

Zachary Dodds

9/7/2015

Professor of Computer Science
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Professional Calling

My overarching goal is to help bring CS capabilities and confidence to as many students as possible – *especially* those who don't consider themselves computer scientists.

Research Interests

(i) I am excited about how CS1 and CS2 curricula – as well as pre-college CS – can promote success along many professional pathways; (ii) I continue, too, to pursue robotics and vision projects and their roles in undergraduate education, including platform development, vision-based robot control, probabilistic map-building, 3d from video, and hand/eye coordination.

Education

Ph.D., Computer Science Department, Yale University, New Haven, CT (2000)
Thesis: *Task Specification Languages for Uncalibrated Visual Servoing*, Advisor: Dr. Gregory D. Hager
M.S., Computer Science, Yale University, New Haven, CT (1996)
Thesis: *A Color Interest Operator for Landmark Selection*
B.A., Mathematics, Yale University, New Haven, CT (1991)
Thesis: Mathematics for Secondary Education

Employment

Professor of Computer Science, Harvey Mudd College (2010-)
Associate Professor of Computer Science, Harvey Mudd College (2005-2010)
Assistant Professor of Computer Science, Harvey Mudd College (1999-2005)
Research Fellow, Yale Center for Computational Vision and Control (1994-1999)
Teaching Assistant, Yale University Department of Computer Science (1995-1999)
Software Developer, HelpMate Robotics, Danbury, CT (1996-1997)
Secondary mathematics and CS teacher, Evansville Day School, Evansville, IN (1992-1994)

Students' honors and accomplishments

The summer of 2015 presented a team of seven first-year students to present parts of a professional development workshop serving teachers from Pomona Unified school district. Such interactions are not typical for college students still contemplating an academic and intellectual identity – to me, the realizations and results from those interactions have been inspiring, and certainly I hope that some of the many middle- and high-school students will identify with that CS curriculum, too. As of 9/7/15, the team

of Rebekah Justice '18, Terrence Diaz '17, David Kwan '18, Preethi Seshadri '18, Marissa Gee '18, and Brenda Castro '18 await word on the team's submission to SIGCSE '16.

In summer 2015, the robotics team of Julio Medina '18, Veronica Rivera '17, David Tenorio '17, Maddie Gaumer '19, and Aaron Leondar (OSU '17) investigated the problem of using visually textured 3d maps as a basis for robot navigation, localization, and spatial reasoning. As of 9/7/15, we await word on the team's submission to ISVC '15.

Earlier students' accomplishments

The conference presentations of Kristina Ming '15 and Chris Eriksen '15, both at CCSC-SW and a AAAI spring symposium in 2014, were another particular point of pride: that team had started from scratch to create HMC's first 3d spatial models, which they then used as the basis for autonomously localizing and navigating a quadrotor helicopter. Their work has been continued by another team, Alex Rich '16 and John Allard (Glendale Community College) through summer '14.

First place, 2011 LA County Science Fair, mathematics and computer sciences division, by Kenny Lei (Walnut H.S. '12) worked with me in 2009 and 2010 on a variety of robot projects, including this one, in which he quantified the extent to which the addition of an autonomous aerial platform improved a ground robot's navigation efficiency. Kenny earned a spot in the 2011 Intel International Science and Engineering Fair, where he won the Award of Excellence from the U.S. Army and was selected to present at the AAAS Pacific Division annual meeting on June 16, 2011.

First place out of 72 teams, 2010 Southern California Programming Competition, by Anak Yodpinyanee '12, Daniel Fielder '11, and Stuart Pernsteiner '12; the team had a 72nd place showing in the International Computer Programming Competition in Orlando, Florida in May, 2011.

First place out of 70 teams, 2009 Southern California Programming Competition, by Anak Yodpinyanee '12, Daniel Fielder '11, and Stuart Pernsteiner '12; the team had a 64th place showing in the International Computer Programming Competition in Harbin, China in February, 2010.

Neuron Robotics's award for *Most elegant robotic solution* and cash prize to Zeke Koziol (HMC '10), Sabreen Lakhani (HMC '11), and Anatole Paine (HMC '11) at the 2009 Robotics Innovations Competition and Conference, November 7-8, 2009 at Worcester Polytechnic Institute for their machine-learning approach enabling a webcam to emulate a laser range scanner.

First place, 2009 Richard Tapia Robotics Competition: Rebecca Green, Sabreen Lakhani, Kate Burgers (all HMC '11) for *import antigravity*, a landmark-finding iRobot Create, Portland, OR. (2009)

Judges' Blue Ribbon for Education, to P. Mawhorter (HMC '08), Z. Koziol (HMC '10), E. Shaver (HMC '09), for their work presented at the 2008 AAAI robot workshop and exhibition. This was a demonstration of several accessible robot platforms, bridging the motivational goals of robot-based education and the research successes of recent mapping and spatial-reasoning algorithms.

