite Element Analysis, Computational Fluid Dynamics

Honors:

Brandeis University Graduate Professional Studies Advisory Board for their Master's in Robotic Software Engineering program	2016 – Present
Moderator on Robotics.StackExchange	2017 – Present
IEEE RAS Boston Chapter Steering Committee	2014 – 2020
Co-Vice President of Atlanta Hobby Robotics Club	January 2009 – May 2010
Three-page profile in book: "Programming Microsoft® Robotics Studio" by Sara Morgan. ISBN-10: 0735624321. Pages 81 – 83.	2008
IPRE Research Fellow	December 2006
ASME George Farnell Senior Design Award	May 2003
Bernard Wood Achievement Award in Mechanical Engineering	May 2003
Harry Blatt Memorial Scholarship in Applied Science	Spring 2002
Kin Nee Tong Award for Outstanding Academic Achievement of a First Year Engineering Student	May 2000
Lego Mindstorms Novice Hall of Fame	Jul. 1999 and Dec. 2000

Interests: Piano, rock climbing, archery, Go