

KARL D. IAGNEMMA

Current Position

Principal Research Scientist
Laboratory for Manufacturing and Productivity
Massachusetts Institute of Technology
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Cambridge, Massachusetts 02139
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Education

Massachusetts Institute of Technology, Cambridge, MA
Postdoctoral fellow, Mechanical Engineering, February 2001—February 2002
Research area: Mobile robotics and intelligent vehicles
Advisor: Prof. Steven Dubowsky

Massachusetts Institute of Technology, Cambridge, MA
Ph.D., Mechanical Engineering, February 2001
Thesis: *Rough-Terrain Mobile Robot Planning and Control with Application to Planetary Exploration*
Advisor: Prof. Steven Dubowsky
Minor field of study: Fiction writing

Massachusetts Institute of Technology, Cambridge, MA
M.S., Mechanical Engineering, June 1997
Thesis: *Manipulator Identification and Control using a Base-Mounted Force/Torque Sensor*
Advisor: Prof. Steven Dubowsky

University of Dublin, Trinity College, Dublin, Ireland
Curriculum of applied mathematics and English literature

University of Michigan, Ann Arbor, MI
B.S., Mechanical Engineering, *Summa cum laude*, June 1994

Research Interests

Director of the Robotic Mobility Group in the laboratory for manufacturing and productivity at MIT. Laboratory research focuses on the modeling, design, control, motion planning, and sensing for robotic systems operating in unstructured environments. Specific applications include autonomous passenger vehicles, planetary exploration rovers, unmanned ground vehicles, manipulators, and surgical robotics.

Academic Positions

Visiting Professor Halmstad University, Halmstad, Sweden	<i>2/13 –</i>
Principal Research Scientist	<i>1/06 –</i>
Lecturer	<i>7/04 – 7/05</i>
Research Scientist	<i>2/02 – 1/06</i>
Postdoctoral Researcher	<i>2/01 – 2/02</i>
Graduate Research Assistant Department of Mechanical Engineering Massachusetts Institute of Technology, Cambridge, USA	<i>9/95 – 2/01</i>
Visiting Researcher Department of Mechanical Engineering National Technical University of Athens, Athens, Greece	<i>9/06 – 9/07</i>
Visiting Researcher Science and Technology Development Section NASA Jet Propulsion Laboratory, Pasadena, USA	<i>9/98 – 12/98</i>

Grants and Awards

Design of an Underwater Robotic Gripper U.S. Navy Principal Investigator	<i>\$25k</i>	<i>9/13 – 2/14</i>
A Gripper Based on Controllable Wet Adhesion by a Magnetorheological Fluid MIT-Italy Program Principal Investigator	<i>\$7k</i>	<i>7/13 – 7/14</i>
Measurement and Analysis of Granular Soil Beneath Lightweight Robotic Running Gear U.S. Army Research Office and U.S. Army TARDEC Principal Investigator	<i>\$300k</i>	<i>5/13 – 4/15</i>
Hydraulic Actuation for Micro-Scale Robots (HAMR) DARPA Co-Investigator, with A. Hosoi (PI), R. Zane	<i>\$375k</i>	<i>1/13 – 12/14</i>
Advanced Threat Assessment for Autonomous Driving on Highways Nissan Principal Investigator	<i>\$420k</i>	<i>11/12 – 11/14</i>

- Classification and Modeling of Vegetation from Unmanned Ground Vehicles**
 U.S. Army ERDC *\$255k 11/12 – 4/15*
 Principal Investigator
- Assisted Perception, Planning and Control for Remote Mobility and Dexterous Manipulation—the DARPA Robotics Challenge**
 DARPA *\$375k 10/12 – 6/13*
 Co-Investigator, with S. Teller (PI), R. Tedrake, and J. Shah
- High Performance Terrain Modeling**
 JIEDDO *\$203k 4/12 – 12/12*
 Principal Investigator
- Path Planning and Retrieval of Terrain Properties Using Curiosity's Mobility System as a Terramechanics Virtual Instrument**
 NASA *\$152k 1/12 – 1/15*
 Co-Investigator, with R. Arvidson
- Magnetorheological Fluids for Robotics Applications**
 Battelle *\$110k 9/11 – 8/12*
 Principal Investigator
- Terrain-Dependent Driving Control for Medical Robots and Mobility Assist Devices**
 U.S. Army Research Office *\$50k 9/11 – 2/12*
 Principal Investigator, with M. Rohde
- Development of Variable Stiffness Mechanisms and Centimeter-scale Hyper-Redundant Manipulators**
 Samsung *\$180k 4/11 – 4/12*
 Principal Investigator, with S. Kim
- xTerramechanics: Integrated Simulation of Planetary Surface Missions**
 Keck Institute for Space Studies *\$165k 3/11 – 10/13*
 Co-Investigator, with R. Lindemann, J. Andrade (PI)
- Threat-Based Semi-Autonomous Operator Assistance Algorithms for Ground Vehicles**
 Defense Advanced Research Projects Agency *\$600k 3/11 – 2/14*
 Principal Investigator, with M. Rohde
- Enabling Novel Minimally-Actuated Robotic Capabilities Through Active Fluids**
 Defense Advanced Research Projects Agency *\$300k 2/11 – 12/12*
 Co-Investigator, with A. Hosoi (PI), G. McKinley, and M. Culpepper
- MURI: Neuro-Inspired Event-Driven Perception and Control of Autonomous Vehicles for Aggressive Driving**
 U.S. Army Research Office *\$862k 11/10 – 11/15*