First place, 2007 Richard Tapia Robotics Competition: Jessica Wen, Rachel ArceJaeger, and Vedika Khemani, (all HMC '10) for HMC Hammer, a landmark-finding iRobot Create, Orlando, FL. (2007)

2007 AAAI robot exhibition, recognition for *the design and deployment of accessible, low-cost platforms for undergraduate robotics*: Morgan Conbere (HMC '08) AAAI, Vancouver, BC. (2007)

2006 AAAI robot exhibition, judges' award for *the introduction of a novel, low-cost platform for research and education*: Ben Tribelhorn (HMC '07) AAAI, Boston, MA. (2006)

First place, 2005 AAAI Robotics competition, Scavenger Hunt: Susanna Ricco, Alan Davidson, Mac Mason (all HMC '06) and Ben Tribelhorn (HMC '07) AAAI, Pittsburgh, PA (2005). This award included the prize of a Sony AIBO canine robot.

Technical Achievement Award for *Overall Excellence in a Fully Autonomous System* across all AAAI robotics competition categories, by the four students listed above, at AAAI 2005.

Third place, 2005 ACM Student research competition, undergraduate division: Kamil Wnuk (HMC '06) Mapping with Monocular Vision, ACM Awards banquet (2005)

First place, 2005 SIGCSE undergraduate student research competition: Kamil Wnuk (HMC '06) Mapping with Monocular Vision, St. Louis, MO (2005)

Last place, 2004 Botball Collegiate Competition, collocated with AAAI 2004 in San Jose, CA. Although our team did not fare well in this competition, several of the group noted that the experience was one of the highlights of their HMC experience!

Individual honors

Computing Curriculum Coordinator (2015-), a cross-college "ambassadorship" to work with non-CS departments
Leonhard-Johnson-Rae Professor of Computer Science (2014-)
Joseph Platt Professor of Effective Teaching (2012-2014)
Howard and Iris Critchell Assistant Professorship (2003-4)
Yale University Teaching Fellowship Prize (1998)
Yale University Teaching Fellowship Nomination (1996, 1998)
B.A., Summa cum Laude, Yale University (1991)
Kaplan Mathematics Prize, Yale University (1991)
Phi Beta Kappa (1990)

Workshops, symposia, and exhibitions organized

[organizer] 2015 MyCS workshop July 21-25, 2015. A week-long professional-development workshop for 32 middle-years teachers from the Pomona Unified School District and surrounding areas. Building from the 2014 MyCS workshop: July 21-25, 2014.

[organizer] 2015 MyCS workshop June 9-13, 2015. A week-long professional-development workshop for 12 middle- and elementary-school teachers largely from the Kauai Unified School District; some were also from private schools on that island. Building from the 2014 MyCS workshop: June 9-13, 2014.

[co-organizer] 2015 ICRA workshop entitled *Robotics Research and Education for Undergraduates: Resources and Practices that Maximize Both*, presented May 30, 2015. This shared the REU efforts at HMC and our students' pathway into and through research projects. Co-organized with Bill Smart of OSU.

[organizer] 2015 NSF showcase March 5, 2015. Touting the Middle-School outreach curriculum, MyCS, which has been adopted in schools in the SW U.S. and has reached over 3,000 students *during the academic day as part of the regular school curriculum*.

[organizer] 2014 NSF showcase March 6, 2014. Touting the HMC Core Lab and our students' projects... with OSU's Bill Smart and again with Mac Mason.

[organizer] 2013 MyCS workshop July 8-12, 2013. A week-long professional-development workshop for twenty middle-years teachers largely from the Pomona Unified School District; a few came from other districts, as well.

[organizer] 2013 MyCS workshop June 10-14, 2013. A week-long professional-development workshop for 12 middle-years teachers largely from the Kauai Unified School District; some were from private schools on that island.

[co-organizer] 2013 SIGCSE workshop entitled ROS at Every Level: Using the Robot Operating System in CS 0, 1, 2, and beyond, March 6, 2013. Touting the HMC Core Lab and our students' projects... with OSU's Bill Smart and again with Mac Mason.

[co-organizer] 2012 SIGCSE workshop entitled ROS for Educators: Teaching with the Robot Operating System (ROS) and Microsoft's Kinect, February 29, 2012, with Mac Mason, HMC '06!

[chair] AAAI Robot exhibition and workshop: Robotics-education track, as part of AAAI '11, San Francisco, CA. August 7-11, 2011.

[co-organizer] EAAI: *Educational Advances in Artificial Intelligence* a symposium collocated with AAAI presenting contributions of, by, and for the community of AI educators. [with chair M. des Jardin, et al., AAAI '11, San Francisco, CA: August 7-11, 2011]

[co-organizer] EAAI: *Educational Advances in Artificial Intelligence* a symposium collocated with AAAI presenting contributions of, by, and for the community of AI educators. [with chair M. Sahami, et al., AAAI '10, Atlanta, GA: July 11-15, 2010]

[co-chair] AAAI Robot exhibition and workshop: Robotics-education track, as part of AAAI '10, Atlanta, GA. July 11-15, 2010.

