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CONTACT  
INFORMATION

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RESEARCH  
INTERESTS

**Planning and execution systems for flexible, coordinated, and cooperative multi-robot and robot-human teams**, with an emphasis on execution-time conflict prediction and adaptation. Other interests include the integration of humans into robotic teams via sliding autonomy, inter-robot coordination in both non-contact and cooperative manipulation scenarios, graduated and robust failure recovery, human-robot interaction, and social robotics.

EDUCATION

**Ph.D., Robotics** (2001 - 2008)

**Carnegie Mellon University**, Pittsburgh, Pennsylvania USA

Thesis Title: *Proactive Replanning for Multi-Robot Teams*

Defense to occur December 2008

Ph.D. Committee:

- Reid Simmons (chair), CMU Robotics
- Sanjiv Singh, CMU Robotics
- Steven Smith, CMU Robotics
- Tara Estlin, California Institute of Technology JPL

**B.S., Computer Science and Human-Computer Interaction** (1997 - 2001)

**Carnegie Mellon University**, Pittsburgh, Pennsylvania USA

- Minor in Robotics
- University Honors

EMPLOYMENT

2011 - present	Seegrid Corporation	Director of Software Development
2009 - 2011	Seegrid Corporation	Senior Software Developer
2001 - 2008	Carnegie Mellon University	Research Assistant
Summer 2001	Carnegie Mellon University	Summer Intern: Perceptor Project, CMU RI
Summer 2000	Carnegie Mellon University	Summer Intern: iCubes Project, CMU ICES
1999 - 2001	Carnegie Mellon University	Undergraduate Research Assistant: DiME Project, CMU

**Seegrid Corporation: Director of Software Development (2011 - Present)**

- Manage a team of up to 9 software developers and all aspects of the software development, testing, and release cycle, while continuing to contribute individually to development.
- Coordinate escalated support issues between field service and engineering, using the identified issues to drive software reliability improvements.
- Establish development priorities and determine the contents of each release.
- Rearchitected major portions of the robot control software.
- Led the architecting and development of the Seegrid Supervisor, a centralized control and coordination node.
- Converted the entire software stack from a home-grown messaging system to a pub/sub (AMQP) stack.

**Seegrid Corporation: Senior Software Developer (2009 - 2011)**

- Developed a robotic case picking application and server with two other developers. Responsible for all aspects of the project and customer relations.
- Release manager for multiple software releases.
- Developed a robot simulator from scratch, for use in safety system development and application planning/layout.
- Rewrote logging and data analysis system used across Seegrid's entire deployed base of robots and servers.

## MULTI-AGENT COORDINATION

**Distributed Robot Architectures (2001 - 2002)**

- Applied multi-robot system architectures to a construction task performed by three heterogeneous robots, requiring coordinated manipulation and decoupled sensing.

**Trestle / Space Solar Power (2002 - 2006)**

- Built on the Distributed Robot Architectures project to autonomously construct a complex node-and-beam assembly using three interdependent heterogeneous robots.
- Investigated the use of sliding autonomy to smoothly integrate human teleoperators with autonomous assembly agents, allowing the autonomous system to request help or the human to proactively take control of an agent.
- Predicted task outcomes to inform sliding autonomy decisions.

**Institute for Dextrous Space Robotics (2006 - 2007)**

- Managed a team in the application of the Trestle architecture to the University of Maryland's 27-DOF Ranger robot.
- Extended the Trestle visual servoing system to support Ranger.
- Integrated the Ranger control software with the Trestle architecture.
- Performed experiments in which Ranger autonomously assembled a portion of the EASE structure in neutral buoyancy.

**Intelligent Monitoring of Assembly Operations (2007 - 2008)**

- Wrote the specification for a language to encode automated and manual processes, safety regions, and complex inter-process constraints.
- Created a hand-held safety and informational user interface.
- Developed a proof of concept execution and monitoring system in both simulation and on existing hardware.

