

Monroe D. Kennedy III

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Education

Ph.D. - Mechanical Engineering [University of Pennsylvania], GPA: 3.45/4.00 March 2019
M.S.E. - Robotics [University of Pennsylvania], GPA: 3.28/4.00 May 2016
B.S. - Mechanical Engineering [University of Maryland Baltimore County], GPA: 3.793/4.00 May 2012

Research Experience

This work was performed at the University of Pennsylvania

- *Cooperative Human, Robot Transport*: Inspired by ant transport we study how a mobile robot can cooperatively navigate an obstacle filled environment while providing intelligent support for a carried object with a human counterpart. To do this, I developed a computer vision based ant force sensor system for collaboration with Arizona State University biology research group with the goal of better understanding how ants transport objects. We then used algorithms to mimic the behavior of the ants between robots with limited communication. Finally I extend the work to human-robot collaboration with implicit communication with the goal of having the mobile manipulator transport an object with a human counterpart by estimating the humans intent in the context of the cluttered environment.
- *Autonomous Pouring*: Inspired by GlaxoSmithKline, we pour precisely using only visual feedback using a redundant manipulator. In our latest work, we simultaneously approximate the pouring container while pouring a precise amount of fluid in a single attempt. We combine all of these capabilities with a user interface to allow the research scientist to use the mobile platform in a wet lab research setting.

Skills

- Dynamics and Controls Analysis, Numerical Optimization, Kalman Filters, Motion Planning, Computer Vision
- *Programming Languages*: Python, C++ , MATLAB
- *Applications*: ROS, OpenCV, Solid Works, Eigen, Gurobi, L^AT_EX
- *Operating Systems*: Linux/Unix system
- *Robots*: Fetch Mobile Manipulator, Rethink Robotics Baxter and Sawyer, KUKA iiwa and YouBot, Scarab Differential Drive

Academic Experience

- **University of Pennsylvania** — Philadelphia, PA (Graduate Research Assistant) Aug 2012 - March 2019
Robotist in the Kumar Lab working on ground and mobile manipulator robots.

Professional Experience

- **MITRE Corp** — Alexandria, VA (Internship) Summer 2012
Worked on software for the android phone for obstacle detection during autonomous, fixed-wing flight.
- **University of Pennsylvania** — Philadelphia, PA (Internship) Summer 2011
Worked on mapping the magnetic field topography for micro-robotic control.
- **Rutgers University** — New Brunswick, NJ (Internship) Summer 2010
Studied the effects of compaction and additives on the tensile strength of acetaminophen tablets.
- **University of Illinois Urbana Champaign** — Urbana Champaign IL (Internship) Summer 2009
Developed circuitry designs for regenerative braking in a robotic arm.

Awards, Certificates and Patents

- National Science Foundation Graduate Fellow [University of Pennsylvania]
- GEM Fellow [University of Pennsylvania]
- Outstanding Teaching Assistant Award in Mechanical Engineering [University of Pennsylvania]

- Center for Teaching and Learning (CTL) Teaching Certificate [University of Pennsylvania]
- Meyerhoff Scholar [University of Maryland, Baltimore County]
- Tau Beta Pi Honors Society [University of Maryland, Baltimore County]

Academic Service

- Reviewer for International Journal of Robotics Research 2019
- Reviewer for IEEE International Conference on Automation Science and Engineering 2018
- Reviewer for ASME International Design Engineering Technical Conferences 2017-2018
- Reviewer for IEEE Robotics and Automation Letters 2017
- Reviewer for IEEE International Conference on Intelligent Robots and Systems 2014-2016

Professional Affiliations

- Member, American Society of Mechanical Engineers
- Member, Institution of Electrical and Electronic Engineers

Press Coverage and Media Appearances

- [KUKA Innovation award Finalist 2018](#)
- [Exploration Earth 2050 “Bio-Mechanimals” \(S1E1\)](#)
- [Bloomberg Technology: “The End of Traffic: How the Smartest People in the World Are Fixing Your Commute”](#)
- [Xploration Nature Knows Best \(S1E12\)](#)

Mentoring

- SUNFEST REU **2018**
 - Mentored student in [SUNFEST](#) program in project for human-robot cooperative transport modeling
- NSF RET ([research experience for teachers](#)) **2016-2017**
 - Mentored project for essential AI for lab based robot in social interactions 2017
 - Mentored project for robotic arm used for transcription 2016
- Senior Project **2016**
 - Mentored a senior design group in the development of disaster response ground robot
- NSF GRASP REU **2014-2015**
 - Mentored student in a project for cooperative ground robot transportation 2015
 - Mentored student in a project for an olfactory sensor for chemical source triangulation 2014

Publications

- [1] **Monroe Kennedy**, Luis Guerrero, and Vijay Kumar. Decentralized algorithm for force distribution with applications to cooperative transport. In *ASME 2015 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, pages V05CT08A013–V05CT08A013. American Society of Mechanical Engineers, 2015.
- [2] **Monroe Kennedy**, Kendall Queen, Dinesh Thakur, Kostas Daniilidis, and Vijay Kumar. Precise dispensing of liquids using visual feedback. In *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 1260–1266, Sept 2017.
- [3] **Monroe Kennedy**, Karl Schmeckpeper, Dinesh Thakur, Jiang Chenfanfu, Vijay Kumar, and Kostas Daniilidis. Autonomous precision pouring from unknown containers. *IEEE Robotics and Automation Letters*, pages 1–1, 2019.
- [4] **Monroe Kennedy**, Dinesh Thakur, M Ani Hsieh, Subhrajit Bhattacharya, and Vijay Kumar. Optimal paths for polygonal robots in se (2). *Journal of Mechanisms and Robotics*, 10(2):021005, 2018.
- [5] Caio Mucchiani, **Monroe Kennedy**, Mark Yim, and Jun Seo. Object picking through in-hand manipulation using passive end-effectors with zero mobility. *IEEE Robotics and Automation Letters*, 3(2):1096–1103, April 2018.

- [6] Edward Steager, Mahmut Selman Sakar, Magee Ceridwen, **Monroe Kennedy**, Anthony Cowley, and Vijay Kumar. Automated biomanipulation of single cells using magnetic microrobots. *The International Journal of Robotics Research*, 32(3):346–359, 2013.
- [7] Mabel Zhang, **Monroe Kennedy**, M. Ani Hsieh, and Kostas Daniilidis. A triangle histogram for object classification by tactile sensing. In *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4931–4938, Oct 2016.