[co-chair] IJCAI Robot exhibition: Student robotics challenge, chaired with Deborah Burhans, as part of IJCAI '09, Pasadena, CA. July 11-17, 2009.

[co-chair] AAAI AI Education Colloquium, chaired with Haym Hirsch and Kiri Wagstaff, as part of AAAI '08 and the AAAI Teaching Forum, Chicago, IL. July 14, 2008.

[chair] AAAI Spring Symposium on Using AI to Motivate Greater Participation in Computer Science, organized with Mehran Sahami, Marie desJardins, Jeffrey Forbes, Tim Huang, Caitlin Kelleher, Tom Lauwers, Todd Neller, and Illah Nourbakhsh. Stanford, CA. March 26-28, 2008.

[chair] SIGCSE workshop, Computer Vision and Image Processing: Accessible resources for undergraduate CS curricula, organized with Bob Avanzato, Doug Blank, Bruce Maxwell, Lisa Meeden, and David Touretzky, as part of SIGCSE '08 Portland, OR. March 12, 2008.

[chair] AAAI Robot exhibition, part of the AAAI '07 robotics competition and exhibition, Vancouver, BC. July 22-26, 2007.

[chair] AAAI Spring Symposium on Robots and Robot Venues: Resources for AI Education, organized with Doug Blank, Paul Rybski, Jerry Weinberg, and Holly Yanco Stanford, CA. March 26-28, 2007.

[chair] SIGCSE workshop, A hands-on exploration of educational robotics, organized with Doug Blank, as part of SIGCSE '07 Covington, KY. March 9, 2007.

[chair] AAAI Robot scavenger hunt, part of the AAAI '06 robotics competition and exhibition, Boston, MA. July 16-20, 2006.

[chair] SIGCSE workshop on Emerging Robotic Resources in Undergraduate CS, organized with Doug Blank and Paul Rybski, as part of SIGCSE '06 Houston, TX. March 3, 2006.

[co-organizer] AAAI Spring Symposium on Accessible, Hands-on AI and Robotics Education, organized with L. Greenwald (chair), A. Howard, S. Tejada, and J. Weinberg. Stanford, CA: March 22-24, 2004.

[co-organizer] Tutorial in Recent Methods for Image-Based Modeling and Rendering, IEEE Virtual Reality Conference, organized with M. Jagersand (chair), D. Burschka, D. Cobzas, G. Hager, and K. Yerer. Los Angeles, CA: March 22, 2003.

[co-organizer] Workshop on Vision-based Motion Control in Human Environments, at the IEEE International Symposium on Computational Intelligence in Robotics and Automation, organized with M. Jagersand and G. Hager (chair). Banff, Alberta: August 1, 2001.

Publications

Journal Issues Edited

Robots and Robotics in Undergraduate AI Education, a special issue of *AI Magazine*, by Dodds, Z., Greenwald, L., Howard, A., Tejada, S., and Weinberg, J., editors. Volume 27, Number 1, Spring 2006, AAAI Press

Book Chapters

Integrating an undergraduate elective with research experiences, by Z. Dodds. In Karukstis and Elgren, Eds. Designing, Implementing, and Sustaining a Research-Supportive Undergraduate Curriculum. CUR Publications, Washington, DC. 2007.

Incremental Focus of Attention: A Layered Approach to Robust Vision and Control, by K. Toyama, G. D. Hager, and Z. Dodds in Robust Vision for Vision-based Control of Motion, IEEE Press, 2000.

Journal articles

Schofield, E. '13, M. Erlinger, and Z. Dodds. MyCS: A CS Curriculum for Middle-years Students *Journal of Computing Sciences in Colleges* 29(4) April, 2014, pp. 145-155.

Eriksen, C. '15, K. Ming '15, and Z. Dodds. Accessible Aerial Robotics *Journal of Computing Sciences in Colleges* 29(4) April, 2014, pp. 218-227.

Dodds, Z. Pixels as polymers: Unifying introductory biology and computer science through visual computation, *The Journal of Computing Sciences in Colleges* 26(4), April 2011, pp. 130-138.

Mawhorter, P. (HMC '08), Koziol, Z. (HMC '10), Shaver, E. (HMC '09), and Dodds, Z. *A Tale of Two Platforms: Low-cost Robotics in the CS Curriculum*. *The Journal of Computing Sciences in Colleges* 24(4), 2009, pp. 180-188.

Dodds, Z., Greenwald, L., Howard, A., Tejada, S., and Weinberg, J. *Components, Computation, and Community: Robots and Robotics in Undergraduate AI Education*. *AI Magazine* 27(1), Spring 2006. pp. 11-22.

Hespanha, J., Dodds, Z., Hager, G. D., Morse, A. S. *What Tasks can be Performed with an Uncalibrated Stereo Vision System?* *International Journal of Computer Vision*, 35(1): 65-85, Nov. 1999.

