

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

- **Lead Robotist — iRobot Corporation (Bedford, MA)**
March 2003 – Present: Lead researcher and lead software engineer for robotics R&D projects including:
 - Wayfarer** Principal Investigator for a research project to develop autonomous navigation capabilities for the iRobot PackBot. The Wayfarer navigation payload uses stereo vision, LIDAR, GPS, and INS sensors to enable a PackBot to autonomously explore and map urban terrain.
 - Daredevil** Principal Investigator for an Army-funded project to develop an all-weather perception payload for the PackBot. The payload integrates ultra wideband (UWB) radar with LIDAR and stereo vision to detect obstacles through adverse weather and foliage.
 - R-Gator** Integrated high-precision GPS/INS localization system and collision avoidance radars with iRobot/John Deere R-Gator autonomous all-terrain vehicle.
 - Griffon** Principal Investigator for a research project to develop a man-portable hybrid UAV/UGV prototype (“the Flying PackBot”) based on a PackBot equipped with a powered parafoil and a gasoline engine.
 - Valkyrie** Principal Investigator for a research project investigating ways to rescue battlefield casualties using UGVs.
- **Senior Robotist — iRobot Corporation (Burlington, MA)**
January 1999 – February 2003: Senior researcher and senior software engineer for robotics R&D projects including:
 - iRobot-LE** Developed sonar-based indoor mapping and navigation system for a the iRobot-LE Internet telepresence robot designed for home use.
 - RoboCleaner** Developed LIDAR-based indoor mapping and navigation system for an autonomous industrial cleaning robot designed for commercial applications.
 - Deployer** Developed techniques to coordinate heterogeneous robot swarms to perform indoor mapping and navigation tasks.

- Research Associate — Naval Research Laboratory (Washington, DC)**
 August 1996 - December 1998: Developed frontier-based exploration techniques to enable mobile robots to explore and map unknown environments. Developed strategies that allow multirobot teams to cooperate in a manner robust to the loss of individual robots.
- Postdoctoral Fellow — Institute for the Study of Learning and Expertise (ISLE) (Palo Alto, CA)**
 August 1995 - July 1996: Developed robust methods for indoor place learning and place recognition in dynamic environments using sonar-based occupancy grids. Integrated place learning and recognition on a mobile robot system.
- Research Contractor — Naval Research Laboratory (Washington, DC)**
 Summer 1993, Summer 1994: Investigated the use of genetic algorithms to evolve neural network controllers for mobile robots. Implemented a mobile robot system using an topological map for exploration and navigation in dynamic environments.
- 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 orbiter.
- Member of the Technical Staff — Jet Propulsion Laboratory (Pasadena, CA)**
 Summer 1991: Designed navigation software for Rocky III, a six-wheeled Mars rover prototype. Developed a behavior-based system for cross-country navigation across unknown terrain. Later versions of the Rocky rovers were used as prototypes for the Sojourner rover used in the Mars Pathfinder mission.

Grants

- 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 – September 2009
- 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 (SAB 2000, SAB 2002, SAB 2004)
- Program Committee, SPIE Conference on Unmanned Systems Technology X

Publications

Journal Papers

- 1) "Sequential Behavior and Learning in Evolved Dynamical Neural Networks", Brian Yamauchi and Randall Beer, *Adaptive Behavior*, Vol. 2, No. 3, Winter 1994
- 2) "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
- 3) "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
- 4) "Integrating Exploration and Localization for Mobile Robots," Brian Yamauchi, Alan Schultz, and William Adams, *Adaptive Behavior*, Vol. 7, No. 2, Spring 1999
- 5) "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
- 6) "Frontier-Based Exploration Using Multiple Robots," Brian Yamauchi, *Journal of Robotics and Autonomous Systems*, Vol. 29, No. 2-3, November 1999
- 7) "Griffon: A Man-Portable Hybrid UGV/UAV," Brian Yamauchi and Pavlo Rudakevych, *Industrial Robot*, Vol. 31, No. 5, pp. 443-450, 2004

Conference Papers

- 1) "Juggler: Real-Time Sensorimotor Control Using Independent Agents", Brian Yamauchi, *Image Understanding and Machine Vision*, Cape Cod, MA, Optical Society of America, June 1989
- 2) "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*, Sacramento, CA, April 1991

