

Zsolt Kira

CONTACT INFORMATION

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RESEARCH INTERESTS

Applying artificial intelligence and machine learning algorithms to real embodied robots, allowing them to intelligently perceive and act. Specifically, my proposal topic involves the sharing of knowledge and experience, gathered using instance-based learning, among *heterogeneous* robots with differing sensing, actuation, and experience levels.

EDUCATION

Georgia Institute of Technology, Atlanta, Georgia USA
College of Computing

Ph.D. Student, Computer Science, August 2002
Advisor: Ronald C. Arkin
Expected Graduation Date: May 2009

University of Miami, Coral Gables, Florida USA
Department of Electrical and Computer Engineering

B.S., Computer Engineering and Computer Science (Dual), July, 2002
GPA: 3.92

HONORS AND AWARDS

Awarded 2007 Google Summer of Code grant (8 proposals accepted out of 69 for the project)
Outstanding SAIC Scholar Research Award, April 2007.
2004 National Defense Science and Engineering Graduate Fellowship, Honorable Mention
Eliahu I. and Joyce Jury Award for undergraduate scholarship
Tzay Y. Young Award for Outstanding Senior Design Project
Vice President of U.M. Chapter of ACM (Association for Computing Machinery)
Member of the Eta Kappa Nu engineering honors society
Rensselaer Polytechnic Institute Math and Science Award

PUBLICATIONS

CONFERENCE FULL PUBLICATIONS **Kira, Z.** and Long, K., "Modeling Robot Differences by Leveraging a Physically Shared Context", in L. Berthouze, C.G. Prince, M. Littman, H. Kozima, and C. Balkenius (Eds.), *Proceedings of the Seventh International Conference on Epigenetic Robotics: Modeling Cognitive Development in Robotic Systems*, pp. 53-59, 2007. Sweden: Lund University Cognitive Studies.

Kira, Z., "Modeling Cross-Sensory and Sensorimotor Correlations to Detect and Localize Faults in Mobile Robots", in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1520-1526, 2007. San Diego, CA, USA.

Kira, Z. and Schultz, A.C., "Continuous and Embedded Learning for Multi-Agent Systems", in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp.3184-3190, 2006.

Kira, Z. and Arkin, R.C., "Forgetting Bad Behavior: Memory Management for Case-Based Navigation", *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3145-3152, 2004.

Mobile Robot Lab, Georgia Institute of Technology, Atlanta, Georgia USA

Graduate Research Assistant

May, 2006 - December, 2006

- Wrote and submitted a concept paper detailing novel methods for integrating cross-sensory and sensorimotor data on a mobile robot. Based on this concept paper, funding for the research assistanship was given by Science Applications International Corporation (SAIC).
- Independently designed and implemented a framework for maintaining cross-sensory and sensorimotor mappings in order to detect and identify faults occuring on a robot during performance of a task.
- This research has resulted in a single-author paper that was accepted at IROS 2007.

Graduate Research Assistant

August, 2004 - December, 2005

- As part of this project funded by Science Applications International Corporation (SAIC), researched Simultaneous Localization and Mapping (SLAM) using vision-based approaches in outdoor urban environments.
- Quantitatively and qualitatively evaluated the use of VSLAM in indoor and outdoor environments. The software used is part of the Evolution Robotics ERSP 3.0 software, situated on a Scorpion robot.
- Designed and implemented (co-work with Alan Wagner) an exploration algorithm designed to minimize uncertainty while using Visual SLAM.
- Integrated the VSLAM software into MissionLab, the mission specification and planning system developed at the Georgia Tech Mobile Robot Lab.

Graduate Research Assistant

January, 2003 - June, 2004

- As a member of the MARS (Mobile Autonomous Robot Software) project, researched several learning algorithms used to improve robot navigation.
- Investigated the importance of forgetting in a learning system. Specifically, designed strategies for forgetting cases in a Case-Based Reasoning system used for mobile robot navigation. Set up an experimental design and analyzed the importance of such a mechanism during learning, and the trade-offs between periodically removing bad cases or only doing so when the case library is full. This research resulted in a first-author paper at IROS 2004.