Dodds, Z., Wang, J., and Miranker, W. *Principal Component Analysis for Place Recognition*, *The Journal of Neural, Parallel, and Scientific Computations*, Volume 5: 347-358, 1997.

Magazine and newsletter articles

C. Alvarado, Z. Dodds, and R. Libeskind-Hadas. ***Broadening Participation in Computing at Harvey Mudd College***, *ACM Inroads* 3(4), 2012.

S. Chernova, Z. Dodds, M. Stilman, D. S. Touretzky, and A. Thomasz. ***Report on the AAAI 2011 Robot Exhibition***, *AI Magazine* 33(3), summer 2012. AAAI Press.

Z. Dodds, M. Erlinger, and E. Sweedyk, ***Middle-school CS? Yes!*** Special Issue of *CSTA Voice Computer Science K-8: Building a Strong Foundation* CSTA and ACM, pubs. NY, NY, 2012.

M. D. Anderson, S. Chernova, Z. Dodds, A. L. Thomasz, and D. S. Touretzky. ***Report on the AAAI 2010 Robot Exhibition***, *AI Magazine* 32(3), pp. 109-118. AAAI Press.

Refereed Conference Papers (HMC student co-authors are cited by graduation year)

J. Allard, A. Rich, I. Aguilar, and Z. Dodds. ***Robot Spatial Reasoning Via 3D Models***, presented at ICMCSSE, May, 2015 Montreal, Quebec.

Z. Dodds, K. Ming '15, C. Eriksen '15, S. Hsiung '16, X. Huang '16, and Z. Davidson '16. ***A Computational Focus for Robotics Education*** Proceedings of the AAAI Spring Symposium KRR '14, March 23-25, 2014., Stanford, CA.

Z. Dodds and M. Erlinger. ***MyCS: CS for middle-years students and their teachers*** Proceedings, SIGCSE 2014, Atlanta, GA, March 5-8, 2014, pp. 337-342.

N. Berezny, CalPoly '12, Brad Jensen, '13, Lilian de Greef '12, Malen Sok, CalPoly '13, Kim Sheely '12, and Z. Dodds. ***Accessible Aerial Autonomy***, Proceedings, IEEE International Conference on Technologies for Practical Robot Applications, Boston, MA April 23-24, 2012.

Z. Dodds, R. Libeskind-Hadas, and E. Bush. ***Bio1 as CS1: evaluating a crossdisciplinary CS context***, Proceedings, ITiCSE 2012, Haifa, Israel, July 3-5, 2012.

N. Berezny, CalPoly '12, Lilian de Greef '12, Brad Jensen '13, Kimberly Sheely '12, Malen Sok, CalPoly '13, and Zachary Dodds. ***CWIC-SoCal 2012*** April 14-15, 2012.

Z. Dodds, ***Can quadrotors succeed as an educational platform?*** Proceedings, 20th AAAI Robotics workshop and exhibition, San Francisco, CA August 8-11, 2011.

N. Lape, D. Harris., Z. Dodds, M. Keeter, and M. Ong, ***Autonomous Vehicles: A hands-on interdisciplinary freshman course***, presented and published at the 118th ASEE Annual Conference and Exhibition Vancouver, BC, June 26-28, 2011.

M. Leece (HMC '11), N. Lesperance, S. Matsumoto (HMC '12), M. Korbel (HMC '13), K. Lei, and Z. Dodds. *PixelLaser: Evaluating Monocular Range from Texture*, Proceedings, IEEE International Conference on Technologies for Practical Robot Applications, Boston, MA April 11-12, 2011.

Lape, N., Harris, D., Dodds, Z., Keeter, M. (HMC '11), and Ong, M. (HMC '11), *Autonomous Vehicles: A hands-on interdisciplinary freshman course*, accepted to the 118th ASEE Annual Conference and Exhibition Vancouver, BC, June 26-28, 2011.

Garcia, D., Dodds, Z., Huang, T., Rebelsky, S. *Teaching tips we wish they'd told us before we started*. SIGCSE 2011, Dallas, TX, March 10-13, 2010.

Grasel, J. (HMC '12), Vonnegut, W. (HMC '11), and Dodds, Z. *Bitwise Biology: Crossdisciplinary physical computing atop the Arduino*. AAAI Spring Symposium on Using Electronic Tangibles to Promote Learning, Tom Lauwers, chair, Palo Alto, CA, March 22-24, 2010.

Alvarado, C. and Dodds, Z. *Women in CS: An evaluation of three promising practices*. SIGCSE 2010, Milwaukee, WI, March 10-13, 2010.

Koziol, Z. (HMC '10), Lakhani, S. (HMC '11), Paine, A. (HMC '11) and Dodds, Z. *A vision for spatial-reasoning commodity robots*. Proceedings, IEEE Int. Conf. on Technologies for Practical Robot Applications (TePRA '09), Woburn, MA, Nov. 9-10, 2009.

Koziol, Z. (HMC '10), Paine, A. (HMC '11), Lakhani, S. (HMC '11), and Dodds, Z. *Createing Range from Texture*. Proceedings, 2009 Robotics workshop of the International Joint Conferences on Artificial Intelligence (IJCAI '09), Pasadena, CA, July 11-17, 2009.

