

Vytas SunSpiral

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LEADERSHIP OBJECTIVES

Understanding both people and technologies I seek the connections between what exists and what is possible so I can inspire teams to create and innovate with enthusiasm. I research human and robotic motion because understanding the fundamentals of motion gives insight into perception, thought, intelligence, and even applies to how we work as teams and communities. My life-service is providing vision and leadership to the communal effort of deepening our experience and knowledge of being human.

PROFESSIONAL EXPERIENCE

Senior Robotics Researcher, Intelligent Robotics Group **June 2010 - Present**
NASA Ames Research Center, Moffett Field, CA, USA
Employed by Stinger Ghaffarian Technologies

As a senior researcher in the group my responsibilities include developing new lines of research, fostering collaboration with other centers and private industry, providing project leadership, and attracting new sources of funding for the group. Projects I have focused on include: Demonstrating ATHLETE (6 legged 4M tall robot) walking at DRATS field test, Smartphone for SPHERES (free floating robot on International Space Station) Software Architecture, Robotic Tensegrity Structures, Proposals for Lunar Polar Exploration mission studies, and coordinating efforts to use Smartphones as embedded processors for robotics and space applications.

Awards:

Nov. 2011 Ames Contractor Council Certificate of Excellence for ISRDS Human Exploration Tele-Robotics Spheres Team.

Founder and Chief Technology Officer, DemocracyDirect.me **June 2011 – Present**
Democracy Direct aims to change the way we interact with our government, politicians, campaigns and bills. Using social tools we empower you to communicate directly with the politicians that represent you and the ones that think like you.

Board of Advisors, BodyTrack.org **May 2011 - Present**
The BodyTrack project seeks to help people working to track down suspected environment/health interactions (food sensitivities, asthma or migraine triggers, sleep problems, etc.) by building open-source and open-API tools that empower individuals to embark on the process of medical self-discovery.

Chief Technology Officer **Nov 2008 – June 2010**
Board of Advisors **Dec 2007 - June 2010**
Apisphere Inc., Berkeley, CA, USA

Apisphere sells a cloud-based platform for automated Mobile Internet Services for location aware mobile devices. As CTO I've been involved in almost every aspect of the company, providing the center of gravity between the divergent needs of engineering, sales, marketing, funding, customer support, and forward looking technical leadership. Heavily involved in the creation of funding and customer proposals and contracts, Apisphere has grown from zero to \$3M in yearly revenues during my time as CTO. I wrote three, and filed two, patent applications for Apisphere technology.

**Athlete Footfall Project Lead and
PI of Robotic Manipulation Research Lab (ArmLab)
NASA Ames Research Center, Moffett Field, CA, USA
Employed by Carnegie Mellon University**

**Oct 2006 – Jan 2009
Sept 2005 – Jan 2009**

Athlete is a 4 meter diameter, six legged, 42-DOF robot which was built at JPL. I led the effort to automate the walking process, which was being manually teleoperated. This project entailed the development and integration of ground tools for telemetry processing, stereo image processing and integration from 9 stereo pairs, stability analysis, force/torque analysis, motion planning, terrain/obstacle avoidance, 3D visualizations for operator situational awareness, gait generation, leg sequencing, command sequencing, execution monitoring, and field testing at lunar analog sites. For more on the project and links to papers, see:
<http://www.magicalrobot.org/BeingHuman/2011/01/walking-vision-and-self-awareness>

The ArmLab is dedicated to researching dexterous and non-dexterous manipulation. Its assets include two Amtec 7-DOF arms, two Barrett Hands, integrated fingertip 6-axis force torque sensors, stereovision camera systems, and a 5 DOF planetary relevant manipulator. As PI of the ArmLab I managed between 2 to 11 students (undergrad, masters and PhD) as various forms of manipulation were explored, such as: soil manipulation and trenching, compliant grasping, grasping and retrieving deployed communication nodes, remote science instrument placement mechanisms, and DH parameter optimization techniques.