- 3) "Escaping Static and Cyclic Behavior in Autonomous Agents", Brian Yamauchi and Randall Beer, *Proceedings of the Second European Conference on Artificial Life (ECAL 93)*, Brussels, Belgium, May 1993
- 4) "Integrating Reactive, Sequential, and Learning Behavior Using Dynamical Neural Networks", Brian Yamauchi and Randall Beer, *From Animals to Animats 3: Proceedings of The Third International Conference on the Simulation of Adaptive Behavior (SAB 94)*, Brighton, England, MIT Press, July 1994
- 5) "Dynamical Neural Networks for Mobile Robot Control", Brian Yamauchi, *Proceedings of the Fifth International Symposium on Robotics and Manufacturing (ISRAM 94)*, Maui, HI, ASME Press, August 1994
- 6) "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*, Minneapolis, MN, April 1996
- 7) "Place Learning in Dynamic Real-World Environments", Brian Yamauchi and Pat Langley, *Proceedings of ROBOLEARN-96: International Workshop on Learning for Autonomous Robots*, Key West, FL, May 1996
- 8) "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
- 9) "Frontier-Based Exploration Using Multiple Robots," Brian Yamauchi, *Proceedings of the Second International Conference on Autonomous Agents (Agents '98)*, Minneapolis, MN, May 1998
- 10) "Integrating Exploration, Localization, and Navigation," Brian Yamauchi, Alan Schultz, and William Adams, *AAAI Spring Symposium on Integrating Robotics Research*, Stanford, CA, March 1998
- 11) "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*, Leuven, Belgium, May 1998
- 12) "Integrating Map Learning, Localization, and Planning in a Mobile Robot," Brian Yamauchi, Alan Schultz, and William Adams, *Proceedings of the 1998 IEEE International Symposium on Computational Intelligence in Robotics and Automation*, Special Session on Integration and Cross-Platform Validation in Robotics, Gaithersburg, MD, September 1998
- 13) "Unifying Exploration, Localization, Navigation and Planning Through a Common Representation," Alan Schultz, William Adams, Brian Yamauchi, and Michael Jones, *Proceedings of the 1999 IEEE International Conference on Robotics and Automation*, Detroit, MI, May 1999
- 14) "Derived Performance Metrics and Measurements Compared to Field Experience for the PackBot", Tom Frost, Christopher Norman, Scott Pratt, and Brian Yamauchi, *Proceedings of the Performance Metrics for Intelligent Systems Workshop*, Gaithersburg, MD, August 2002
- 15) "Bloodhound: A Semi-Autonomous Battlefield Medical Robot", Brian Yamauchi, Polly Pook, and Amanda Gruber, *Proceedings of the 23rd Army Science Conference*, Orlando, FL, December 2002

- 16) "PackBot: A Versatile Platform for Military Robotics", Brian Yamauchi, *Proceedings of SPIE Vol. 5422: Unmanned Ground Vehicle Technology VI*, Orlando, FL, April 2004
- 17) "The Wayfarer Modular Navigation Payload for Intelligent Robot Infrastructure," Brian Yamauchi, *Proceedings of SPIE Vol. 5804: Unmanned Ground Technology VII*, Orlando, FL, March 2004
- 18) "Wayfarer: An Autonomous Navigation Payload for the PackBot," Brian Yamauchi, *Proceedings of AUVSI Unmanned Vehicles North America 2005*, Baltimore, MD, June 2005
- 19) "Autonomous Urban Reconnaissance Using Man-Portable UGVs," Brian Yamauchi, *Proceedings of SPIE: Unmanned Ground Vehicle Technology VIII*, Orlando, FL, April 2006
- 20) "Daredevil: Ultra Wideband Radar Sensing for Small UGVs," Brian Yamauchi, *Proceedings of SPIE: Unmanned Systems Technology IX*, Orlando, FL, April 2007
- 21) "All-Weather Perception for Small Autonomous UGVs", Brian Yamauchi, *Proceedings of SPIE: Unmanned Systems Technology X*, Orlando, FL, April 2008