Justin M. Bradley

curriculum vitae

Assistant Professor
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1 EDUCATION AND EMPLOYMENT HISTORY

1.1 Education History

University of Michigan — Ann Arbor, MI
Ph.D., Aerospace Engineering — August 2014
Thesis: Toward Co-Design of Autonomous Aerospace Cyber-Physical Systems
Adviser: Dr. Ella M. Atkins
Area of Study: Cyber-physical systems, dynamics and control

University of Michigan — Ann Arbor, MI
M.S., Aerospace Engineering — December 2012
Area of Study: Cyber-physical systems, dynamics and control

Brigham Young University — Provo, UT
M.S., Electrical Engineering — August 2007
Thesis: Particle Filter Based Mosaicking for Forest Fire Tracking
Adviser: Dr. Clark Taylor
Area of Study: Computer vision, UAS applications for fire tracking

Brigham Young University — Provo, UT
B.S., Computer Engineering — August 2005
Emphasis: embedded systems, electrical engineering

1.2 Employment History

University of Nebraska — Lincoln, NE

- **Assistant Professor** — August 2015–current
  Computer Science and Engineering Department
- **Assistant Professor** — Jan 2017–current
  Mechanical and Materials Engineering Department (by courtesy)
- **Co-Director** — August 2015–current
  Nebraska Intelligent MoBile Unmanned Systems (NIMBUS) Lab

University of Michigan — Ann Arbor, MI

- **Research Fellow (Postdoc)** — August 2014–July 2015
  Department of Aerospace Engineering

Lawrence Livermore National Laboratory — Livermore, CA

- **Control System Software Engineer** — September 2007–December 2009

2 RESEARCH ACCOMPLISHMENTS

2.1 Publication Record

The following subscripts are used to indicate graduate student co-authors
1: Masters student under my supervision
2: Ph.D. student under my supervision

2.1.1 Peer Reviewed Journal Publications in Print

[1] R. D. Eubank, **J. M. Bradley**, and E. M. Atkins, "Energy-Aware Multi-Flight Planning for an Unattended Seaplane - Flying Fish," *AIAA Journal of Aerospace Information Systems*, pp. 1–19, Dec 2016, **(Contribution: 50%)**

[2] **J. M. Bradley** and E. M. Atkins, "Optimization and Control of Cyber-Physical Vehicle Systems," *Sensors*, vol. 15, p. 23020, Sep 2015, **(Contribution: 70%)**

[3] **J. M. Bradley** and E. M. Atkins, "Coupled Cyber-Physical System Modeling and Coregulation of a CubeSat," *IEEE Transactions on Robotics*, vol. 31, pp. 443–456, April 2015, **(Contribution: 95%)**

[4] **J. M. Bradley** and E. M. Atkins, "A Cyber-Physical Optimization Approach to Mission Success for Unmanned Aircraft Systems," *Journal of Aerospace Information Systems*, vol. 11, pp. 48–60, January 2014, **(Contribution: 90%)**

[5] **J. M. Bradley** and E. M. Atkins, "Toward Continuous State-Space Regulation of Coupled Cyber-Physical Systems," *Proceedings of the IEEE*, vol. 100, pp. 60–74, January 2012, **(Contribution: 70%)**

[6] **J. M. Bradley** and C. N. Taylor, "Georeferenced Mosaics for Tracking Fires Using Unmanned Miniature Air Vehicles," *Journal of Aerospace Computing, Information, and Communication*, vol. 8, pp. 295–309, October 2011, **(Contribution: 70%)**

2.1.2 Peer Reviewed Journal Publications Submitted for Review

[7] T. Shen, C. A. Nelson, and **J. M. Bradley**, "Design of a model-free cross-coupled controller for a notes robot," *Mechatronics (under review)*, Sep 2016, **(Contribution: 20%)**

2.1.3 Conference Proceedings: Peer Reviewed

[1] E. Foruzan, S. Asgarpoor, and **J. M. Bradley**, "Hybrid system modeling and supervisory control of a microgrid," in *2016 North American Power Symposium (NAPS)*, pp. 1–6, Sept 2016. Denver, CO, **(Contribution: 30%)**

[2] **J. M. Bradley**, M. L. Clark, E. M. Atkins, and K. G. Shin, "Mission-Aware Cyber-Physical Optimization on a Tabletop Satellite," in *AIAA Infotech@Aerospace*, (Boston, MA), August 2013, **(Contribution: 80%)**

[3] E. M. Atkins and **J. M. Bradley**, "Aerospace Cyber-Physical Systems Education," in *AIAA Infotech@Aerospace*, (Boston, MA), August 2013, **(Contribution: 30%)**

[4] **J. M. Bradley** and E. M. Atkins, "Multi-Disciplinary Cyber-Physical Optimization for Unmanned Aircraft Systems," in *AIAA Infotech@Aerospace*, (Garden Grove, CA), June 2012, **(Contribution: 70%)**

[5] **J. M. Bradley** and E. M. Atkins, "Computational-Physical State Co-Regulation in Cyber-Physical Systems," in *ACM/IEEE Conference on Cyber-Physical Systems*, (Chicago, IL), ACM/IEEE, April 2011, **(Contribution: 70%)**

[6] **J. M. Bradley** and C. N. Taylor, "Particle Filter Based Mosaicking for Tracking Forest Fires," in *AIAA Conference on Guidance, Navigation, and Control*, (Hilton Head, SC), August 2007, **(Contribution: 70%)**

[7] A. Rodriguez, E. Andersen, **J. M. Bradley**, and C. N. Taylor, "Wind Estimation Using an Optical Flow Sensor on a Miniature Air Vehicle," in *AIAA Conference on Guidance, Navigation, and Control*, vol. 6614, (Hilton Head, SC), August 2007, **(Contribution: 30%)**

