Daniel M. Lofaro Ph.D

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Research Interest

My research interests lie primarily in Humanoid Robotics, Control Systems and Software, Cloud Robotics, Human Robot Interaction (HRI), Human Robot Interfacing, Brain Machine Interfacing (BMI), and Full Body Locomotion/Manipulation.

Education

Drexel University 2008 - 2013
PhD in Electrical and Computer Engineering in Control Systems and Robotics. Dissertation Title:
Unied Algorithmic Framework for High Degree of Freedom Complex Systems and Humanoid Robots
Advisor: Dr. Paul Oh

Drexel University 2006 - 2008
Masters in Electrical and Computer Engineering in Control Systems
Thesis Title: *Control Design to Reduce the Effects of Torsional Resonance in Coupled Systems*
Graduated with Honors

Drexel University 2003 - 2008
Bachelor of Science in Electrical and Computer Engineering in Control Systems
Graduated Cum Laude and with Honors

Fellowships and Awards

NSF-GRFP Honorable Mention 2009
The program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees in the U.S. and abroad.

NSF-EAPSI Fellow 2008
The primary goals of EAPSI are to introduce students to East Asia and Pacific science and engineering in the context of a research setting, and to help students initiate scientific relationships that will better enable future collaboration with foreign counterparts.

Lester Kraus Award 2008
Awarded to Electrical Engineering student who has shown the greatest promise of developing into a creative and socially responsible engineer.

Dean's Fellowship 2008
Non-need-based award for full-time graduate students designed to assist outstanding applicants.

Programming

Proficient Languages: C/C++, Python, MATLAB, Java, C#, LabView
Platforms and OS: Linux, Windows
Computer Control Methods: Real-Time, Inter-Process Communication, Network Based

Lab Skills and Tools

PCB Layout and Design, PCB Surface Mount Population, Soldering (Solder and Solder Paste) Use of: Oscilloscopes, Spectrum Analyzers, Function Generators, Volt-Ohm Meters, Amp Meters, Jigsaws, Band Saws, Routers, Drills, etc. Carpentry skills include both metal and wood working.

Publications

***Reliable Software for Humanoid Robots** RAM 2013
Authors: Dantam, N.; Lofaro, D.; Hereid, A.; Oh, P.; Ames, A.; Stilman, M.
IEEE Robotics and Automation Magazine

***Linear and Non-linear Mitigation of Torsional Resonance...** ACC 2013
Authors: Lofaro, D.; Chmielewski, T; IEEE American Control Conference

*Under Peer-Review

Multi-Process Architecture for Robust Control the Hubo2+ Robot TePRA 2013
Authors: Grey, M.; Dantam, N.; Stilman, M.; Lofaro, D.
IEEE International Conference on Technologies for Practical Robot Applications

Toward A User-Guided Manipulation Framework for High-DOF... TePRA 2013
Authors: Alunni, N.; Phillips-Graffin, C; Suay, H.; Lofaro, D.; Berenson, D.
Chernova, S; Lindeman, R; Oh, P.;
IEEE International Conference on Technologies for Practical Robot Applications

Humanoid Pitching at a Major League Baseball Game Humanoids 2012
Authors: Lofaro, D.; Sun, C.; Oh, P.;
Humanoid Robots (Humanoids), 2012 10th IEEE-RAS International Conference

A n-dimensional Convex Hull Approach for Fault Detection ICCAS 2012
Authors: Lofaro, D.; Lynch, K. Oh, P.;
International Conference on Control, Automation and Systems

Design of Collision-Free Trajectories with Sparse Reachable Maps IROS 2012
Authors: Lofaro, D.; Ellenberg, D. Oh, P.; Oh, JH.;
Intelligent Robots and Systems (IROS), 2012 IEEE/RSJ International Conference

Humanoid Throws Inaugural Pitch at Major League Baseball Game URAI 2012
Authors: Lofaro, D.;Oh, P.;
International Conference on Ubiquitous Robotics and Ambient Intelligence

Design of Humanoids as Interactive Musical Participants IASTED 2011
Authors: Lofaro, D.; Grunberg, D. Oh, P.; Kim, Y.; Oh, J.;
International Association of Science and Technology (IASTED), 2011
International Conference on Robotics

Robot Audition and Beat Identification in Noisy Environments IROS 2011
Authors: Grunberg, D.; Lofaro, D. ; Oh, J.; Kim, Y;
Intelligent Robots and Systems (IROS), 2011 IEEE/RSJ International Conference

Towards a musically-aware humanoid for interactive music... EURASIP 2011
Authors: Kim, Y.; Lofaro, D; Batulaa, A; Grunberg, D;
EURASIP Journal on Audio, Speech, and Music Processing