Awards:

April 2009 Group Achievement Award, "Human Robotics Systems Moses Lake Field Test Team"
August 2008 Outstanding Service Award, NASA Ames
June 2007 Outstanding Service Award, NASA Ames

**Robotics Researcher
NASA Ames Research Center, Moffett Field, CA, USA
Employed by QSS Group, Inc.**

June 2002 – Sept 2005

During this time I worked on multiple projects within the Model Based Diagnostics Group and the Embedded Decisions Systems Group. Significant research was done on applying particle filters to hybrid models for fault diagnostics. This work was applied both to planetary rovers and to autonomous drilling rigs. Also, a system to predict operator intention for the control of Robonaut (a humanoid robot) was created. This research involved using Bayesian inference techniques and other statistical models to segment and categorize six dimensional (pose and orientation) motion trajectories. The results could easily be extended to gesture recognition or other HRI applications. A number of papers were published based on these projects.

**Project Lead for Tele-presence Robot
Contract with Mobot Inc., Pittsburgh, PA, USA**

Oct 2001 - Nov 2001

I was brought in as an independent contractor to manage this project through a critical stage of development and ensure it was completed on time. The RAVEN project is an interactive tele-presence robot built for the National Aviary in Pittsburgh that allows remote students to take guided tours of the Aviary. This project involved building the complete robot from the ground up (as opposed to buying a pre-built mobile base). You can read more about the results of this project at: http://upclose.lrdc.pitt.edu/people/louw_assets/RAVEN.PDF

**Robot Personality Engineer and Technical Manager
Mobot Inc., Pittsburgh, PA, USA**

Oct 1998 – Nov 2000

Mobot built and sold unsupervised fully autonomous socially interactive robots. These robots were mainly tour guides in public museums, but we also branched out into other roles for them. As the first employee hired by this small start-up, I had my hand in every aspect of the company. On the technical side, I designed, built, debugged, installed, and personalized robots. Creating practical robots requires a holistic understanding of: electrical and mechanical engineering; AI, vision, and machine learning; human cognition and social interaction; entertainment, education and issues of operating in a public space. As technical manager, I was responsible for overseeing development of new products and technologies. I also worked closely with customers, wrote contracts, worked on PR and marketing, applied for and received government grants, and helped develop a business plan. The robots we built achieved unprecedented records of long term autonomous deployment as they operated autonomously on a daily basis in public spaces for multiple years with no direct human supervision. Pictures of some the robots we built are available at: <http://www.mobotinc.com/>

EDUCATION

**M.S. Computer Science
Stanford University, CA, USA**

June 1998

Masters Advisor: Dr. Oussama Khatib. A self-designed course of study on various aspects of autonomous robotics was completed, along with research into TR trees for Dr. Nils Nilsson (for a report on this work see: <http://ai.stanford.edu/users/nilsson/trweb/learningcontrol.pdf>).

**B.A. With Honors, Symbolic Systems
Stanford University, CA, USA**

June 1997

Symbolic Systems is an interdisciplinary major that includes courses from the departments of Philosophy, Psychology, Linguistics, and Computer Science. A self-designed concentration on robotics and artificial intelligence was completed. Independent research on autonomous robotics, map building in dynamic settings, and hypothesis generation was conducted with Dr. Illah Nourbakhsh and Clay Kunz (see publications).

PATENTS

(Note: Prior to marriage in 2005, published as Thomas Willeke)
Vytas SunSpiral, Craig Harper, Vincent Sheffer, “System for and Method of Location-Based Process Execution,” Patent Pending, filed 2010.

Vytas SunSpiral, Craig Harper, “A System for Improved Passive Sensor Network Tracking of Cellular Mobile Devices Through Control of Communication Cycle Frequency,” Patent Pending, filed 2010.