Co-Investigator, with P. Tsiotras (PI), E. Frazzoli, J. Rehg, E. Feron, F. Dellaert, and L. Itti

Design and Control of Omnidirectional Unmanned Ground Vehicles for Rough Terrain

U.S. Army Research Office *\$448k 7/09 – 5/12*
Principal Investigator

DURIP: Equipment for UGVs with Omnidirectional Sensing and Mobility

U.S. Army Research Office *\$149k 4/09 – 9/10*
Principal Investigator

2009 Conference on Field and Service Robotics, FSR '09

U.S. Army Research Office *\$26k 4/08 – 9/09*
Principal Investigator

SQUISHBot (Soft QUIet SHape-shifting robot)

Defense Advanced Research Projects Agency (DARPA) *\$65k 1/08 – 7/09*
Co-Investigator, with A. Hosoi (PI), G. McKinley, and M. Culpepper

Self-Supervised Mobility-Based Terrain Classification for Unmanned Ground Vehicles

U.S. Army Research Office *\$718k 9/07 – 12/12*
Principal Investigator

A Unified Approach to Sensor-Based Terrain Characterization and UGV Mobility Prediction

U.S. Army Research Office *\$375k 9/07 – 9/10*
Principal Investigator

Efficient Stochastic Mobility Prediction for Mobile Robotic Systems

U.S. Army Research Office *\$375k 9/07 – 9/10*
Principal Investigator

Mobility-Dependent Motion Planning for High Speed Robotic Vehicles

U.S. Army Research Office *\$125k 9/07 – 9/08*
Principal Investigator, with E. Frazzoli (Co-I)

Lookahead Control and Sensing for Active Navigation and Hazard Avoidance

Ford Motor Company *\$300k 9/07 – 9/09*
Principal Investigator

Workshop on Mobility and Control in Challenging Environments

U.S. Army Research Office *\$15k 9/06 – 9/07*
Principal Investigator

Microbots for Large-Scale Planetary Surface and Subsurface Exploration

NASA Institute for Advanced Concepts *\$400k 9/05 – 9/07*
Co-Investigator, with S. Dubowsky (PI) and P. Boston

Navigation and Hazard Avoidance for High Speed Unmanned Ground Vehicles in Rough Terrain

U.S. Army Research Office *\$328k 4/05 – 4/08*
Co-Investigator, with S. Dubowsky (PI)

Reinforcement Learning for Dynamic Vehicle Control

DARPA (with Stanford Univ.) *\$227k 10/04 – 5/06*
Co-Investigator, with S. Dubowsky (PI), S. Thrun, and A. Ng

Multi-Sensor Terrain Classification and Terrain-Adaptive Navigation for Rovers in Very Rough Terrain

NASA Mars Technology Program (with JPL) *\$600k 9/04 – 9/07*
Co-Investigator, with S. Dubowsky (PI), L. Matthies, and D. Helmick

Sensing and Control For Improved Vehicle Stability

Ford Motor Company *\$450k 9/04 – 9/07*
Co-Investigator, with S. Dubowsky (PI)

Model-Based Control of High-Speed Rough-Terrain Robotic Vehicles

DARPA and U.S. Army TARDEC *\$625k 3/01 – 3/05*
Co-Investigator, with S. Dubowsky (PI)

Microbots for Large-Scale Planetary Surface and Subsurface Exploration

NASA Institute for Advanced Concepts *\$75k 10/03 – 4/04*
Co-Investigator, with S. Dubowsky (PI) and P. Boston

