Joshua Vander Hook

CONTACT

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OVERVIEW

Autonomy and Distributed Systems Researcher at NASA Jet Propulsion Laboratory. US Citizen.

EDUCATION

2015 Ph.D. Computer Science, The University of Minnesota, Minneapolis, MN
- Thesis: Active Target Localization and Tracking with Application to Robotic Environmental Monitoring

2010 B.S. Computer Science *Cum Laude*, Minnesota State University, Mankato, MN
- Thesis: Experimental Verification of Costless-Merge Pairing Heaps

RELEVANT EXPERIENCE

- Advanced technical communication including proposal writing, technical publication.
- Strong analytical skills: path optimization, estimation, target tracking, and algorithm design
- Hands-on experience with all aspects of mobile robot systems, from firmware and sensor design to development of high level path planning algorithms, state estimation, and target tracking.
- C,C++,Python programming for a variety of embedded, web, and desktop environments, including the Robot Operating System (ROS), Windows, Linux, ARM, and SoC
- Experience in small and large team environments including leading research projects, mentoring students, and working in industry

AWARDS

2017:	JPL Team Award: Deploy and demonstrate new JPL autonomy on Navy test vehicles
2017:	JPL Team Award: Enhancement to the Mars 2020 rover navigation algorithm
2016:	JPL Team Award: Designing, developing, and demonstrating state-of-the-art multi-agent autonomy for ONR
2014:	Winner of the Honeywell Urban Autonomous Navigation Challenge
2014-2015:	Doctoral Dissertation Fellowship
2014-2015:	Sigma Xi ($\Sigma\Xi$) Dorothy and Charles Andrew Bird Award
2013-2015:	ARCS Foundation Scholarship, 2013-2015
2010:	Chuck Sherwood Scholarship
2008-2010:	National Science Foundation Scholarship
2007-2010:	Minnesota State CS Dept. Scholarship
2007-2010:	Minnesota State University Scholarship

RELEVANT PROJECTS

2015-Present: NASA Jet Propulsion Laboratory
Mission autonomy and coordinated behaviors for teams of heterogeneous autonomous vehicles operating in unstructured environments.
- PI: Adaptive formation control for fast-moving maritime vehicles (increased to TRL 6)
- PI: Distributed, shared computing for future Mars exploration missions (TRL 3)
- TL: Task-allocation and coordination for multi-robot heterogeneous maritime systems (TRL 8)
- TL: Distributed resource allocation for multi-robot systems w/ lossy communication (TRL 8)
- Contributor: World modeling, sensor data processing, systems development
- Mentor 2-3 students per year

2011-2015: Thesis work at the University of Minnesota
Robotic Sensor Network for Monitoring Invasive Fish, a system of mobile robots (autonomous boats and autonomous rovers) which can track radio-tagged invasive carp in Minnesota lakes.
- C++ for Robot Operating System, C for Adruino Firmware
- C++ for multi-agent path planning, state estimation,and target tracking
- C++ for convex optimization, batch estimation algorithms
- Sensor design, API design, real time software design

Selected Publications

- J. Vander Hook, P. Tokekar, V. Isler. **Algorithms for Cooperative Active Localization of Static Targets with Mobile Bearing Sensors under Communication Constraints** *Transactions on Robotics*. 31 (4) 2014. pp 864-876.
- J. Vander Hook, P. Tokekar V. Isler. **Cautious Greedy Strategy for Bearing-Only Active Localization: Analysis and Field Experiments** *Journal of Field Robotics*, pp 296-318, 31(2), April 2014.
- J. Vander Hook, V. Isler. **Pursuit and Evasion with Uncertain Bearing Measurements** Accepted to: *Canadian Conference on Computational Geometry*.

Teaching

2010-2015: University of Minnesota, Minneapolis

- Homework design, office hours, lectures, and grading for several courses
- Sample reviews and feedback available at josh.vanderhook.info/teaching
- CSCI 5551: Introduction to Intelligent Robotic Systems
- CSCI 4041: Algorithms and Data Structures
- CSCI 2021: Machine Structures and Organization

Minnesota State University, Mankato

- Homework design, office hours, and grading for several courses
- CS 311: Algorithms and Data Structures
- CS 210: Machine Structures and Programming
- CS 111: Introduction to C++ Programming

Industry Highlights

2015-Present: NASA Jet Propulsion Laboratory

- Robotics Technologist in the Decision, Control, and Estimation Group (347E)
- Propose, research, develop, and support system and algorithm development for space exploration and defense work
- Managed multiple teams of 3-5 developers or researchers
- Several successful military or NASA demonstrations

Summer 2009: MTS Systems, Software Engineering Inter, Aerospace Division.

- C++ for MFC/COM Windows development.
- Real time data acquisition, display, and file system drivers

2009-2010: FPX, LLC, Software Engineering Contractor

- Java / J2EE, Struts for Server-side optimization and data management
- AJAX / Javascript for responsive client-side data display

2007-2008: VTek Inc

- C, PLC, and Labview for industrial automation platforms

Volunteering

Pro bono development

- 2017-Present Technical web dev. consulting for All Access H20 501(c)(3)
- 2015-Present Computer Science Curriculum lead developer for Mind Makers. 501(c)(3) See: Mind Makers Project
- 2012-Present Robotics Stack Exchange: http://goo.gl/SEIt98
- 2014 John Howard Association, 501(c)(3) PHP development. See: http://www.thejha.org/mission
- 2014 Hope Academy Concord, 501(c)(3) Wordpress. See: http://www.hopeacademyconcord.org/about-our-school/
- 2013 Earth Day Fair at Cannon River STEM School
- 2008-2015: Volunteer judge for the Minnesota science fair, high school level
- 2011 Math, Science, Engineering Family Fun Day (U of M Open House)
- 2009 IEEE 24 hour programming competition (We finished second in the region)