Thomas Willeke (with Illah Nourbakhsh, Clayton Gregory Kunz, Carolyn O’Brien Green, and Vinton Coffman III). “Socially Interactive Autonomous Robot.” US Patent Number 6760647, granted 7/6/2004, and also US Patent Number 6539284, granted March 25, 2003.

PUBLICATIONS

(Note: Prior to marriage in 2005, published as Thomas Willeke)
All papers are available to download at: <http://www.sunspiral.org/vytas/cv>

JOURNAL ARTICLES

Vytas SunSpiral, DW Wheeler, Daniel Chavez-Clemente, David Mittman, “Development and Field Testing of the FootFall Planning System for the ATHLETE Robots,” *The Journal of Field Robotics*, Vol. 29: pp 483–505. 2012

Clayton Kunz, **Thomas Willeke**, Illah Nourbakhsh. "Automatic Mapping of Dynamic Office Environments." *Autonomous Robots Journal*. Editor George A. Bekey. Kluwe Academic Publishers, Vol. 7, No. 2, September 1999.

CONFERENCE PAPERS

Terrence Fong, Reginald Berka, Maria Bualat, Myron Diftler, Mark Miciric, David Mittman, **Vytas SunSpiral**, Chris Provencher, “The Human Exploration Telerobotics Project,” to appear in Proceedings of *The Global Space Exploration Conference*, Washington, DC, May 2012.

Dawn Wheeler, Daniel Chavez-Clemente, **Vytas SunSpiral**, “FootSpring: A Compliance Model for the ATHLETE Family of Robots.” In Proceedings, *10th International Symposium on Artificial Intelligence, Robotics and Automation in Space*, (i-SAIRAS 2010). Sapporo, Japan, August 2010.

Vytas SunSpiral, Daniel Chavez-Clemente, Michael Broxton, Leslie Keely, Patrick Mihelich, David Mittman, Curtis Collins “FootFall: A Ground Based Operations Toolset Enabling Walking for the ATHLETE Rover”, In Proceedings, *AIAA Space2008*, San Diego, California, Sept. 2008.

Tristan B. Smith, Javier Barreiro, David E. Smith, **Vytas SunSpiral**, Daniel Chavez-Clemente, “ATHLETE's Feet: Multi-Resolution Planning for a Hexapod Robot”, in Proceedings, *International Conference on Automated Planning and Scheduling* (ICAPS), Sydney, Australia, Sept. 2008.

Vytas SunSpiral, Mark B. Allan, Rodney Martin, Kevin R. Wheeler, “Modeling and Classifying Six-Dimensional Trajectories for Tele-operation Under Time Delay”, in proceedings, *AAAI Spring Symposium*, Stanford, CA, 2006

Kevin Wheeler, Rodney Martin, Mark Allan, **Vytas SunSpiral**, “Predictive Interfaces for Long-Distance Tele-Operations”, in Proceedings, *ISAIRAS Conference*, Munich Germany, 2005.

Emmanuel Benazera, Richard Levinson, **Thomas Willeke**, Howard Cannon, “Runtime Decision Sampling and Branch Utility Re-Evaluation in the Robust Execution of Contingent Plans”, In Proceedings of *International Conference of Robotics and Automation*, Barcelona, April 2005.

Thomas Willeke, Richard Dearden, “Building Hybrid Rover Models: Lessons Learned” in *Proceedings of 15th International Workshop on Principals of Diagnosis*, Carcassone, France. June 2004.

Richard Dearden, Frank Hutter, Reid Simmons, Sebastian Thrun, Vandt Verma, and **Thomas Willeke**, “Real-time Fault Detection and Situational Awareness for Rovers: Report on the Mars Technology Program Task”, In Proceedings, *IEEE Aerospace Conference*, March 2004.

Illah Nourbakhsh, Clay Kunz, **Thomas Willeke**, "The Mobot Museum Robot Installations: A Five Year Experiment" In Proceedings of IROS 2003, Las Vegas.