On-Line Terrain Characterization and Traversability Assessment for Mars Rovers

NASA Jet Propulsion Laboratory *\$499k 5/01 – 5/04*
Co-Investigator, with S. Dubowsky (PI)

Teaching Experience

Course assistant

2.007: Design and Manufacturing I *1997*
Massachusetts Institute of Technology
Department of Mechanical Engineering

Honors and Awards

NASA Group Achievement Award (as part of MSL Science Office Development and Operations Team) *2014*
Best patent award, Boston Patent Law Association *2013*
Best conference paper award, Ground Vehicle Systems Engineering and Technology Symposium *2012*
Certificate for Outstanding Research Activity, Robotics and Mechatronics Division, Japanese Society of Mechanical Engineering *2009*

Best conference paper award, IEEE International Conference on Mechatronics and Automation	2008
Winner, APEX Grand Award for Writing, for <i>Journal of Field Robotics</i> special issue on the DARPA Grand Challenge	2007
Best paper award bronze medal, 25 th Army Science Conference	2006
Nominee, MacArthur Foundation Fellowship	2005
Chosen as one of the “top 10 innovative young scientists” by <i>Red Herring</i> magazine	2005
Chosen as one of 16 people who “redefined science in 2003” by <i>SEED</i> magazine	2003
National Science Foundation Graduate Research Fellowship	1995-1998
Rotary Foundation International Ambassadorial Scholarship	1995
University of Michigan Distinguished Undergraduate Achievement Commendation (first in class)	1994
Dow Chemical Scholar	1994
General Motors Scholar	1992-1994

Academic Activities

Conference Session Chair or Co-Chair

IEEE/RSJ International Conference on Intelligent Robots and Systems	2008, 2011
IEEE International Conference on Robotics and Automation	2007–
SPIE Conference on Unmanned Ground Vehicles	2003–

Conference Program Committee Participation

Workshop on Cyber-Physical Systems, EuroMicro/SEAA Conference	2014
Workshop on Modelling, Estimation, Perception and Control of All-Terrain Mobile Robots	2014
ES4CPS—Engineering Simulations for Cyber-Physical Systems	2014
IEEE International Symposium on Robotic and Sensors Environments	2013
AIM/IEEE Workshop on Design, Modeling and Evaluation of Cyber Physical Systems	2013
International Conference on Field and Service Robotics	2009–
IEEE International Conference on Robotics and Automation	2006–
Robotics: Science and Systems	2006
International Conference on Advanced Robotics	2005
SPIE Conference on Unmanned Systems Technology	2003–

Technical Committee Participation

IEEE Robotics and Automation Society, Soft Robotics Technical Committee	2012–
IEEE Robotics and Automation Society, Space Robotics Technical Committee	2007–
International Society of Terrain-Vehicle Systems, Planetary	2007–

& Terrestrial Rovers Technical Group

Workshop and Conference Organization

- Advisory Committee, AM/IEEE Workshop on Design, Modeling *2013–*
and Evaluation of Cyber Physical Systems
- Co-Organizer, Workshop on Terramechanics for Integrated *2011*
Simulation of Planetary Surface Missions, California
Institute of Technology, Pasadena, CA
- Co-Organizer, Workshop on the 2007 DARPA Urban *2008*
Challenge at the 2008 IEEE International Conference
on Robotics and Automation, Pasadena, CA
- Co-Chair, Conference on Field and Service Robotics, *2007*
FSR '09, Cambridge, MA
- General Chair, ARO Workshop on Mobility and Control in *2006*
Challenging Environments, Olin College, Needham MA

Editorial Service

- IEEE Transactions on Robotics—Associate Editor *2007–2011*
- Journal of Terramechanics—Guest co-Editor, special issue *2007*
on Robots in Natural Terrain
- Journal of Field Robotics—Guest co-Editor, special issue *2007–2008*
on the 2007 DARPA Urban Challenge
- Journal of Field Robotics, Associate Editor *2006–*
- Journal of Field Robotics—Guest co-Editor, special issue *2006–2007*
on the 2005 DARPA Grand Challenge

