

SURANGA D. HETTIARACHCHI

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EDUCATION

University of Wyoming, Laramie WY
Ph.D., Computer Science, September 2007
Thesis - Distributed Evolution for Swarm Robotics
Advisor - Dr. William M. Spears

University of Wyoming, Laramie WY
M.S., Computer Science, December 2002

University of Wyoming, Laramie WY
B.S., Management Information Systems, December 1999

Australian Computer Society, Complete Examination, June 1995.

National Center for Computing, United Kingdom
Diploma in Computer Studies, December 1993

IDM Computer Studies, Colombo Sri Lanka
Diploma in Advanced Programming Techniques Using COBOL, June 1993

IDM Computer Studies, Colombo Sri Lanka
Diploma in Computer Studies, September 1992

ACADEMIC AND INDUSTRY EXPERIENCE

08/09–present **Assistant Professor, Computer Science Department, Indiana University Southeast** , New Albany, IN

09/07–07/09 **Visiting Assistant Professor, Computer Science and Multimedia Department, Eastern Oregon University** , La Grande, OR

06/08–present : *seasonal* **Consultant, Swarmotics LLC.** , Laramie, WY

06/08–09/08 **Visiting Research Professor, Distributed Robotics Laboratory - University of Wyoming**, Laramie WY

Implemented fully distributed Physicomimetics algorithm on five Maxelbot robots, enhanced obstacle avoidance module (OAM) with extra sensors, and implemented a wireless data transfer module on Maxelbot. Supported by Eastern Oregon University summer faculty research grant.

01/07–09/07 Research Assistant, Distributed Robotics Laboratory - University of Wyoming, Laramie WY

Designing and implementing algorithms for obstacle avoidance module (OAM) that runs on a PIC micro-controller. Integrating OAM on real robotic architecture (MMP5) and testing in different obstacle courses. Funded by Joint Robotics Program, Office of the Secretary of Defense. PI: Dr. William Spears.

02/00–12/06 Teaching Assistant, Computer Science Dept. - University of Wyoming, Laramie WY

Teaching, grading, and preparing assignments for various computer science labs and summer courses.

01/03–12/06 Research Assistant, Computer Science Dept. - University of Wyoming, Laramie WY

Developed a fast learning system, called DAEDALUS (Distributed Agent Evolution with Dynamic Adaptation to Local Unexpected Scenarios), for goal-seeking robot swarms in dynamic environments. Empirically analyzed the feasibility of DAEDALUS for agents with obstructed perception. Investigated the behavior of agents that use the *artificial physics* framework of Drs. William and Diana Spears for navigating through obstacle fields.

5/04–5/05 Research Assistant, Computer Science Dept. - University of Wyoming, Laramie WY

Examined several potential energy models within the *artificial physics* framework, used to control aerial surveillance assets (such as UAVs) tasked with detecting ground-based targets (such as tanks and transport vehicles). Funded by DARPA. PI: Prof. William Spears.

5/05–01/07 : seasonal Instructional Computing Services - University of Wyoming, Laramie WY

Creating and Trouble shooting WebCT and eCompanion web courses for distance learning classes. Assisting instructors and students with web based course technology. Helping patrons with general computer technology.

05/99–08/99 Intern, 3M, St.Paul, MN

Set up the Trading Partner Project web page for sharing of models and project information. GUI prototype development for the CORBA API.

12/99–05/01 Wyoming Cancer Control Network, Laramie, WY

Set up and maintained a database. This project provided a way for health-care professionals to quickly and easily view cancer information and communicate among themselves about issues related to cancer and its treatments, using a searchable web page that provides "quick links" to other pre-screened web pages.

02/94–07/96 IDM Computer Studies, Colombo, Sri Lanka

Worked as a computer instructor and a supervisor for junior instructors. Lectured in various application languages and packages. Coordinated classes. Organized and maintained training programs for new instructors. Prepared employee work schedules and students' practical allocation reports. Maintained computer systems. Managed lab instructors' activities.