Graduate Research Assistant

August, 2002 - December, 2002

- As a member of the FCS (Future Combat Systems) project, enhanced *MissionLab* multi-agent robotics mission specification and control software by improving the user interface used to teleoperate robots. The resulting software is included in the public release of the *MissionLab* software suite.
- Added waypoint features, such as the ability to add and remove waypoints (points the robot should visit) in real time, to aid the robot operators.
- Added display showing robot battery status, sonar and laser data, communication quality, etc. and tied them to real data.

Naval Research Lab, Washington D.C. USA

Contractor, Supervisors: Alan C. Schultz, Mitchell A. Potter

**June - August,
2004, 2005, 2007**

- Investigated the use of Continuous and Embedded Learning (CEL) in a multi-agent defender/attacker domain, in which a simulator is used for learning in an agent (using Genetic Algorithms). The simulator is updated to reflect major changes in the world, to allow for more accurate learning.
- The CEL architecture was extended to include sharing of rulebases and knowledge of the environment, as well as a novel Distributed Case-Based Reasoning system in which the cases are actual GAs. Cases are retrieved both from a local case library, as well as the library of nearby agents. This research resulted in a first-author paper at IROS 2006.

- Tackled the problem of human control of a robotic swarm in a physicomimetic system. Created two methods of control, one top-down and the other bottom-up, allowing a human to influence the swarm in predictable ways. These methods were integrated in a user interface. This research resulted in a first-author paper submitted to ICRA 2008.

TEACHING
EXPERIENCE

Georgia Institute of Technology, Atlanta, Georgia USA

SAIC Opportunity Scholar Mentor

October, 2006 - Present

- Mentored underrepresented and minority undergraduate as part of this scholar program designed to increase student retention and foster interest in research.
- Assigned tasks and papers to read, explained background materials and concepts, and directed research for the students. Resulting research received **Outstanding SAIC Scholar Research Award**, and results stemming from this research were accepted at the 2007 International Conference on Epigenetic Robotics.
- Assisted students with any other problems they had, both within the scope of the research project and other student issues.

Graduate Teaching Assistant

August, 2007 - December, 2007

"Computing, Society, and Professionalism". Supervisor: Dr. Amy Bruckman

- Gave one lecture, graded and assisted students with material, assignments, and final project.

Graduate Teaching Assistant

January, 2007 - May, 2007

"Autonomous Robotics". Supervisor: Dr. Ronald C. Arkin

- Created homeworks, exam questions, and graded assignments and final projects.
- Gave one lecture, and assisted students with material, assignments, and final project.

Graduate Teaching Assistant

January, 2005 - May, 2005

"Computing, Society, and Professionalism". Supervisor: Dr. Ashok Goel

- Assisted with choice and presentation of course material, graded assignments, and proctored exam.
- Answered questions about the material or assignments, and adapted to feedback given by students.

University of Miami, Coral Gables, Florida USA

Teaching Assistant

September, 2000 - August, 2001

Supervisor: Dr. Stephen Murrell

- Grading homework and tests for several courses including Introduction to Programming and Intermediate Programming, and also assisted in creation of tests.
- Duties also include system administration of a Unix system used by students and assisting students when they require help.

MEMBERSHIPS

- Association for Computing Machinery (ACM)
- Institute of Electrical and Electronics Engineers (IEEE)
- IEEE Robotics and Automation Society

SERVICE ACTIVITIES

- Student Review Board of The Tower, interdisciplinary undergraduate research journal (Jan 2007).
- Participated in Mentoring Undergraduate Researchers workshop (January 2007).
- SAIC Opportunity Scholars Mentor (2006-).
- Robotics demonstration for students at Dodgen Middle School, Cobb county, Georgia (December 2006).
- FIRST Lego League (FLL) robotics competition, technical judge (January 2007).