Visual Beat Tracking: A Novel Approach to Tempo Tracking... Humanoids 2010
Authors: Lofaro, D.; Oh, P.; Oh, J.; Kim, Y.;
Humanoid Robots (Humanoids), 2010 10th IEEE-RAS International Conference

Interactive Games With Humanoids: Playing With Jaemi Hubo Humanoids 2010
Authors: Lofaro, D.; Ellenberg, R.; Oh, P.;
Humanoid Robots (Humanoids), 2010 10th IEEE-RAS International Conference

Developing Humanoids for Musical Interaction IROS 2010
Authors: Kim, Y.; Batula, A.; Grunberg, D.; Lofaro, D. ; Oh, J.;
Intelligent Robots and Systems (IROS), 2010 IEEE/RSJ International Conference

Mechatronics Education: From Paper Design to Product Prototype... FIRA 2009
Authors: Lofaro, D.; Le, T.; and Oh, P.;
Progress in Robotics, ser. Communications in Computer and Information Science

Control Design to Reduce the Effects of Torsional Resonance in... MS Thesis 2008
Author: Lofaro, D.
Masters Thesis, Drexel University Department of Electrical and Computer Engineering

Work Experience

Drexel Autonomous Systems Lab Research Assistant
Philadelphia, PA April 2008 to Present
Researching Complex Control Systems and Robotics. Daniel's dissertation topic is end-effector velocity control for bipedal robots, also known as throwing. Primary care taker of the full-size humanoid robot Jaemi Hubo.

DARPA Robotics Challenge Track A Team: DRC-Hubo Control System Engineer
Philadelphia, PA July 2012 to Present
I work directly with Dmitry Berenson at WPI on the valve opening/closing task of the challenge. In collaboration with Mike Stilman and Neil Dantam at Gerogia Tech I lead the developed of the needed open-source, Linux based, BSD licensed controller for humanoid robots. Our software is the primary control system for the DRC-Hubo team and is currently being used by MIT, WPI, Purdue, Ohio State, Swarthmore College, Georgia Tech, and Drexel University. Team Website: *http://www.drc-hubo.com*

Dragonfly Incorporated Engineer
Philadelphia, PA April 2011 to Present
Testing and modeling of linear actuators for dual rotor unmanned aerial vehicles.

Drexel University Teaching Assistant
Philadelphia, PA April 2008 to Present
Assist professor with electrical engineering lab courses as well as organizing and maintaing Senior Design for the electrical and computer engineering dept.

IEEE (ICRA 2012) Intl conf origination, web des
Piscataway, NJ May 2011 to July 2012
Design and maintain events and website for the International Conference on Robotics and Automation.

NATO (ASI-2012) Technical/Workshop Chair
Cesme, Turkey August 2009 to November 2010
Organize and maintain 6 workshops for an international audience with participation from 23 countries

FIRST Robotics Mentor, Judge, and Volunteer
Villanova, PA March 2006 to June 2010
Coach/mentors for the all girls high school, Agnes Irwin School (Bryn Mawr, PA), FIRST Robotics team and Philadelphia Regional Competition volunteer.

Moog Component Group Assistant Design Engineer
Springfield, PA August 2005 to March 2006
Temperature response testing - Error analysis on positional and rotational actuators - Fault detection circuit design and implementation for positional and rotator actuators - PCB trace verification, Trained in MIL-SPEC soldering.

Evaporated Coatings Inc. Vacuum Deposited Thin Film Assistant Design Engineer
Willow Grove, PA August 2004 to March 2005
Design and implementation of vacuum deposited tin films for the control of optical, thermal and electrical surface properties, design using computer simulations. Implementation via vacuum deposition using electron beam gun.

Invited Talks and Demonstrations

University of Pennsylvania - Philadelphia, PA Spring 2013
Talk Title: DARPA Robot Challenge: The DRC-Hubo Team - Where we are and what we are doing.

Columbia University - New York, NY Fall 2012
Demonstration: Hands on demonstration of the Hubo2+ humanoid robot. Following the demonstration there was a in depth Q&A session with the graduate and undergraduate students in the college of engineering.

Maker Faire - New York, NY Fall 2012
Demonstration: Showed the inner-workings of Hubo the humanoid robot to the do it yourself (DYI) community.

ASME - Drexel University - Philadelphia, PA Summer 2012
Talk Title: Humanoid Pitching at a Major League Baseball Game: Challenges, Approach, Implementation and Lessons Learned

Philadelphia Phillies and Philly Science Festival - Philadelphia, PA Spring 2012

Demonstration: Developed a system to make Hubo become the first full-size humanoid robot to successfully throw the inaugural pitch at a Major League Baseball game, Philadelphia Phillies vs. Chicago Cubs. 45,196 spectators according to the USA Today.
Video: http://danlofaro.com/projects/philliesGame/

Friends of the Free Library - Philadelphia, PA Spring 2012
Talk Title: Humanoid Robots, they are fun!
Included live hands-on demonstration of a miniature humanoid.
Purpose what to get the inner city students exposed to advanced robotics.