Peer Review—Journal Publications

- ASME Journal of Dynamic Systems, Measurement and Control
- ASME Journal of Mechanisms and Robotics
- IEEE/ASME Transactions on Mechatronics
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Control Systems Technology
- IEEE Transactions on Robotics
- IEEE Transactions on Systems, Man, and Cybernetics
- IEEE Transactions on Vehicular Technology
- Intelligent Service Robotics
- International Journal of Robotics and Automation
- International Journal of Robotics Research
- International Journal of Vehicle Autonomous Systems
- International Journal of Vehicle Design
- Journal of Advanced Robots
- Journal of Automobile Engineering
- Journal of Autonomous Robots
- Journal of Defense Modeling and Simulation
- Journal of Field Robotics
- Journal of Mechanical Science and Technology
- Journal of Mechanism and Machine Theory
- Journal of Terramechanics
- Planetary and Space Science

Robotica
Simulation Modeling Practice and Theory
Vehicle System Dynamics

Peer Review—Conference Proceedings

ASME Computers and Information in Engineering Conference
ASME Dynamic Systems and Control Conference
ASME Mechanisms and Robotics Conference
ASME Vibration and Noise Conference
IEEE American Control Conference
IEEE Conference on Decision and Control
IEEE International Conference on Automation Science and Engineering
IEEE International Conference on Intelligent Robots and Systems
IEEE International Conference on Multisensor Fusion and Integration for
Intelligent Systems
IEEE Intelligent Vehicles Symposium
IEEE International Conference on Robotics and Automation
International Conference on Advanced Robotics
International Conference on Advances in Robot Kinematics
International Symposium on Robotic Research
Robotics: Science and Systems
SICE International Conference on Instrumentation, Control, Information
Technology and System Integration
TAROS: Towards Autonomous Robotic Systems
Workshop on Design, Modeling and Evaluation of Cyber Physical Systems

Peer Review—Books and Book Proposals

Cambridge University Press
Marshall Cavendish Benchmark Publishers
Springer
Wiley-Interscience Publishers

Peer Review—Proposal Evaluation

American Institute of Biological Sciences
Austrian Science Fund
NASA
National Institutes of Health
National Research Foundation of Singapore
National Science Foundation
University of Nebraska—Lincoln
University of Western Ontario
U.S. Army Medical Research and Materiel Command
U.S. Army Research Office
U.S. Civilian Research and Development Foundation

Scientific Review Panels and Teams

JPL MSL Rover Mt. Sharp Ascent Team	<i>2013–</i>
Mars Science Laboratory Science Team Collaborator	<i>2012–</i>
Athena Rover Science Team Member	<i>2010–</i>

NASA Jet Propulsion Laboratory Spirit Rover extraction *2009*
Review team member

Technical Consulting

Agency for Defense Development, Korea
Battelle
Boston Dynamics
California Institute of Technology
Daewoo Shipbuilding and Marine Engineering, Co.
Defense Advanced Research Projects Agency
FM Electronics, Inc.
Harvest Automation
Hoya Corporation
NASA Jet Propulsion Laboratory
Quantum Signal, LLC
Team O'Neil Motorsports
The Monitor Group
Turtle Ridge Foundation
U.S. Army Tank-Automotive Research, Development and Engineering
Center (TARDEC)
Vehicle Control Training, LLC
Vishwa Robotics
Washington University, St. Louis

Companies Founded

nuTonomy LLC (co-founder, with Emilio Frazzoli)

Academic Affiliations

IEEE
Sigma Xi

Invited Lectures

“Future Directions in Autonomous Vehicle Research,” Denso, Southfield, MI, November, 2013
“Motion Planning for Autonomous Robots,” Halmstad University, Halmstad, Sweden, November, 2013
“Safe Semi-Autonomous Control of Unmanned Ground Vehicles,” Workshop Keynote Address, ELLIT Workshop, Lund University, Lund, Sweden, November, 2013
“Design and Control of Safe Robotic Systems for Human-in-the-Loop Applications,” KTH, Stockholm, Sweden, August, 2013
“Threat Assessment and Semi-Autonomous Control of Manned and Unmanned Vehicles,” Orebro University, Orebro, Sweden, February, 2013