COURSES TAUGHT AND CURRENTLY TEACHING

- CSCI-C 202-Class (Computer Programming, *Fall'09 and Spring'10*) (*4 credits*)
- CS 410-Special Topics (Robotic Research, *Spring'09*) (*variable credits*)
- CS 311-Class (Operating Systems, *Spring'09*) (*3 credits*)
- CS 162-Class (Foundations of CS II, *Spring'09*) (*4 credits*)
- CS 260-Class (Data Structures, *Spring'09 and Spring'08*) (*4 credits*)
- CS 360-Class (Object-Oriented Programming with C++, *Winter'09 and Winter'08*) (*4 credits*)
- CS 161-Class (Foundations of CS I, *Winter'09*) (*4 credits*)
- CS 248-Class (Unix Programming, *Winter'09 and Winter'08*) (*3 credits*)
- CS 221-Class (C/C++ Programming, *Fall'08*) (*4 credits*)
- CS 318-Class (Analysis of Algorithms, *Fall'08 and Fall'07*) (*4 credits*)
- CS 410-Class (Robotics, *Spring'08*) (*4 credits*)
- CS 140-Class (Microcomputer Systems, *Spring'08*) (*3 credits*)
- CS 314-Class (Computer Architecture, *Winter'08*) (*4 credits*)
- CS 210-Class (Multi-Agent Systems, *Fall'07*) (*4 credits*)
- CS 301-Class (Assembly Language Programming, *Fall'07*) (*4 credits*)
- COSC 3020-Labs (Analysis of Algorithms, *Fall'02 – Fall'06*) (*4 credits*)
- COSC 2030-Labs (Computer Science II – *Fall'06*) (*4 credits*)
- RESE 0064-Class (Robotics for High School Students (Upward Bound Program), Summer '06) (*6 credits*)
- MBAM 5140-Class (Programming Techniques using JAVA (MBA Program), Summer '04) (*3 credits*)
- RESE 0025-Class (MSW Logo and JAVA Web Start for High School Students (Upward Bound Program), Summer '04) (*4 credits*)
- COSC 1030-Class and Labs (Problem Solving using C++, *Spring '00 – Summer '03*) (*4 credits*)
- COSC 1010-Labs (Introduction to Programming using JAVA, *Spring'00 – Spring '02*) (*4 credits*)

NEW COURSE DEVELOPMENT

- CS 410-Class (Robotics, *Spring'08*) (*4 credits*)
- CS 140-Class (Microcomputer Systems, *Spring'08*) (*3 credits*)
- CS 210-Class (Multi-Agent Systems, *Fall '07*) (*4 credits*)
- RESE 0064-Class (Robotics for High School Students (Upward Bound Program), Summer '06) (*6 credits*)
- RESE 0025-Class (MSW Logo and JAVA Web Start for High School Students (Upward Bound Program), Summer '04) (*4 credits*)

PRINCIPAL AREAS OF RESEARCH

- The control, design, and analysis of distributed adaptive robotic sensing networks
- Development of novel learning and adaptation algorithms for robotic swarms
- Autonomous robot architectures
- Evolutionary algorithms
- Neural networks
- Search algorithms and optimization problems

PAPERS IN PREPARATION

- Hettiarachchi, S. (2010). Effect of obstacle density on swarm survival.
- Hettiarachchi, S. (2010b). Physicomimetics for obstacle avoidance.
- Hettiarachchi, S. (2010c). Using scouts to improve robot survival in dynamic environments.
- Hettiarachchi, S. (2010d). Improving swarm survival with DAEDALUS (in review).