### **Proactive Replanning** (thesis) (2005 - 2008)

- Developed a planning/execution system able to predict future conflicts and inefficiencies, then rapidly replan to avoid or take advantage of them.
- Researched and implemented a prediction method capable of estimating a distribution across the remaining duration of a task, given a measure of its current state.
- Conceived of optional roles and extended the ASPEN planner to support them. If filled, optional roles improve some aspect of the team's performance, but are not strictly necessary to the task's completion.
- Extended ASPEN to support the addition and removal of agents throughout the execution of a task.
- Experimentally validated the components of proactive replanning in simulation.

### SOCIAL ROBOTICS

#### **GRACE** (2001 - 2003)

- Part of a team that developed a robot able to: ask for (and follow) directions, ride elevators, read conference center signage, locate and stand in a line of humans, interact with a human registrar, navigate through crowds, and present a conference talk about itself.
- Implemented human-robot speech-based interaction with human registrar.
- Integrated dialog, vision, navigation, tracking, and interaction systems from five institutions.
- Built unified executive to sequence tasks, coordinate skills, and recover from failures.

#### **Lena** (2003)

- Adapted GRACE software for a traveling exhibit with the Science Museum of Minnesota, focusing on contextual dialog for a stationary exhibit.

#### **Roboceptionist** (2004 - 2006)

- Developed user interface for ongoing long-term interactive robotic installation.
- Adapted dialog system to support contextual conversations.
- Implemented automated conversation analysis, system monitoring, and process management.

### OTHER

#### **Digital Mind's Eye** (1999 - 2001)

- Developed an augmented reality system incorporating a head-mounted camera and display that supported arbitrary modification of the user's view of the world.
- Performed preliminary experiments evaluating the use of this technology to compensate for a variety of vision defects.

#### **Perceptor** (Summer 2001)

- Developed and tested vision algorithms for path following in outdoor environments.

#### **Wireless Localization** (2002 - 2003)

- Applied Monte-Carlo localization methods to localize a moving target from wireless signal strengths to within 3 meters, with no *a priori* knowledge of the locations of the signal sources.

**Microraptor** (2003 - 2008)

- Conceived, designed, and developed a multi-agent process control and monitoring system with Trey Smith.
- Client-daemon approach allows multiple users to simultaneously monitor and interact with an arbitrary set of processes spread across multiple machines.
- Developed user interface and utility library which supports programmatic cross-machine process control. Assisted with daemon development.
- Microraptor is currently in use on at least eight projects at Carnegie Mellon and NASA Ames, ranging from social robot installations to rovers operating in the field.