- “Future Directions in Semi-Autonomous Vehicle Research,” Volvo Group, Gothenburg, Sweden, August, 2012
- “Threat Assessment and Semi-Autonomous Control of Manned and Unmanned Ground Vehicles,” Mitsubishi Electronics Research Laboratory, Cambridge, MA, July, 2012
- “Towards High Speed Off-Road Vehicle Navigation with Safety Guarantees,” Korean Agency for Defense Development, Daejeon, Korea, July, 2012
- “Autonomy is Overrated: Towards Shared Human-Machine Control for Vehicles and Other Mechanical Systems,” George Washington University, Washington, DC, February, 2012
- “Design and Shared Human-Machine Control of Bio-inspired Compliant Robotic Mechanisms,” NASA Johnson Space Center, Houston, TX, December, 2011
- “Autonomy is Overrated: Towards Shared Human-Machine Control for Vehicles and Other Mechanical Systems,” MIT Research and Development Conference, Cambridge, MA, November, 2011
- “Shared Human-Machine Control of Vehicles and Other Mechanical Systems,” Samsung Electronics, Seoul, Korea, July, 2011
- “Tunable Stiffness Mechanisms for Robotic Applications: Jamming of Granular Materials,” Samsung Electronics, Seoul, Korea, July, 2011
- “Towards High Speed Off-Road Vehicle Navigation,” Korean Agency for Defense Development, Daejeon, Korea, July, 2011
- “Robot-Terrain Interaction Modeling: Engineering Methods,” Keck Foundation workshop on xTerramechanics, Pasadena, CA, July 2011
- “Fundamentals of Terramechanics: History and Limitations,” Keck Foundation workshop on xTerramechanics, Pasadena, CA, July 2011
- “Shared Human-Machine Control of Vehicles and Other Mechanical Systems,” MIT-Japan Conference, Cambridge, MA, January, 2011
- “An Optimal Control Approach to Safe Semi-Autonomous Control of Passenger Vehicles,” University of Colorado at Boulder, Boulder, CO, October, 2010
- “Semi-Autonomous Control of Passenger Vehicles for Active Safety Applications,” Carnegie Mellon University, Pittsburgh, PA, March, 2010
- “Mobile Robots in Challenging Environments: State of the Art and Technical Frontiers,” U.S. Army Tank-Automotive Research, Development, and Engineering Center, Warren, MI, September, 2007
- “Robotic Terrain Surveying and Probabilistic Mobility Prediction,” U.S. Army Engineer Research and Development Center, Vicksburg, MS, July, 2006
- “Modeling, Sensing, and Control of Mobile Robots in Challenging Environments,” Army Cold Regions Research and Engineering Laboratory, Lyme, NH, February, 2006
- “Modeling, Analysis, and Sensing Methods for Passenger Vehicle Tripped Rollover,” Ford Motor Company, Dearborn, MI, October, 2005

“Next Generation Space Robotics Research,” Northeastern University, Boston, MA, February, 2005

“Navigation and Hazard Avoidance for High-Speed Mobile Robots in Rough Terrain,” University of Nebraska-Lincoln, Lincoln, NE, November, 2004

“Sensing and Control for Tripped Rollover Mitigation,” Ford Motor Company, Dearborn, MI, May, 2004

“Next Generation On-Orbit, Surface, and Sub-Surface Robotic Systems,” NASA/MIT Workshop on Transformational Technologies, Cambridge, MA, December, 2003

Publications

Publication h-index as of April, 2014 (from scholar.google.com): 32

- Largest number h such that h publications have at least h citations

Publication i10-index as of April, 2014 (from scholar.google.com): 86

- Number of publications with at least 10 citations

Theses

[T2] **Iagnemma, K.**, *Rough-Terrain Mobile Robot Planning and Control, with Application to Planetary Exploration*, Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA, 2001

[T1] **Iagnemma, K.**, *Manipulator Identification and Control Using a Base-Mounted Force/Torque Sensor*, Master's Thesis, Massachusetts Institute of Technology, Cambridge, MA, 1997

Books and Monographs

[B1] **Iagnemma, K.**, and Dubowsky, S., *Mobile Robots in Rough Terrain: Estimation, Motion Planning, and Control with application to Planetary Rovers*, Springer Tracts in Advanced Robotics (STAR) Series, Volume 12, Springer, June 2004

Edited Volumes

[E9] Howard, A., **Iagnemma, K.**, and Kelly, A., (eds.), *Field and Service Robotics: Results of the 7th International Conference*, Springer Tracts in Advanced Robotics (STAR) Series, Vol. 62, Springer, August 2010

[E8] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *The DARPA Urban Challenge: Autonomous Vehicles in City Traffic*, Springer Tracts in Advanced Robotics (STAR) Series, Vol. 56, Springer, December, 2009

[E7] Richter, L., **Iagnemma, K.**, and Shoop, S., (eds.), *The Journal of Terramechanics Special Issue on Terrain Interaction for Small Robotic Vehicles*, Vol. 46, No. 3, June, 2009