REFEREED JOURNAL, CONFERENCE AND WORKSHOP PUBLICATIONS

- Hettiarachchi, S. and W. Spears (2009). Distributed adaptive swarm for obstacle avoidance. In *International Journal of Intelligent Computing and Cybernetics*, Volume 2 No 4, pp. 644–671. Emerald Group Publishing.
- Hettiarachchi, S., P. Maxim, W. Spears, and D. Spears (2008). Connectivity of collaborative robots in partially observable domains. In *8th International Conference on Control, Automation and Systems (ICCAS 2008)*, pp. 721–728. IEEE.
- Maxim, P., S. Hettiarachchi, W. Spears, D. Spears, J. Hamann, T. Kunkel, and C. Speiser (2008). Trilateration localization for multi-robot teams. In *in Proceedings of the International Conference on Informatics in Control, Automation and Robotics, Special Session on MultiAgent Robotic Systems*, pp. 301–307.
- Hettiarachchi, S., E. Cohen, T. Willey, and N. Schmidt (2008). Developing a mobile robot simulation as a research tool. In J. Meinke (Ed.), *The Journal of Computing Science in Colleges*, Volume 23-6, pp. 181–186. Consortium for Computing Sciences in Colleges.
- Hettiarachchi, S. and W. Spears (2006). DAEDALUS for agents with obstructed perception. In *SMCals/06 IEEE Mountain Workshop on Adaptive and Learning Systems*, pp. 195–200. IEEE Press, Best Paper Award.
- Hettiarachchi, S. (2006). Distributed online evolution for swarm robotics. In T. Ishida and A. B. Hassine (Eds.), *Autonomous Agents and Multi Agent Systems*, pp. 17–18. Doctoral Mentoring Program.
- Hettiarachchi, S., W. Spears, W. Kerr, D. Zarzhitsky, and D. Green (2006). Distributed agent evolution with dynamic adaptation to local unexpected scenarios. In *Second GSFC/IEEE Workshop on Radical Agent Concepts*. Springer.
- Hettiarachchi, S. and W. Spears (2005). Moving swarm formations through obstacle fields. In *International Conference on Artificial Intelligence*, Volume 1, pp. 97–103. CSREA Press.
- Spears, W., D. Zarzhitsky, S. Hettiarachchi, and W. Kerr (2005, invited). Strategies for multi-asset surveillance. In *IEEE Networking, Sensing and Control*, pp. 929–934. IEEE Press.
- Spears, W., D. Spears, R. Heil, W. Kerr, and S. Hettiarachchi (2005). An overview of physicomimetics. In E. Sahin and W. Spears (Eds.), *Lecture Notes in Computer Science State-of-the-Art Series*, Volume 3342, pp. 84–97. Springer.

FUNDING

- Indiana University Southeast, undergraduate student research assistant program grant of \$1000 to support a student assistant, *Spring '10*.
- Indiana University Southeast, summer faculty research fellowship grant of \$8000, *Summer '10*.
- Indiana University Southeast, faculty research support program grant of \$1000 to support a student assistant, *Fall '09*.
- Indiana University Southeast faculty research start-up grant of \$20,000 to start Department of Computer Science Distributed Robotics Laboratory, *Fall '09*.
- Oregon University System - Eastern Oregon University travel grant of \$1000 for “Robotics - Hands-On and Interactive” program presented by Johns Hopkins University Center for Talented Youth and Oregon University System, OR, *Spring '09*.
- Eastern Oregon University faculty summer research grant of \$12,000 for swarm robotics research titled “Distributed Communication Architecture for Robot Swarms” at University of Wyoming Distributed Robotics laboratory, *Summer '08*.
- Eastern Oregon University-Engineering and Technology Industry Council of Oregon funding of \$15,000 for undergraduate robotics research, *Fall '07 - Spring '09*.
- Eastern Oregon University faculty development fund travel grant of \$1300 to present research work at CCSC08, CA, *Spring '08*.
- University of Wyoming travel grant of \$3000 to present research work at AAMAS06 and ISWA, Japan, *Spring '06*.
- University of Wyoming travel grant of \$2000 to present research work at three conferences, *Spring and Fall '05*.

RESEARCH PROPOSALS

- Indiana University Southeast, undergraduate research assistant grant proposal titled “Implement an Obstacle Avoidance Algorithm for X80Pro Robots” (2010), (funded).
- Indiana University Southeast, summer faculty fellowships for research proposal titled “Implementation of a Fully Distributed Control Algorithm on X80Pro Robots” (2009), (funded).
- Indiana University Southeast, faculty research support program grant proposal titled “Funding Request to Implement an Intelligent Robot Localization Technique for X80Pro Robots” (2009), (partially funded).
- Collaborator “Advancing a Physics-Based Control Framework for Distributed Agents”, Submitted to Office of Naval Research, Co-Principal Investigators: Lee Frey, Harbor Branch Oceanographic Institution. Dr. Paul Wiegand III, Florida Atlantic University. Dr. William M. Spears, Swarbotics LLC. (2009) (declined).
- Eastern Oregon University, summer research grant proposal titled “Distributed Communication Architecture for Robot Swarms” in collaboration with University of Wyoming Distributed Robotics laboratory (funded) (2008).
- Principal Investigator: A Novel Approach for Early Detection of Forest Fire. White paper submitted to Union county, Forest Service (declined).
- Principal Investigator: DARPA Small Business Initiative Research Program “Artificial Physics-based Cooperative Behavior in Fluidic Environments”. Co-Principal Investigators: Dr. Kent Henry, ADA Technologies. Professors William and Diana Spears, University of Wyoming. (2007) (declined).
- Principal Investigator: DARPA Small Business Initiative Research Program “Cooperative Robot/Human

Teams for Assessing Chemical Threats". Co-Principal Investigators: Dr. Kent Henry, ADA Technologies. Professors William and Diana Spears, University of Wyoming. (2007) (declined).