- JOURNAL ARTICLES
- [1] Brennan Sellner, Frederik W. Heger, Laura M. Hiatt, Reid Simmons, and Sanjiv Singh. Coordinated multi-agent teams and sliding autonomy for large-scale assembly. *Special Issue of the Proceedings of the IEEE on Multi-Robot Systems*, 94(7), 2006 2006.
- BOOK CHAPTERS
- [1] Brennan Sellner, Reid Simmons, and Sanjiv Singh. User Modelling for Principled Sliding Autonomy in Human-Robot Teams. In Lynne E. Parker, Frank E. Schneider, and Alan C. Schultz, editors, *Multi-Robot Systems: From Swarms to Intelligent Automata*, volume 3. Springer, 2005.
- MAGAZINE ARTICLES
- [1] R. Simmons and et. al. GRACE: An Autonomous Robot for the AAI Robot Challenge. *AAAI Magazine*, 24(2):51–72, Summer 2003.
- REFEREED CONFERENCE PAPERS
- [1] Brennan Sellner, Frederik W. Heger, Laura M. Hiatt, Nik Melchior, Stephen Rod-erick, David Akin, Reid Simmons, and Sanjiv Singh. Overcoming sensor noise for low-tolerance autonomous assembly. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS-2008)*, Acropolis Convention Center, Nice, France, Sept. 22-26 2008.
- [2] Brennan Sellner and Reid Simmons. Duration prediction for proactive replanning. In *Proceedings of the 2008 IEEE International Conference on Robotics and Automation (ICRA '08)*, Pasadena, California, May 2008.
- [3] Brennan Sellner, Laura Hiatt, Reid Simmons, and Sanjiv Singh. Attaining situa-tional awareness for sliding autonomy. In *Proceedings of HRI 2006*, Salt Lake City, UT.
- [4] Frederik W. Heger, Laura M. Hiatt, Brennan Sellner, Reid Simmons, and Sanjiv Singh. Results in Sliding Autonomy for Multi-Robot Spatial Assembly. In *8th In-ternational Symposium on Artificial Intelligence, Robotics and Automation in Space (iSAIRAS)*, Munich, Germany, September 5-8, 2005.
- [5] Rachel Gockley, Allison Bruce, Jodi Forlizzi, Marek Michalowski, Anne Mundell, Stephanie Rosenthal, Brennan Sellner, Reid Simmons, Kevin Snipes, Alan C. Schultz, and Jue Wang. Designing robots for long-term social interaction. In *Pro-ceedings of IROS 2005*, Edmonton, Alberta, 2005.
- [6] Mary Berna, Brennan Sellner, Brad Lisien, Sebastian Thrun, Geoff Gordon, and Frank Pfenning. A learning algorithm for localizing people based on wireless signal strength that uses labeled and unlabeled data. In *Proceedings of International Joint Conference on Artificial Intelligence (IJCAI)*, 2003.
- REFEREED WORKSHOP PAPERS
- [1] Brennan Sellner and Reid Simmons. Duration prediction for proactive replanning. In *Proceedings of the 3rd Workshop on Planning and Plan Execution for Real-World Systems*, September 2007. Held in conjunction with ICAPS '07.
- [2] Brennan Sellner and Reid Simmons. Towards proactive replanning for multi-robot teams. In *Proceedings of the 5th International Workshop on Planning and Scheduling in Space 2006*, Baltimore, MD, October 2006.

OTHER  
PUBLICATIONS

- [1] Reid Simmons, Sanjiv Singh, Frederik Heger, Laura Hiatt, Seth Koterba, Nik Melchior, and Brennan Sellner. Human-robot teams for large-scale assembly. In *Proceedings of the NASA Science Technology Conference 2007 (NSTC-07)*, Adelphi, MD, June 2007.

TEACHING  
ASSISTANTSHIPS

CMU 16-862: **Introduction to Mobile Robot Programming**, instr. Illah Nourbakhsh, Spring 2005.

CMU 24-354: **General Robotics**, instr. Howie Choset, Fall 2000.

OTHER  
EXPERIENCE

**Resonance Works**, Pittsburgh, Pennsylvania USA

Operations Manager, Treasurer (2013 - present)

- Co-founded a multi-modal musical performing arts company.
- Managed all technical and operational aspects of three productions to date: two fully-staged operas and one mixed-media chamber orchestra concert.
- Handled the company's finances, taxes, and all contracting details.

**Carnegie Involvement Association**, Pittsburgh, Pennsylvania USA

Chair (1999 - 2001)

- Recruited and managed a 40-50 member racing team.
- Oversaw the design and construction of a hybrid carbon fiber / aluminum buggy.

**Scotch 'n' Soda Theatre**, Pittsburgh, Pennsylvania USA

Technical Director, Master Carpenter (1997 - 2001)

- Lead teams of 4 - 30 in the design, construction, and installation of 12 theater sets.

**Help@Home.Computer**, Montevideo, Minnesota USA

Co-founder, Consultant (1994 - 1999)

- Co-founded computer consulting company.
- Trained individuals and companies on a variety of computing topics.
- Helped secure funding for computing resources for the Minnesota River Valley Educational District.
- Conducted workshops for educators in several school districts.
- Network design and installation, web design, troubleshooting.

AWARDS

NASA Graduate Student Research Program Fellowship, 2003-2004.

Member, Phi Kappa Phi, 2001.

Member, Phi Beta Kappa, 2001.

Carnegie Mellon University Honors in Computer Science, 2001.

Carnegie Mellon University Andrew Carnegie Society Scholar, 2001.

Carnegie Mellon University Scholarship, 1997 - 2001.

National Merit Scholarship, 1997.