[E6] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *Journal of Field Robotics Special Issue on the DARPA Urban Challenge, Part 3*, Vol. 25, No. 10, October, 2008

- [E5] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *Journal of Field Robotics Special Issue on the DARPA Urban Challenge, Part 2*, Vol. 25, No. 9, September, 2008
- [E4] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *Journal of Field Robotics Special Issue on the DARPA Urban Challenge, Part 1*, Vol. 25, No. 8, August, 2008
- [E3] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.) *The 2005 DARPA Grand Challenge: The Great Robot Race*, Springer Tracts in Advanced Robotics (STAR) Series, Volume 36, Springer, September, 2007
- [E2] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *Journal of Field Robotics Special Issue on the DARPA Grand Challenge, Part 2*, Vol. 23, No. 9, September, 2006
Winner, APEX Grand Award
- [E1] Buehler, M., **Iagnemma, K.**, and Singh, S., (eds.), *Journal of Field Robotics Special Issue on the DARPA Grand Challenge, Part 1*, Vol. 23, No. 8, August, 2006
Winner, APEX Grand Award

Refereed Journal Publications

- [J52] Arvidson, R. Belutta, P., Calef, F., Fraeman, A., Garvin, J., Gasnault, O., Grant, J., Grotzinger, J., Hamilton, V., Heverly, M., **Iagnemma, K.**, Johnson, J., Lanza, J., Mouelic, S., Mangold, N., Ming, D., Mehta, M., Morris, R., Newsom, H., Renno, N., Rubin, D., Sletten, R., Vasavada, A., Vizcaino, J., “Terrain Physical Properties Derived From Orbital Data and the First 360 Sols of Mars Science Laboratory Curiosity Rover Observations in Gale Crater,” *Journal of Geophysical Research—Planets*, in press
- [J52] Smith, W., Melanz, D., Senatore, C., **Iagnemma, K.**, and Peng, H., “Comparison of Discrete Element Method and Traditional Modeling Methods for Steady-State Wheel-Terrain Interaction of Small Vehicles,” *Journal of Terramechanics*, submitted
- [J51] Cheng, N., Gopinath, A., Wang, A., **Iagnemma, K.**, and Hosoi, A., “Thermally Tunable, Self-healing Composites for Soft Robotic Applications,” *Journal of Macromolecular Materials and Engineering*, in press
- [J50] Jayakumar, P., Melanz, D., MacLennan, J., Gorsich, D., Senatore, C., and **Iagnemma, K.**, “Scalability of Classical Terramechanics Models for Lightweight Vehicle Applications Incorporating Stochastic Modeling and Uncertainty Propagation,” *Journal of Terramechanics*, submitted
- [J49] Jayakumar, P., Melanz, D., MacLennan, J., Senatore, C., and **Iagnemma, K.**, “Stochastic Modeling and Uncertainty Cascade of Soil Bearing and Shearing Characteristics for Light-Weight Vehicle Applications,” *Journal of Terramechanics*, submitted
- [J48] Watanabe, M., Wiltsie, N., Hosoi, A., and **Iagnemma, K.**, “Characteristics of Controllable Adhesion using Magneto-Rheological Fluid and its Application to Climbing Robotics,” *Advanced Robotics*, submitted