Sugartown Elementary School - Sugartown, PA Winter 2011
Demonstration: Hands on demonstration and interactive sessions of ground vehicles, pick and place robots and miniature humanoids for elementary school students.

Philcon 2011 - New Jersey, NJ Fall 2011
Talk Title: Humanoid robots, a step in the right direction?
About Philcon: Started in 1936, Philcon features cutting-edge programming about literature, art, television, film, anime, comics, science, gaming, costuming and cosplay, music, and other topics of interest to fans of sci-fi, fantasy, and horror.

State Senator Invitation - 5^{th} Annual Carole Smith Technology Symposium - Philadelphia, PA Fall 2011
Talk Title: Humanoid Robots, Past, Present, Future. 5^{th} Annual Carole I Smith Technology Symposium. Presented by State Senator LeAnna M. Washington, Hosted by Temple University

Daegu Institute of Science and Technology - Daegu, South Korea Spring 2011
Talk Title: Interactive Games With Humanoids.

Korean Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea Spring 2011
Talk Title: Interactive musical participation with humanoid robots through the use of novel musical tempo and beat tracking techniques in the absence of auditory cues.

Hanyang University - Seoul, South Korea Spring 2011
Talk Title: Visual Beat Tracking

MY Robotics Club, Bryn Mawr College - Bryn Mawr, PA Winter 2010
Talk Title: Humanoid Robots, Past, Present, Future

Philadelphia Please Touch Museum - Philadelphia, PA Spring 2009
Demonstration: Live hands on demonstration for children and adults ages 3 to 99.

Extracurricular Activities

IEEE-Humanoids 2012 Student Activity Board Event Organizer 2012
Designed and implemented student socials and activities for the IEEE-Humanoids 2012 conference in Osaka, Japan. This included organizing daily group lunch and dinners for students, Karaoke night, a day trip to Kyoto, and a Student Banquette. My over all purpose for these events is to "*create an atmosphere conducive for students to get to know each other in a non-academic setting.*" Website: http://humanoids2012.danlofaro.com/

IEEE-ICRA 2012 Student Activity Board Event Organizer 2012
Designed and implemented student socials and activities for the IEEE-ICRA 2012 conference in St. Paul, MN. This included a student dinner with a comedian as well as daily events and activities. My over all purpose for these events is to "*create an atmosphere conducive for students to get to know each other in a non-academic setting.*" Website: http://icra2012.org/student/

Senior Design Robot Competition 2009 - 2011
Designed, implemented, and coached a robot competition for senior students in the Drexel University Senior Design class. The competition consisted of multiple teams and multiple robots. Each robot was less then 1.0m x 1.0m x 1.0m and less then 10kg.

Indoor Aerial Robotics Competition 2008 - 2011
Designed and implemented the Indoor Aerial Robotics Competition from 2008-2011. The IARC

was formed in 2005 by Dr. Paul Oh in parallel with the Congressional mandate that requires 30% of all U.S. deep-strike aircraft to be capable of autonomous navigation by 2015. To keep in line with this mandate, the competition was revised to increase the difficulty each year with the goal of having a "backpack-able" vehicle that flies autonomously inside buildings by 2015.

CoE Engineers Week Annual Egg Drop Competition 2007 - 2011
The Egg Drop competition challenges student, faculty, and professional staff teams to create a recyclable contraption that will protect a large Grade A egg from a free fall of 40 feet or from it gliding down a steel zip line and crashes into a target more than 30 feet below. Scoring is based on a mathematical formula that calculates weight and speed.

IEEE Student Branch Technical Chair 2006 - 2008
Drexel University's IEEE Branch Technical Chair. Designed events and activities for IEEE student branch.

Eita-Kappa-Nu Popsicle Stick Bridge Contest 2008 - 2009
The goal of this competition is to build the lease expensive bridge that can span a 12 inches gap, have a width of at least 3 inches, and hold a load at its center using only the materials listed below. The functioning bridge with the lowest materials cost wins. Please note that this competition is geared towards middle school students to teach them some of the basics of engineering.

Biannual IEEE Lego Robot Competition 2006 - 2008
Design and implementation of the bi-annual Lego robot competition. The competition has the expressed goals of enforcing the knowledge the electrical and computer engineering students have learned in class including robot design, logic and autonomous systems.

NAVY SeaPerch Challenge (regional and national competition) 2009-2011
Judge for high school student robot competition. The SeaPerch Program provides students with the opportunity to learn about robotics, engineering, science, and mathematics (STEM) while building an underwater ROV as part of a science and engineering technology curriculum. Throughout the project, students will learn engineering concepts, problem solving, teamwork, and technical applications.