Garcia, D. Cutler, R, Dodds, Z., Roberts, E., and Young, A. *Rediscovering the Passion, Beauty, Joy and Awe : Making Computing Fun Again*. (special session) SIGCSE 2009, Chattanooga, TN, March 4-7, 2009, pp. 217-218. ACM Press.

Smith, D. (HMC '09) and Dodds, Z. *Visual Navigation: Image Profiles for Odometry and Control* Proceedings, Consortium for Computing in Small Colleges (CCSC-SW '09) SanDiego, CA, April 3-4, 2009, pp. 168-179.

Hoersting, H. (HMC '10), Bilitchenko, L. (CA Poly, Pomona '11), and Dodds, Z. *Visual Loop-Closing with Image Profiles*. Proceedings, the 24th annual ACM Symposium on Applied Computing (SAC 2009, March 9-12, 2009), pp. 1166-1170, ACM Press.

Dodds, Z. *Leveraging laptops for low-cost, full-fledged outdoor robotics*. Proceedings, Consortium for Computing in Small Colleges (CCSC-RM '08 Colorado Springs, CO, October 17-18, 2008) 24(1) pp. 158-166.

Mawhorter, P. (HMC '08), Koziol, Z. (HMC '10), Shaver, E. (HMC '09), and Dodds, Z. *Mapping for All*. Proceedings of the 2008 AAAI Robotics Exhibition and Workshop, Chicago, IL, July 13-17, 2008, AAAI Press.

Dodds, Z., Alvarado, C., and Sood, S. *Making Research Tools Accessible for All AI Students*. (under review) Proceedings, 2008 AI Education Colloquium (at AAAI '08), Chicago, IL, July 13-17, 2008, AAAI Press.

Dodds, Z. *Leveraging laptops: Resources for low-cost low-level AI*. Proceedings, 21st Conference of the Florida Artificial Intelligence Research Society (FLAIRS '08), Coconut Grove, FL, May 15-17, 2008, AAAI Press.

Dodds, Z. *AI Assignments in a CS 1 Course: Reflections and Evaluation*. Proceedings, 2008 Conference of the Consortium for Computing Sciences in Colleges (CCSC-SW '08). Northridge, CA, April 18-19, 2008. ACM Press.

Dodds, Z. *Leveraging AI's breadth in CS 1*. AAAI Spring Symposium on Using AI to Motivate Greater Participation in Computer Science. March 26-28, 2008, Stanford, CA. AAAI Press.

Dodds, Z, Alvarado, C., Libeskind-Hadas, R., and Kuenning, G. *Evaluating a Breadth-First CS 1 for Scientists*. Proceedings, 2008 Conference of the Special Interest Group in Computer Science Education (SIGCSE '08) (SIGCSE paper acceptance rate: 31%). March 12-15, 2008, Portland, OR. ACM Press.

Markham, L. (HMC '09), Melton, S. C. (U Chicago, '10), and Dodds, Z. *Robot control via region-based 3d reconstruction*. Proceedings, Intelligent Systems and Control (ISC '07) November 19-21, 2007, Cambridge, MA. ref. 592-151. ACTA Press.

Conbere, M. (HMC '08) and Dodds, Z. *Toys and Tools: Accessible Robotics via Laptop Computers*. Proceedings, 2007 AAAI Robot Workshop, July 23, 2007, Vancouver, BC. AAAI Press

Dodds, Z, Alvarado, C., Libeskind-Hadas, R., and Kuenning, G. *Breadth-First CS 1 for Scientists: Curriculum and Assessment*. Proceedings, 2007 Conference on Innovation and Technology in Computer Science Education (ITiCSE '07), June 25-27, 2007, Dundee, Scotland, ACM Press.

Tribelhorn, B. (HMC '07) and Dodds, Z. *Evaluating the Roomba: A low-cost, ubiquitous platform for robotics research and education*. Proceedings, 2007 International Conference on Robotics and Automation, pp. 1393-1399, Rome, Italy, April 2007, IEEE Press.

Tribelhorn, B. (HMC '07) and Dodds, Z. *Envisioning the Roomba as AI Resource: A Classroom and Laboratory Evaluation*. Proceedings of the 2007 Spring Symposium: Robots and Robot Venues: Resources for AI Education. Stanford, CA, March 2007, AAAI Press.

Tribelhorn, B., (HMC '07) and Dodds, Z. *Roomba and Mac OS X: Cross-platform Vision and Robotics for AI*. Technical Report from the 2006 AAAI Robot Workshop. January, 2007, AAAI Press.

Dodds, Z. and Karp, L. (HMC '04). *The evolution of a computational outreach program to secondary school students*. Proceedings, 2006 ACM SIGCSE Symposium, pp. 448-452. Houston, TX Mar. 1-5, 2006.