INVITED BOOK CHAPTERS

Hettiarachchi, S., P. Maxim, and W. Spears (2008). An architecture for adaptive swarms. In X. P. Gu (Ed.), *Robotics Research Trends*. Nova Publishers.

DOCTORAL AND MASTERS THESES

Hettiarachchi, S. (2007). *Distributed Evolution for Swarm Robotics*. Ph. D. thesis, University of Wyoming.

Hettiarachchi, S. (2002). Using data-marts to create an internet-based system for gathering information. Master's thesis, University of Wyoming.

HONORS AND RECOGNITION

- Nominated for 2010 Indiana University Southeast Distinguished Teaching Award
- University of Wyoming Graduate School Honors, 2007: Oral Presentation Winner (with Paul Maxim)
- Best Paper Award: 2006 IEEE Mountain Workshop on Adaptive and Learning Systems
- Presenter among 24 selected doctoral students out of 96 applicants: 2006 Doctoral Mentoring Program, AAMAS
- Dean's Honor Roll: 1996, 1997 University of Wyoming, College of Arts and Sciences
- International Student Scholarship: 1997, 1999, 2002, 2003, 2006 University of Wyoming
- Dunnawald Memorial Scholarship: 1998, 2004, 2005 University of Wyoming

PRESENTATIONS/PARTICIPATION

- Lunch time talk series, Indiana University Southeast- Institute for Learning & Teaching Excellence, 2009.
- Spring Colloquium, Eastern Oregon University, La Grande, Oregon, USA, 2008.
- First Annual Consortium for Computing Sciences in Colleges - Southwestern Regional Conference California State University - Northridge, California, USA, 2008.
- Textron Corporation, at University of Wyoming, Laramie, Wyoming, USA, 2008.
- Fifth Graduate Student Symposium at University of Wyoming, Laramie, Wyoming, USA, 2006.
- IEEE Mountain Workshop on Adaptive and Learning Systems, Utah State University, Logan, Utah, USA, 2006.
- Doctoral Mentoring Program, Future University of Hakodate, Japan, AAMAS, 2006.
- International Students Workshop on Agents, Kyoto University, Japan, 2006.
- Fourth Graduate Student Symposium at University of Wyoming, Laramie, Wyoming, USA, 2006.
- International Conference on Artificial Intelligence, Las Vegas, Nevada, USA, 2005.
- Second GSFC/IEEE Workshop on Radical Agent Concepts, NASA Goddard Space Flight Center, Washington D.C., USA, 2005.
- IEEE International Conference on Networking, Sensing and Control, Tucson, Arizona, USA, 2005.
- Third Graduate Student Symposium at University of Wyoming, Laramie, Wyoming, USA, 2005.
- Second Graduate Student Symposium at University of Wyoming, Laramie, Wyoming, USA, 2004.

STUDENTS SUPERVISED AND UNDER SUPERVISION

Past and Present Undergraduate Projects

- Brian Wimpsett: A project titled “Predictability of Swarm Distribution in Partially Observable Environments” The project analyzes and predicts the required degree of distribution of a swarm in partially observable environments for effective navigation.
- Michael Francis: A project titled “Real-Time Robotic Sound Localization Using Parallel Processing with CUDA” The project try to improve the efficiency of sound localization using CUDA and GPU.
- Patrick Kaiser and Michael Revel: Research assistants at Indiana University Southeast, Robotics Laboratory. Assisting day to day activities of the laboratory and implementing a robot localization and obstacle avoidance algorithms for X80Pro robots.
- Brad Baker: Capstone Project Advisor (B.S. in CS, *Spring’09*). Implement a simulated dynamic mapping tool for hot-spot detection using a swarm of Physicomimetics driven unmanned aerial vehicles. Currently a MS student at Boise State University, ID.
- Eli Cohen, Tim Willey, Brad Nelson, Brad Baker, Cody Jarrett, and Nathan Schmidt: Fall’07 - current, undergraduate robotic research project. Addresses issues and techniques related to localization, data communication, obstacle avoidance by robot teams, and design and implement these techniques using physical robots.
- Nathan Schmidt: Capstone Project Advisor (B.S. in CS, *Spring’08*). Implement a novel hybrid neuro-evolution technique for digit recognition problem. Currently a MS student at Boise State University, ID.