- [J47] Ishigami, G., **Iagnemma, K.**, Overholt, J., and Hudas, G., “Design, Development, and Mobility Evaluation of an Omnidirectional Mobile Robot for Rough Terrain,” *Journal of Field Robotics*, submitted
- [J46] Kim, Y., Cheng, S., Kim, S., and **Iagnemma, K.**, “A Stiffness-Adjustable Hyper-Redundant Manipulator using a Variable Neutral-line Mechanism for Minimally Invasive Surgery,” *IEEE Transactions on Robotics*, in press
- [J45] Senatore, C., and **Iagnemma, K.**, “Analysis of Stress Distributions Under Lightweight Wheeled Vehicles,” *Journal of Terramechanics*, Vol. 51, pp. 1-17, February 2014
- [J44] Kim, Y., Cheng, S., Kim, S., and **Iagnemma, K.**, “A Novel Layer Jamming Mechanism with Tunable Stiffness Capability for Minimally Invasive Surgery,” *IEEE Transactions on Robotics*, Vol. 29, No. 1, pp. 1031-1042, August 2013
- [J43] Lanzetta, M., and **Iagnemma, K.**, “Gripping by Controllable Wet Adhesion Using a Magnetorheological Fluid,” *Manufacturing Technology*, Vol. 62, No. 1, pp. 21-25. 2013
- [J42] Anderson, S., Walker, J., Karumanchi, S., and **Iagnemma, K.**, “The Intelligent CoPilot: A Constraint-Based Approach to Shared-Adaptive Control of Ground Vehicles,” *IEEE Intelligent Transportation Systems Magazine*, Vol. 5., No. 2, pp. 45-54, 2013
- [J41] Ding, L., Deng, Z., Gao, H., Guo, J., Zhang, D., and **Iagnemma, K.**, “Experimental Study and Analysis of the Wheels’ Steering Mechanics for Planetary Exploration Wheeled Mobile Robots Moving on Deformable Terrain,” *International Journal of Robotics Research*, Vol. 32, No. 6, pp. 712-743, May 2013
- [J40] Peters, S., Anderson, S., Pilutti, T., Tseng, E., and **Iagnemma, K.**, “Threat-Based Hazard Avoidance for Semi-Autonomous Vehicles Using Nonlinear Model Predictive Control,” *IEEE Transactions on Control Systems Technology*, in press
- [J39] Ding, L., Deng, Z., Gao, H., Tao, J., **Iagnemma, K.**, and Liu, G., “Interaction Mechanics Model for Rigid Driving Wheels of Planetary Rovers Moving on Sandy Terrain Considering Multiple Effects,” *Journal of Field Robotics*, in press
- [J38] Zhou, F., Arvidson, R., Bennett, K., Trease, B., Lindemann, R., **Iagnemma, K.**, Senatore, C., Belluta, P., and Maxwell, S., “Simulation of Mars Exploration Rover Opportunity Traverses,” *Journal of Field Robotics*, Vol. 31, No. 1, pp., 141-160, January/February 2014
- [J37] Senatore, C., Wulfmeier, M., Vlahinic, I., Andrade, J., and **Iagnemma, K.**, “Design and Implementation of a Particle Image Velocimetry Method for Analysis of Running Gear-Soil Interaction,” *Journal of Terramechanics*, Vol. 50, No. 5-6, pp. 311-326, October/December 2013
- [J36] Ding, L., Gao, H., Deng, Z., Dong, Y., Liu, Y., Liu, G., and **Iagnemma, K.**, “Foot-Terrain Interaction Mechanics for Legged Robots: Modeling and

- Experimental Validation,” *International Journal of Robotics Research*, Vol. 32, No. 13, pp. 1585-1606, 2013
- [J35] Anderson, S., Walker, J., and **Iagnemma, K.**, “Experimental Performance Analysis of a Homotopy-Based Shared Autonomy Framework,” *IEEE Transactions on Human-Machine Systems*, Vol. 44, No. 2, pp. 190-199, April 2014
- [J34] McDaniel, M., Nishihata, T., Brooks, C., Salesses, P., **Iagnemma, K.**, “Terrain Classification and Identification of Tree Stems Using Ground-Based LIDAR,” *Journal of Field Robotics*, Vol. 29, No. 6, pp. 891-910, November/December 2012
- [J33] Ishigami, G., Overholt, J., and **Iagnemma, K.**, “Multi-material Anisotropic Friction Wheels for Omnidirectional Ground Vehicles,” *Journal of Robotics and Mechatronics*, Vol. 24, No. 1, pp. 261-267, 2012
- [J32] Brooks, C., **Iagnemma, K.**, “Self-Supervised Terrain Classification for Planetary Surface Exploration Rovers,” *Journal of Field Robotics*, Vol. 29, No. 3, pp. 445-468, May/June 2012
- [J31] Kewlani, G., Crawford, J., and **Iagnemma, K.**, “A Polynomial Chaos Approach to Analysis of Vehicle Dynamics Under Uncertainty,” *Vehicle System Dynamics*, Vol. 50, No. 5, pp. 749-774, 2012
- [J30] Zhou, S., Chen, H., McDaniel, M., Nishihata, T., Salesses, P., **Iagnemma, K.**, “Self-supervised Learning to Visually Detect the Terrain Surface for Autonomous Robots Operating in Forested Terrain,” *Journal of Field Robotics*, Vol. 29, No. 2, pp. 277-297, March/April 2012
- [J29] Arndt, D., Bobrow, J., Peters, S., **Iagnemma, K.**, and Dubowsky, S., “Two-Wheel Self-Balancing of a Four-Wheeled Vehicle,” *IEEE Control Systems Magazine*, Vol. 31, No. 2, pp. 29-37, April 2011
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 Georges Aoude, MIT, Ph.D., 2011
 Adnan Tahirovic, Milan Polytechnic, Ph.D., 2010
 Sisir Karumanchi, University of Sydney, Ph.D., 2010
 Kyu-Jin Cho, MIT, Ph.D., 2007
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 Matthew Spenko, MIT, Ph.D., 2005