Dodds, Z. *Designing an AI elective to Encourage Undergraduate Research*. Proceedings of the 19th International FLAIRS Conference (FLAIRS 2006), Melbourne Beach, FL, May 11-13, 2006.

Dodds, Z and Tribelhorn, B., (HMC '07). *Cost-effective Peripheral Robotics for AI Education*. Proceedings, AAAI 2006, Boston, MA, July 2006, AAAI Press.

Davidson, A. (HMC '06), Mason, M. (HMC '06), Ricco, S. (HMC '06), Tribelhorn, B. (HMC '07), and Dodds, Z. *Scavenging with a Laptop Robot* Proceedings of the 2005 AAAI Robot Workshop, WS-05-11, Pittsburgh, PA July 13, 2005. AAAI Press, pp 11-15.

Davidson, A. (HMC '06), Tribelhorn, B. (HMC '07), Leung, T. (HMC '05) and Dodds, Z. *Low-cost sensing for laptop robots* Proceedings of the 2005 Robotics and Automation conference (RA '05) Cambridge, MA Oct. 31-Nov. 2, 2005, pp. 329-333.

Wnuk, K. (HMC '06), Dang, F. (HMC '07), and Dodds, Z. *Dense 3d mapping with monocular vision*. In the Proceedings of the 2nd International Conference on Autonomous Robots and Agents, December 13-15, 2004, University of Massey, Palmerston North, New Zealand.

Dodds, Z., Santana, S. (HMC '06), Erickson, B. (HMC '04), Wnuk, K. (HMC '06), Fischer, J. (HMC '05), and Livianu, M. (HMC '05). *Teaching Robot Localization with the Evolution ER1*, AAAI Spring Symposium on Accessible, Hands-on AI and Robotics Education (SSS '04), Stanford, CA: pp. 18-23, March 2004.

Dodds, Z. and Hager, G. D. *Handling Discontinuities in Stereovisual Alignment Tasks*, International Conference on Intelligent Robots and Systems (IROS '03), Las Vegas, NV: pp. 479-484, October, 2003.

Takacs, G. (HMC '05) and Dodds, Z. *Resources for Sensor-Limited Autonomous Robotic Mapping*, International Conference on Computer, Communication, and Control Technologies (CCCT '03), Orlando, FL: July, 2003.

Dodds, Z. and Hager, G. D. *Complete Languages for Visually Specified Tasks: From Theory to Practice*, by 2000 World Automation Conference (WAC '00), Maui, HI: June 2000.

Dodds, Z. and Hager, G. D. *On Specifying and Performing Visual Tasks with Qualitative Object Models*, 2000 International Conference on Robotics and Automation (ICRA '00), pp. 636-643, June 2000.

Dodds, Z., Hespanha, J., Hager, G. D., and Morse, A. S. *Task Specification and Monitoring for Uncalibrated Hand/Eye Coordination*, by 1999 International Conference on Robotics and Automation (ICRA '99), pp. 1607-1613, April 1999.

Dodds, Z., Jagersand, M., Toyama, K., and Hager, G. D. *A Hierarchical Vision System for Robotic Manipulation*, by Z. Dodds, M. Jagersand, K. Toyama, and G. D. Hager, 1999 International Conference on Vision Systems (ICVS '99), LNCS 1542, pp. 312-330, Jan. 1999.

Hespanha, J., Dodds, Z. Hager, G. D., and Morse, A. S. *Decidability of Robot Positioning Tasks Using Stereo Vision Systems*, 37th IEEE Conference on Decision and Control (CDC '98), pp. 3736-3741, Dec. 1998.

Hespanha, J., Dodds, Z., Hager, G. D., and Morse, A. S. *What can be Done with an Uncalibrated Stereo System?*, 1998 International Conference on Robotics and Automation (ICRA '98), pp. 1366-1372, July 1998.

Dodds, Z. and Hager, G. D. *A Projective Framework for Constructing Accurate Hand-Eye Systems*, IROS 1997 Workshop on New Trends in Image-Based Robot Servicing, pp. 71-82., September 1997.

Dodds, Z. and Hager, G. D. *A Color Interest Operator for Landmark Selection*, 1997 Conference of the American Association for Artificial Intelligence (AAAI '97), pp. 655-660, July 1997.

Hespanha, J., Dodds, Z. Hager, G. D., and Morse, A. S. *What can be Done with an Uncalibrated Stereo System?* The Confluence of Vision and Control: Proceedings of the 1996 Block Island Workshop on Vision and Control, Springer LNCIS 1998, pp. 79-89.

Posters and Other publications

Booth, J. T., Jones, J., Schaeffer, K., Woodall, K., Kumar, R., Dodds, Z., and Donelick, R. *Mapping for Microscopes: Automating Apatite-Image Handling*, presented at the geological conference Goldschmidt 2015, Prague, Czech Republic, August 34-28, 2015

Z. Dodds. *Ask a Prof: Energy at HMC, The Muddraker*, Volume XVIII, Issue II, February 2009, p 4.

Z. Dodds. *If CS for Scientists == CS 1: In Proceedings, 2007 Microsoft Research Workshop on Computational Education for Scientists*, Sep. 27, 2007, Seattle, WA, Microsoft Corp, pp. 27-8.