OTHER PROJECTS COMPLETED

- Evolving Neural Networks for Digit Recognition
- Parameter Optimization using a genetic algorithm for goal seeking physics-based multi-agents in an obstacle course
- Optimizing interaction potentials for multi-asset surveillance
- Search problems and search techniques
- The performance of artificial neural networks in the keep-away RoboCup test-bed
- Chemical plume detection using neuro-evolution
- Implementation of a subset of the UNIX file system
- UW ticket Master Database
- Desktop Medical Assistant System

PROFESSIONAL SOCIETY MEMBERSHIPS

- IEEE
- Consortium for Computing Sciences in Colleges

CONFERENCE ACTIVITIES

- Program Committee Member: 7th International Conference on Informatics in Control, Automation and Robotics, Madeira, Portugal (2010).
- Paper Reviewer: IEEE Congress on Evolutionary Computation, Barcelona, Spain (2010).
- Paper Reviewer: Third Annual Consortium for Computing Sciences in Colleges - Southwestern Regional Conference, California Lutheran University, California, USA (2010).

- Program Committee Member: 8th ACIS-International Conference on Software Engineering Research, Management and Applications - Montreal, Canada (2010).
- Program Committee Member: 21st Midwest Artificial Intelligence and Cognitive Science Conference at IU- South Bend, Indiana, USA (2010).
- Program Committee Member: 7th ACIS -International Conference on Software Engineering Research, Management and Applications - Haikou, Hainan Island, China (2009).
- Paper Reviewer: IEEE International Conference on Evolutionary Computation, Special Session on “Techniques for Online and Distributed Evolutionary Computation” - Trondheim, Norway (2009).
- Paper Reviewer: IEEE/ICROS - International Conference on Control, Automation and Systems - Seoul, Korea (2008).
- Paper Reviewer: First Annual Consortium for Computing Sciences in Colleges - Southwestern Regional Conference, California State University - Northridge, California (2008).

JOURNAL SERVICES

- Reviewer: Applied Swarm Intelligence, Springer. 2009.
- Editorial Board: Journal of Advanced Research in Evolutionary Algorithms (JAREA), 2008 – 2010.
- Co-organizer: Special Issue on Swarm Robotics for the International Journal of Intelligent Computing and Cybernetics (with William M. Spears, 2009).

OTHER ACTIVITIES

- 3rd Place Winner of the UW International Week Photo Contest (2006)
- Robotics demonstrations/talks for UW child care school (2006)
- Robotics demonstrations/talks for Casper school system (2006)
- Presentation to Laramie Junior High School students on Sri Lankan geography and culture (2006)
- Robotics demonstrations/talks for UW Alumni (2005)
- Presentations to incoming undergraduate Engineering students on swarm robotics research
- President, International Student’s Association, University Of Wyoming(1998/1999)
- Ex-Officio, Associated Students Of University of Wyoming (1998/1999)

UNIVERSITY SERVICES

- Computer Science Department faculty representative to Indiana University Southeast open house (2009/2010).
- Organized NAO- Humanoid Robot presentation by Natanel Dukan at Indiana University Southeast (2009)
- Robotic workshops for incoming freshman class at Eastern Oregon University (2009)
- Conduct workshops for “Robotics - Hands - On and Interactive” program presented by Johns Hopkins University Center for Talented Youth and Oregon University System (2009)
- Conduct Robotic workshop for 4H students in “College Life” day at Eastern Oregon University (03/2009)
- Member of the Eastern Oregon University faculty scholar stipend proposals review committee (2008)
- Member of the judging panel of the INTEL-Oregon first LEGO league local tournament (2007, 2008)
- Member of the Cyber Initiatives committee (2007)
- Member of the Graduate School Panel for the students seeking graduate school admission (2007)