Robin L. H. Deits

CONTACT
INFORMATION

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EDUCATION

Massachusetts Institute of Technology: Ph.D. Candidate   **Sept. 2012 to Present**

Department of Electrical Engineering & Computer Science, Robot Locomotion Group.

MIT: Master of Science, EE&CS   **Sept. 2014. GPA: 5.0/5.0**

Developed a novel algorithm to segment an environment into convex regions to allow global optimization and applied it to bipedal footstep planning.

MIT: Bachelor of Science, Physics   **June 2011. GPA: 4.9/5.0**

HONORS

Hertz Foundation Graduate Fellowship	**2011**
MIT-Schlumberger Energy Initiative Fellowship	**2012**
MIT Prince Edward Fellowship	**2012**
Phi Beta Kappa Honors Society, Xi Chapter	**2011**
Sigma Pi Sigma Physics Honors Society	**2011**

EXPERIENCE

Robot Locomotion Group

Ph.D. Candidate Researcher   **September 2012 to Present**

Researching motion planning for walking robots:
- Developed the footstep planning software used by Team MIT in the DARPA Robotics Challenge Virtual Robotics Challenge and Robotics Challenge Trials [9]
- Currently developing new techniques to allow global optimization of walking and flying robot motions through mixed-integer convex programming [5, 6]

Engineering Consulting

Subcontracted by Battelle Memorial Institute   **September 2011 to August 2012**

Consulted on a variety of interdisciplinary projects:
- Developed a software system for tracking the digging movements of a live razor clam for the MIT RoboClam project
- Produced a software package for gait control for a novel walking robot
- Conducted experiments and analyzed data to develop a natural language system for human-robot interaction [10, 12]

MIT, Department of EECS, Lab For Electromagnetic and Electronic Systems

Power Electronics and Microcomputer Lab Assistant   **September 2010 to May 2011**

Assisted in teaching the laboratory component of 6.115: Microcomputer Project Lab and 6.131: Power Electronics Lab. Gained expertise designing and debugging systems ranging from power electronics to C and assembly code.

Undergraduate Researcher   **November 2010 to February 2011**

Developed an HTML and JavaScript interface for interacting with data from the NILM power consumption management system.

MIT, Department of Mechanical Engineering, Hatsopolous Microfluids Lab

Undergraduate Researcher   **January 2009 to December 2010**

Worked on the MIT RoboClam project sponsored by Bluefin Robotics and Battelle to design an efficient, biologically inspired burrowing mechanism
- Designed and wrote a genetic algorithm to optimize the robot's control parameters [17]
- Wrote control and data acquisition software for the robot
- Performed analysis of the efficiency and energy consumption of the system [11]
- Ran tests of the robot in the lab and in the field

Siemens Dynamowerk, Berlin, Germany

Intern   **June to August 2010**

Implemented an optimization system in Matlab and achieved significant improvements in expected efficiency of magnetic bearing systems. Work resulted in a patent, granted in June 2012 [14, 8].

Mazemakers, Wellesley, MA

Senior Counselor   **June to August 2008 & 2009**

Designed and taught lessons on a variety of subjects, including Robotics, Video Game Design, and Science.
- Introduced children as young as 8 to basic concepts of programming and engineering
- Developed course plans, activities, and demonstrations for science, photography, game design, art, and robotics classes.

Skills

Computer Science:
- Controls, data analysis, and optimization in Matlab, Python, and LabView
- Additional programming experience in C, C++, Intel 8051 assembly, Java, HTML, CSS, JavaScript, Julia, and Go
- Hardware and FPGA design with BlueSpec
- Data acquisition using National Instruments DAQ hardware and software
- Design and implementation of genetic algorithms and neural networks
- Software including Windows/MacOS/Linux, MS Office, LaTeX, Eclipse, Vim

Electrical Engineering:
- Power electronics circuits, including buck/boost converters, transformers, and rectifiers.
- Analog and digital electronic systems, including Intel, Pic, and Atmel microcontrollers

Mechanical Engineering:
- Mechanical design using Solidworks CAD sofware
- Machine tools including the lathe, milling machine, and CNC mill

Projects

Adaptive Particle Image Velocimetry
- Implemented a recent approach to fluid flow tracking on an FPGA: http://csg.csail.mit.edu/6.375/6_375_2013_www/handouts/finals/group2_report.pdf

Cryptic Crossword Solver
- Applied techniques from linguistics and natural language processing to solving cryptic crossword clues: http://blog.robindeits.com/2013/02/11/a-cryptic-crossword-clue-solver/

Publications

[1] R. Tedrake, S. Kuindersma, R. Deits, and K. Miura, "A closed-form solution for real-time ZMP gait generation and feedback stabilization," *Under review*, 2015. [Online]. Available: http://groups.csail.mit.edu/robotics-center/public_papers/Tedrake15.pdf

[2] S. Kuindersma, R. Deits, M. Fallon, A. Valenzuela, H. Dai, F. Permenter, T. Koolen, P. Marion, and R. Tedrake, "Optimization-based locomotion planning, estimation, and control design for the Atlas humanoid robot," *Autonomous Robots (accepted)*, 2015.

