Brian Yamauchi

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Education

- **Ph.D. Computer Science (1995) — Case Western Reserve University**
- **M.S. Computer Science (1990) — University of Rochester**
- **B.S. Applied Math / Computer Science (1988) — Carnegie Mellon University**

Professional Experience

- **Principal Robotics Engineer — iRobot Corporation (Bedford, MA)**

  July 2012 – Present: Developed advanced technologies for future consumer robot products. Designed and implemented navigation software for outdoor consumer robots. Prototyped and evaluated low-cost technologies for robust and accurate outdoor localization.

- **Lead Roboticist — iRobot Corporation (Bedford, MA)**

  March 2003 – June 2012: Conducted applied research and developed software for autonomous robots, including:

  Dynamo Principal Investigator for a DARPA-funded research project to develop Dynamic Threshold Learning (DTL) for real-time learning of robot control behaviors. Applied DTL to enable a PackBot to learn to shift its center-of-gravity using its arm in order to climb tall obstacles.

  Wayfarer Principal Investigator for a research project funded by the Army to develop autonomous urban navigation capabilities for the iRobot PackBot. The Wayfarer navigation system uses stereo vision, LIDAR, GPS, and INS sensors in combination with exploration, mapping, and obstacle avoidance algorithms to map urban environments.

  Scorpion Developed GPS/INS waypoint navigation and obstacle avoidance software for driving autonomous vehicles on urban streets, as part of the DARPA Urban Challenge.

- **Senior Software Engineer — iRobot Corporation (Burlington, MA)**

  January 1999 – February 2003: Developed a sonar-based mapping and navigation system for the iRobot-LE commercial Internet telepresence robot. Developed a LIDAR-based mapping and navigation system for an autonomous industrial floor-cleaning robot.

- **Research Associate — Naval Research Laboratory (Washington, DC)**

  August 1996 - December 1998: Developed frontier-based exploration algorithm to enable mobile robots to autonomously explore and map unknown environments. Frontier-based exploration has since been applied by researchers at many different institutions to allow robots to explore a variety of environments.

- **Postdoctoral Fellow — Institute for the Study of Learning and Expertise (Palo Alto, CA)**

  August 1995 - July 1996: Developed robust methods for place learning and place recognition in dynamic environments using sonar-based occupancy grids.

- **Robotics Engineer — NASA Kennedy Space Center (Cape Canaveral, FL)**

  January 1992 - July 1992: Developed control software for a robot designed to inspect radiator panels on the space shuttle using sonar and vision.

- **Member of the Technical Staff — Jet Propulsion Laboratory (Pasadena, CA)**

  Summer 1991: Designed navigation software for Rocky III, a six-wheeled Mars rover prototype. Later versions of the Rocky rovers were used as prototypes for the Sojourner rover used in the Mars Pathfinder mission.

Programming Languages

- C (20+ years), C++ (20+ years), Python (8 years)

Patents

- US Patent 7,539,557 B2, *Autonomous Mobile Robot*, Inventor: Brian Yamauchi,
- US Patent 8,244,469 B2, *Collaborative Engagement for Target Identification and Tracking*, Inventors: Carol Cheung, Earl Cox, Christopher Geyer, Benjamin Grocholsky, Christopher Jones, Mark Moseley, Sanjiv Singh, and Brian Yamauchi
- US Patent 8,527,113 B2, *Remote Vehicle*, Inventors: Brian Yamauchi, Kent Massey, David Lafferty
- US Patent 8,577,538 B2, *Method and System for Controlling a Remote Vehicle*, Inventors: Scott Lenser, Christopher Jones, Brian Yamauchi

Grants

- Dynamo II, DARPA Defense Sciences Office, $201,269, June 2012 – March 2014
- Dynamo: A Model Transition Framework for Dynamic Stability Control and Body Mass Modulation, DARPA Defense Sciences Office, $130,239, January 2011 – February 2012
- Stingray II: Control of High-Speed Unmanned Vehicles, US Army TACOM (TARDEC), $717,977, October 2008 – October 2010
- Stingray: Control of High-Speed Unmanned Vehicles, US Army TACOM (TARDEC), $69,900, October 2007 – April 2008
- Daredevil II: Imaging Radar for Small Unmanned Ground Vehicles, US Army TACOM (TARDEC), $729,766, September 2007 – March 2010
- Sagittarius: A Human-Assisted UAV/UGV Team for Tracking Elusive Dismounts, US Air Force Research Laboratory (AFRL), $99,572, May 2007 – November 2007
- Daredevil: Imaging Radar for Small Unmanned Ground Vehicles, US Army TACOM (TARDEC), $68,729, November 2006 – May 2007