T. Barkowsky, P. Bruza, Z. Dodds, et al. *AAAI 2007 Spring Symposium Series Reports. AI Magazine* pp. 94-99. Fall 2007, AAAI Press.

P. Rybski, J. Forbes, D. Burhans, Z. Dodds, P. Oh, M. Scheutz, and B. Avanzato. *The AAAI 2006 Mobile Robot Competition and Exhibition. AI Magazine* pp. 101-110. Summer 2007, AAAI Press.
The 2004 AAAI Spring Symposium Series, by L. Canamero, Z. Dodds, et al., *AI Magazine*, 25(4): Winter 2004, pp. 95-100.

Z. Dodds. *Task Specification Languages for Uncalibrated Visual Servoing*, Ph.D. Thesis, Yale University Department of Computer Science, May 2000.

Z. Dodds and G. D. Hager. *On Accurate Performance of Metrical Tasks with Inaccurately Calibrated Vision Systems*, Technical Report, Yale University Department of Computer Science, 1996.

Grants Awarded and other funded projects

NSF awards

[\$358,000] REU Site in Computer Systems (with Ben Wiedermann, co-PI) This REU site proposal extends our summer research efforts beyond HMC itself, bringing students from around the country to Mudd for the summer. (March 2014-February 2017).

[\$595,000] MyCS: Middle-years Computer Science (with Mike E.) This CE21 project proposed the regional deployment of a CS curriculum for middle-school students. (May 2013-April 2016). This project built upon prior summers' workshops and curriculum development.

[\$289,740] Harvey Mudd College Online: Increasing access in computer science and physics, a proposal to William Gates to support the creation of MOOCs for AP curricula in CS and physics, led by Maria Klawe, with co-PIs Mike Erlinger, Sharon Gerbode, and Peter Saeta. (June 2013-August 2014,). (Official number and title: Grant no. OPP1090712, "Online Courses in Computer Science and Physics for Middle and High School Students")

[\$367,461] PI on *REU Site: HMC REU in Systems* CNS-1063169 (PI with co-PI M. O'Neill and PI Emeritus R. Libeskind-Hadas)

[\$27,000] RET supplement to NSF CISE CPATH CNS-#0939149 *Modular CS1 from the Inside Out: Computational Thinking for all STEM Students*.

[\$797,692] co-PI on award #0939149 *Modular CS1 from the Inside Out: Computational Thinking for all STEM Students* with C. Alvarado (PI), R. Libeskind-Hadas (co-PI), and G. Kuenning (co-PI). 2009-2012

[\$133,133] PI on award #0536173 *Laptop Robotics: Expanding students' access and robots' applications by mobilizing existing resources*. 2006-2009

[\$132,252] PI on award #0411176 *From Toys to Tools: Broadening the Reach of the Next-Generation Robotics Laboratory* with co-PI J. Marshall (Pomona College). 2004-2006

Other awards

[Murphy Foundation] award of \$10000 for *Middle-years Computer Science* outreach with students from St. Lucy's High School in Summer 2014. Anneliese Bals, Erin Turley, and Jackie Lopez, all of whom are headed to different colleges in the fall of 2014.

[NSF and HHMI] though I was only a team member on these, I was thrilled to contribute (some of) the CS portion to the successful large projects *Improving STEM Pedagogy through Transferable STEM Skills* [NSF 1439737, \$3m, 2014-2020] and the HMC Biology department's most recent HHMI proposal [\$1.5m, 2012-2015]

[Rose Hills] award of \$12500 for *Middle-years Computer Science*, summer 2013 with Jonathan Ashley '15 and *3d Robotic Mapping* with Chris Eriksen '15 and Kristina Ming '15.

[Google] CS4HS (Computer Science for High School) grant from Google to support a summer 2013 workshop for high-school and middle-school teachers. (March 1, 2013). \$10,000.

[Rose Hills] award of \$12500 for *Vision-based aerial autonomy*, summer 2012 with Cecily Hunt '14 and Matt McDermott '14.

[Rose Hills] award of \$6250 for *Aerial Autonomy*, summer 2011 with Bradley Jensen.

[Google] award of \$15000, a CS4HS (Computer Science for High School) grant from Google to support a summer 2011 workshop for high-school and middle-school teachers. (March 15, 2011)

[Rose Hills] award of \$6000 for *PixelLaser*, summer 2010 with Steve Matsumoto.

[Rose Hills] award of \$6000 for *An Autonomous Cartographer*, summer 2009 with Anatole Paine.

[WPI] award of \$1500 for the development and presentation of the entry by A. Paine (HMC '11) and S. Lakhani (HMC '11) to the *Robotics Innovations Competition and Conference*, Worcester, MA. 11/7-8/2009.

[CMU] award of two Chiara hexapod robots (\$4000) from Carnegie Mellon University, Jan. 2009.