Graduate Students Supervised or co-Supervised

Junghee Park, *Thesis title TBD*, PhD Thesis, MIT, 2015 (*expected*)
 Alexandre Constantin, *Thesis title TBD*, MS Thesis, MIT, 2014 (*expected*)
 Nadia Cheng, *Design and Analysis of Active Fluid-and-Cellular Solid Composites for Controllable Stiffness Robotic Elements*, MS Thesis, MIT, 2009, *Design and Analysis of Jammable Granular Systems*, Ph.D., 2013
 Sterling Anderson, *A Unified Framework for Trajectory Planning, Threat Assessment, and Semi-Autonomous Control of Passenger Vehicles*, MS Thesis, MIT, 2009; *Constraint-Based Navigation for Safe, Shared Control of Ground Vehicles*, Ph.D. Thesis, MIT, 2013
 Nick Wiltsie, *A Controllably Adhesive Climbing Robot Using Magnetorheological Fluid*, MS thesis, MIT, 2012
 Steven Peters, *Modeling, Analysis, and Measurement of Passenger Vehicle Stability*, MS thesis, MIT, 2006; *Optimal Planning and Control for Hazard Avoidance of Front-Wheel Steered Ground Vehicles*, Ph.D. Thesis, 2012
 Matt McDaniel, *Classification and Modeling of Forested Terrain using LIDAR Sensing*, MS Thesis, MIT, 2010
 Gaurav Kewlani, *Stochastic Approaches to Mobility Prediction, Path Planning and Motion Control for Ground Vehicles in Uncertain Environments*, MS Thesis, MIT, 2009
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 Christopher Ward, *Terrain Sensing and Estimation for Dynamic Outdoor Mobile Robots*, MS thesis, MIT, 2007
 Stefan Campbell, *Steering Control of an Autonomous Ground Vehicle with Application to the DARPA Urban Challenge*, MS thesis, MIT, 2007 (*co-supervisor*)
 Ibrahim Halatci, *Vision-based Terrain Classification and Classifier Fusion for Planetary Exploration Rovers*, MS thesis, MIT, 2006

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Undergraduate Students Supervised or co-Supervised

- Greg Puzsko, *Analysis of Rover Wheel Mobility over Simulated Martian Terrain at Various Slip Conditions*, BS thesis, MIT, 2013
- Michael Buchman, *Using a Ferro-Fluid Pad to Climb Walls*, BS thesis, MIT, 2013
- Bee Vang, *Design and Development of a Robotic Air Hockey Player*, BS thesis, MIT, 2013
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- Hector Vargas, *Design and Fabrication of Active Tilt Stage for Laser Rangefinder*, BS thesis, MIT, 2009

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- Sisir Karumanchi, postdoctoral fellow, 2011–present
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- Masaaki Watanabe, postdoctoral fellow, 2012–2013
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- Yong-Jae Kim, visiting technical staff from Samsung Corporation, Korea, 2011-2012
- Christopher Brooks, postdoctoral fellow, 2009–2012
- Markus Wulfmeier, visiting undergraduate student researcher from Leibniz University, 2012
- Mobolaji Akinpelu, visiting undergraduate student researcher from University of Maryland, Baltimore County, 2011
- Shanbao Cheng, postdoctoral fellow, 2011–2012
- Michele Lanzetta, visiting faculty researcher from the University of Pisa, 2011
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- Takayuki Nishihata, visiting technical staff researcher from Komatsu Corporation, Japan, 2008-2010
- Genya Ishigami, postdoctoral fellow, 2008–2010
- Shingo Shimoda, University of Tokyo, 2005

Personal Activities

Internationally published author of fiction. Short story collection, *On the Nature of Human Romantic Interaction*, published by the Dial Press, 2003. Novel, *The Expeditions*, published by the Dial Press, 2008. Major awards for fiction include grants from the National Endowment for the Arts and the Massachusetts Cultural Council, inclusion in *The Best American Short Stories* anthology, Pushcart Prize, *Paris Review* Plimpton Prize, finalist for National Magazine Award. Translations into Chinese, Japanese, Korean, Farsi, Arabic, Italian, French. Guest instructor and visiting speaker at various national and international writing conferences.

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