- Wayfarer: Robust Outdoor Navigation for Small UGVs, US Army TACOM (TARDEC), $1,341,173, September 2003 – September 2005
- Sentinel: A System for Command and Control of Small Teleoperated Robots, US Army TACOM (TARDEC), $69,799, December 2003 – May 2004
- Casualty Extraction Using Mobile Robots, US Army MRMC (TATRC), $316,398, July 2003 – April 2004
- Griffon: A Small-Scale Unmanned Air/Ground Vehicle, US Army TACOM (TACOM-ARDEC), $69,915, February 2003 – August 2003
- Valkyrie: A Patient Recovery Robot, US Army MRMC (TATRC), $69,803, December 2002 – June 2003

Journal/Conference Activities

- Reviewer, *Adaptive Behavior*
- Reviewer, *Autonomous Robots*
- Reviewer, *IEEE Transactions on Robotics and Automation*
- Reviewer, *IEEE Transactions on Systems, Man, and Cybernetics*
- Reviewer, *Journal of Field Robotics*
- Program Committee, Conference on Simulation of Adaptive Behavior
- Program Committee, SPIE Conference on Unmanned Systems Technology

Selected Publications

Selected Journal Papers

- "Sequential Behavior and Learning in Evolved Dynamical Neural Networks", Brian Yamauchi and Randall Beer, *Adaptive Behavior*, Vol. 2, No. 3, Winter 1994
- "Spatial Learning for Navigation in Dynamic Environments", Brian Yamauchi and Randall Beer, *IEEE Transactions on Systems, Man, and Cybernetics — Part B: Cybernetics*, Special Issue on Learning Autonomous Robots, Vol. 26, No. 3, June 1996
- "Place Recognition in Dynamic Environments", Brian Yamauchi and Pat Langley, *Journal of Robotic Systems*, Special Issue on Mobile Robots, Vol. 14, No. 2, February 1997
- "Integrating Exploration, Localization, Navigation and Planning Through a Common Representation," Alan Schultz, William Adams, and Brian Yamauchi, *Autonomous Robots*, Vol. 6, No. 3, June 1999
- "Frontier-Based Exploration Using Multiple Robots," Brian Yamauchi, *Journal of Robotics and Autonomous Systems*, Vol. 29, No. 2-3, November 1999

Selected Conference Papers

- "A Behavior-Based Architecture for Robots Using Real-Time Vision", Brian Yamauchi and Randal Nelson, *Proceedings of the 1991 IEEE International Conference on Robotics and Automation (ICRA 91)*, Sacramento, CA, April 1991
- "Mobile Robot Localization in Dynamic Environments Using Dead Reckoning and Evidence Grids", Brian Yamauchi, *Proceedings of the 1996 IEEE International Conference on Robotics and Automation (ICRA 96)*, Minneapolis, MN, April 1996
- "A Frontier-Based Approach for Autonomous Exploration," Brian Yamauchi, *Proceedings of the 1997 IEEE International Symposium on Computational Intelligence in Robotics and Automation*, Monterey, CA, July 1997
- "Integrating Exploration, Localization, and Navigation," Brian Yamauchi, Alan Schultz, and William Adams, *AAAI Spring Symposium on Integrating Robotics Research*, Stanford, CA, March 1998
- "Mobile Robot Exploration and Map-Building with Continuous Localization," Brian Yamauchi, Alan Schultz, and William Adams, *Proceedings of the 1998 IEEE International Conference on Robotics and Automation (ICRA 98)*, Leuven, Belgium, May 1988
- "Wayfarer: An Autonomous Navigation Payload for the PackBot," Brian Yamauchi, *Proceedings of AUVSI Unmanned Vehicles North America 2005*, Baltimore, MD, June 2005
- "Stingray: High-Speed Teleoperation of UGVs in Urban Terrain Using Driver-Assist Behaviors and Immersive Telepresence," Brian Yamauchi and Kent Massey, *Proceedings of the 26th Army Science Conference,* Orlando, FL, December 2008
- "All-Weather Perception for Man-Portable Robots Using Ultra-Wideband Radar," Brian Yamauchi, *Proceedings of the 2010 IEEE International Conference on Robotics and Automation (ICRA 2010)*, Anchorage, Alaska, May 2010