[IPRE] July, 2008 awarded \$10,000 in order to undertake research with the Myro/Fluke/Scribbler platform in the summer of 2008.

[AAAI] a *travel grant* of \$1000 awarded for the participation in AAAI robot exhibition and competition, July 2008, Chicago, IL with three HMC students.

[Leeds] the Leeds foundation awarded \$2500 for travel to the April, 2009 Tapia Conference in Portland, OR with three students in order to present and compete at the robot competition there.

[ACM] awarded \$400 to H. Hoersting (HMC '10) for our work at the ACM SAC '09 conference. In the end, personal reasons made her use of these funds impossible.

[ICRA] a travel grant of \$900 was awarded to assist with Ben Tribelhorn's travel to the International Conference on Robotics and Automation in Rome, April 10-14, 2007.

[sponsorship] of \$1000 awarded by Surveyor Robotics and K-Team Robotics in order to sponsor a participant lunch at the AAAI 2007 spring symposium *Robots and Robot Venues: Resources for AI Education* in March, '07 in Palo Alto, CA.

[AAAI] a travel grant of \$1000 awarded for the participation in AAAI robot exhibition and competition, July 2006, Boston, MA with HMC student B. Tribelhorn.

[sponsorship] of \$1000 awarded to Topper Kain (HMC '07) to support our work with the PowerWheels vehicles in CS 154 (Robotics) that spring

[Mellon] a \$6,800 Mellon Career Enhancement Award entitled *Laptop Robotics: Preserving a low-cost resource for education and research*. This project funded hardware-related work that fall in Pittsburgh and led to the 2006 NSF proposal.

[Mellon] a \$5,870, Mellon Career Enhancement award entitled *Bringing Hardware into CS Robotics*, 2/17/2004-9/15/2004.

[sponsorship] of \$1000 by KTeam Robotics to support the AAAI spring symposium *Accessible, Hands-on AI and Robotics Education* 3/23/2004, Stanford University.

[Mellon] a \$4,000, Mellon Career Enhancement Award, written with Marianne DeLaet for the HMC Teaching and Learning Committee, spanning 4/1/2004-5/30/2005, entitled *Teaching Outside the Box: Faculty Forums for Science, Technology, and Society for Undergraduate Scientific Education*

[HMC] a \$5,000 HMC Curriculum Development award entitled *From Core CS to Core Computation*, 6/1/2003-9/1/2003.

[HMC] a \$5,000 HMC Diversity Support award entitled *An Inreach program with Pomona High School*, 6/1/2003-9/1/2003.

[Beckman] a \$10,500 Beckman research grant entitled *Accurate Maps from Inaccurate Data*, 6/1/2002-9/1/2002.

Projects in service to the academic community and to HMC

Authored the Assessment Committee's 2012-15 yearly update reports

Authored our 2009-2010 and 2010-2011 CS department assessments

Co-authored *Experiential learning at HMC*, the curriculum committee's WASC report, 2007-2009

Co-authored the HMC strategic vision chapter on *Optimizing HMC's Impact on Society*, 2006-2007

Co-authored the *CS Departmental Evaluation*, the department's evaluation of 2005-2006

Co-created *Bio/CS 6, an Introduction to Biology and Computer Science*, running now in 2009-2010

Yearly reviewer for

NSF proposals: 2-3 times per year: 2008-present

SIGCSE – CS education's largest annual conference in the US.

ITiCSE – a smaller, international conference with goals similar to SIGCSE

CCSC – the CS education community's regional conferences (various regions)

CVPR – the computer vision community's annual conference, usually in the US

ICRA – the robotics community's largest annual conference

IROS – the robotics community's second largest annual conference

FLAIRS – a regional and long-running Artificial Intelligence conference held in Florida
AAAI's Spring Symposia – the AAAI's annual symposium series held at Stanford University

Ad-hoc reviewer for textbooks/journals, e.g.,

Robots with ROS, by Bill Smart et al.

Practical Programming: An introduction to CS using Python

Autonomous Robotics

Transactions on Autonomous and Adaptive Systems

Transactions on Computing Education

Committee service:

Chair, HMC assessment committee, 2011-2015

Chair, HMC research committee, 2009-2010, 2010-2011

Member, HMC research committee, 2007-2009

Chair, HMC curriculum committee, 2006-2007

Member, HMC teaching and learning committee, 2003-2006

Member, HMC Aeronautical Scholars committee, 2004- (ongoing)

various departmental committees

Advising:

Yearly participation as a first-year advisor

Fall 2008: co-taught the *Seminar on Robotics: Hardware and Software* with Prof. Sarah Harris

Customary advising of CS majors

Presentations, tours, and outreach from the robotics lab

Admitted students day, FAST demonstration day

Summer Institute academic preparation for CS

Claremont schools' annual robot competition, judges' coordinator (HMC students judge)

Claremont High School outreach program: *Biology Rules!* with Prof. Ran Libeskind-Hadas