Thomas Willeke, Clayton Kunz, Illah Nourbakhsh. “The History of the Mobot Museum Robot Series: An Evolutionary Study.” *Proceedings of FLAIRS 2001*. Florida. May 2001.

Clayton Kunz, **Thomas Willeke** and Illah Nourbakhsh , "Automatic Mapping of Dynamic Office Environments,". In Proceedings, *IEEE Conference on Robotics and Automation*, volume 2, pages 1681—1687, 1997.

TECHNICAL REPORTS

Rodney A. Martin, Kevin R. Wheeler, Mark B. Allan, and **Vytas SunSpiral**.
“Optimized algorithms for prediction within robotic tele-operative interfaces.”
Technical Report NASA/TM-2010-216417, National Aeronautics and Space Administration, November 2010.

Thomas Willeke. "Genetic Evolution of Behavior-Oriented Robots." *Genetic Algorithms and Genetic Programming at Stanford 1995*, Editor John R. Koza. Stanford University, 1995.

WHITE PAPERS

Vytas SunSpiral. “Automated Location Based Services – an Apisphere Whitepaper”, Feb. 2009
http://www.apisphere.com/pdfs/Apisphere_ALS_WP.pdf

PRESENTATIONS & ACTIVITIES

Invited Presentations

“How We Move: An Exploration of our Minds and Bodies from the Perspective of a NASA Robotics Researcher” Invited presentation at the *We Are=Movement* Seminar Series, San Francisco, CA, April 2012.

“Dynamic Tensegrities: Foundation for Motion and Thought.” Invited presentation to the Biorobotics Lab at Case Western Reserve University, Cleveland, Ohio, April 2012.

“What Can We Learn About Our Bodies and Minds by Researching Robotics?” invited presentation to Department of Electrical & Computer Engineering Research Colloquium, University of Idaho, Feb 2011.

“Biotensegrity and Force Propagation in Human and Robotic Manipulation” invited presentation at Yuri’s Night, NASA Ames, CA, April 2008.

“Control Schemes for Complex Coordinated Human Motion” invited presentation at CoLab’s Luna Philosophie, Yahoo Brickhouse, SF, CA, Feb. 2008.

“Athletic Walking,” invited presentation to the Carnegie Mellon University Robotics Institute, Pittsburgh, PA, November 2007.

“Exploration, Robotics, and the Unknown,” invited keynote presentation given at the *2006 NASA ISGC Research Symposium*, University of Idaho, Moscow, Idaho, October 2006.

“Building Hybrid Rover Models: Lessons Learned,” invited presentation for the *Robot Fault Diagnosis Workshop, International Conference of Robotics and Automation*, New Orleans, Louisiana April 2004.

“A Proposal for the Creation of a Diagnostics and Power Port Standard,” presented at the *AIAA Space Automation & Robotics Symposium*, Naval Research Laboratory, Washington, DC. March 2005.

Session Chair

Chair of Modeling Session, Symposia: “To Boldly Go Where No Human-Robot Team Has Gone Before,” *AAAI 2006 Spring Symposia*, Stanford, CA, March 2006

Conference Panels

Thomas Willeke, William Hefley, Joseph Ballay, Anatole V. Gershman, *Human Computer Interaction in Industry: Experiences from the Field*, Carnegie Mellon University, Sept 1999.

Proposal/Grant/Conference Review Panels

Reviewer for National Robotics Initiative (NRI), AI Panel, March 2012.

Reviewer for Human Robotic Interaction Conference, HRI, 2012

Idaho NASA EPSCoR Technical Advisory Committee, Oct 2010 - Present

Participant on the Grant Review panel for NASA's Planetary Instrument Definition and Development Program, Feb. 2007.

AFFILIATIONS

American Association for Artificial Intelligence (AAAI)
Institute of Electrical and Electronics Engineers (IEEE)