[3] R. Deits and R. Tedrake, "Efficient Mixed-Integer Planning for UAVs in Cluttered Environments," in *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, WA, May 2015.

[4] R. Deits, "Convex Segmentation and Mixed-Integer Footstep Planning for a Walking Robot," Science master's thesis, Massachusetts Institute of Technology, Cambridge, MA, Sep. 2014. [Online]. Available: http://groups.csail.mit.edu/robotics-center/public_papers/Deits14b.pdf

[5] R. Deits and R. Tedrake, "Footstep Planning on Uneven Terrain with Mixed-Integer Convex Optimization," *IEEE-RAS International Conference on Humanoid Robots*, Nov. 2014. [Online]. Available: http://groups.csail.mit.edu/robotics-center/public_papers/Deits14a.pdf

[6] ——, "Computing Large Convex Regions of Obstacle-Free Space through Semidefinite Programming," in *Workshop on the Algorithmic Foundations of Robotics*, Istanbul, Turkey, 2014. [Online]. Available: http://groups.csail.mit.edu/robotics-center/public_papers/Deits14.pdf

[7] A. G. Winter, V, R. L. H. Deits, D. S. Dorsch, A. H. Slocum, and A. E. Hosoi, "Razor clam to RoboClam: burrowing drag reduction mechanisms and their robotic adaptation," *Bioinspiration & Biomimetics*, vol. 9, no. 3, p. 036009, Sep. 2014. [Online]. Available: http://iopscience.iop.org/1748-3190/9/3/036009

[8] R. Deits and M. Lang, "Radial Magnetic Bearing for Magnetic Support of a Rotor," Patent Application US 2013/0 293 051 A1, 2014. [Online]. Available: http://www.freepatentsonline.com/20130293051.pdf

[9] M. Fallon, S. Kuindersma, S. Karumanchi, M. Antone, T. Schneider, H. Dai, C. Perez D'Arpino, R. Deits, M. DiCicco, D. Fourie, T. Koolen, P. Marion, M. Posa, A. Valenzuela, K.-T. Yu, J. Shah, K. Iagnemma, R. Tedrake, and S. Teller, "An Architecture for Online Affordance-based Perception and Whole-body Planning," *Journal of Field Robotics*, 2014. [Online]. Available: http://dspace.mit.edu/handle/1721.1/85690

[10] R. Deits, S. Tellex, P. Thaker, D. Simeonov, T. Kollar, and N. Roy, "Clarifying Commands with Information-Theoretic Human-Robot Dialog," *Journal of Human-Robot Interaction*, vol. 2, no. 2, pp. 58–79, 2013. [Online]. Available: http://humanrobotinteraction.org/journal/index.php/HRI/article/view/112

[11] A. G. Winter, R. L. H. Deits, and D. S. Dorsch, "Critical Timescales for Burrowing in Undersea Substrates via Localized Fluidization, Demonstrated by RoboClam: a Robot Inspired by Atlantic Razor Clams," in *ASME 2013 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, 2013. [Online]. Available: http://gear.mit.edu/Publications/RoboClam/2013_RoboClam_ASME_IDETC_Final.pdf

[12] S. Tellex, P. Thaker, R. Deits, D. Simeonov, T. Kollar, and N. Roy, "Toward Information Theoretic Human-Robot Dialog," in *Robotics: Science and Systems Conference*, 2012. [Online]. Available: http://www.roboticsproceedings.org/rss08/p52.pdf

[13] A. G. Winter, R. L. H. Deits, and A. E. Hosoi, "Localized fluidization burrowing mechanics of Ensis directus," *Journal of Experimental Biology*, vol. 215, no. 12, pp. 2072–2080, 2012. [Online]. Available: http://jeb.biologists.org/cgi/doi/10.1242/jeb.058172

[14] M. Lang and R. Deits, "Radial Magnetic Bearing for the Magnetic Bearing of a Rotor," Patent, 2012. [Online]. Available: http://patentscope.wipo.int/search/en/WO2012084590

[15] A. G. Winter, R. L. H. Deits, D. S. Dorsch, and A. E. Hosoi, "Multi-Substrate Burrowing Performance and Constitutive Modeling of RoboClam: A Biomimetic Robot Based on Razor Clams," in *ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, 2010. [Online]. Available: http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=5654364

[16] A. G. Winter, R. Deits, D. S. Dorsch, A. E. Hosoi, and A. H. Slocum, "Teaching RoboClam to Dig: The design, testing, and genetic algorithm optimization of a biomimetic robot," in *International Conference on Intelligent Robots and Systems (IROS), 2010 IEEE/RSJ*. IEEE, 2010, pp. 4231–4235. [Online]. Available: http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5654364

[17] A. G. Winter, A. E. Hosoi, A. H. Slocum, and R. L. H. Deits, "The Design and Testing of RoboClam: A Machine Used to Investigate and Optimize Razor Clam-Inspired Burrowing Mechanisms for Engineering Applications," in *ASME 2009 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2009*, 2009, pp. 1–6.