[8] **J. Bradley**, B. Prall, R. Beard, and C. Taylor, "An Unmanned Aerial Vehicle Project For Undergraduates," in *The Forty-Second Annual International Telemetering Conference and Technical Exhibition*, vol. 42, (San Diego, CA), pp. 563–572, International Foundation for Telemetering, October 2006, **(Contribution: 60%)**

[9] R. Holt, J. Egbert, **J. Bradley**, R. Beard, C. Taylor, and T. McLain, "Forest Fire Monitoring Using Multiple Unmanned Air Vehicles," in *The Eleventh Forest Service Remote Sensing Applications Conference*, vol. 1, (Salt Lake City, UT), pp. 54–66, American Society for Photogrammetry and Remote Sensing, April 2006, **(Contribution: 20%)**

2.1.4   Other Publications

[1] **J. M. Bradley** and E. M. Atkins, "Position Paper: Cyber-Physical Systems," tech. rep., NIST Foundations for Innovation in Cyber-Physical Systems Workshop, Chicago, IL, March 2012

[2] **J. M. Bradley** and E. M. Atkins, "Co-Regulation of Cyber Physical Systems," tech. rep., 2011 Automotive CPS Workshop, Troy, MI, February 2011

2.2   Grantsmanship Record

2.2.1   Internally Funded Research Grants

1. UNL Undergraduate Creative Activities and Research Experiences Program (UCARE), *Integration of Unmanned Aircraft System Vehicles of UNL's NIMBUS Lab into a commercial simulator*, Sept 2016 - April 2017, $2,400, PI: Bradley, Student PI Shreya Rawal.

2.2.2   Externally Funded Research Grants

1. USDA National Institute of Food and Agriculture (National Robotics Initiative) *NRI: RUI: Collaborative Research: At the Water's Edge - Installation and Optimization of Robotic Sensing Systems*, Total: $949,716, UNL: $635,230 (Direct Funds: $259,959), Sept 2016 - Aug 2019, PI (UNL): Detweiler, PI (University of the Pacific): Basha, Co-PI (UNL): Bradley, USDA-NIFA #2017-67021-25924, SAP WBS: 25-0511-0157-010

   Description: Robot systems currently lack the capabilities required to collect the needed information in complex environments such as wetlands systems. This work addresses this through the development of techniques to optimize selection of the robot systems and sensors based on environmental and system constraints, which is broadly applicable to many heterogeneous robot-sensor systems.

2. National Science Foundation (National Robotics Initiative), *NRI: Enabling UAS Fire Ignitions in Complex Firefighting Contexts*, Total: $995,470 (Direct Funds: $203,277), Sept 2016 - Aug 2019,

PI (UNL): Elbaum, Co-PIs (UNL): Bradley, Detweiler, Duncan, Twidwell, NSF-1638099, SAP WBS: 25-0511-0152-004.

Description: Development of a sUAS for igniting prescribed burns through exploration of five activities, of which she will focus on the motion-based languages that communicate UAS intention and knowledge to operators and bystanders. Broader Impacts: A group of approximately 50 fire managers will be exposed to the technology, trained through field trials; the work will also reach a broader community through the planned participation in workshops and the curation of the collected data and experiences, which will be made available online.

3. NASA Nebraska Space Grant, *Strengthen NASA Collaborations for EPSCoR Proposal, NASA Nebraska Space Grant Mini-Grant*, Total: $1,410 (Direct Funds: $1,410), PI: Bradley, January 1, 2016 - February 29, 2016, SAP WBS: 26-0511-0137-001

Description: This proposal was to obtain funding to travel to NASA Ames to strengthen collaborations for the NASA EPSCoR proposal to be submitted in March 2016.

2.2.3 Externally Research Grants Submitted but not Funded

1. National Science Foundation EXPERIMENTAL EXPEDITIONS pre-proposal, *Collaborative Research: An Expedition to Mars: Clean Slate Design for an Extraterrestrial Internet of Everything*, Requested: $1,980,739, PI (UNL): Ramamurthy, Co-PI (UNL): Bradley, Submitted: May 2, 2016
2. National Science Foundation, *CPS: Breakthrough: Improving Users' Trust in and Adoption of CPS via User-Infused Co-Design*, Requested: $499,566 (Direct Funds: $249,783), Jan 2017 - Dec 2020, PI (UNL): Bradley, Co-PI (UNL): Duncan, Submitted Jun 7, 2016.
3. NASA EPSCoR, *A Cyber-Physical Earth-Observing CubeSat: CubuloNIMBUS*, Requested: $750,000 (Direct Funds: $612,035), Sept 2016 - Aug 2019, PI (UNL): Bradley, Co-PI (UNL): Wang, Nguyen, Co-I (UNO): Nero, Submitted: March 21, 2016.
4. National Science Foundation, *CRII: CPS: Co-Design of Cyber-Physical Systems: Focus on Co-Regulation*, Requested: $174,998 (Directed Funds: $174,998), Jun 2016 - May 2017, PIs: Bradley, Submitted: Sept 30, 2016
5. UNL Laymen Seed, *A Cyber-Physical CubeSat: CubuloNIMBUS*, Requested: $20,000, PI: Bradley, Submitted: Nov 13, 2015.
6. National Science Foundation, *CPS: Synergy: Strongly Coupled Cyber-Physical Systems for Unmanned Aircraft Systems*, $650,814, Jan 1, 2016 - Dec 31, 2019, PI (UNL): Bradley, Co-PI (UNL): Elbaum, PI (Michigan): Atkins, Submitted: May 4, 2015.

2.3 Research Patents and Awards

2.3.1 Regional and Local Research Awards and Recognition

1. Selected to participate in 2015–2016 Research and Development Fellows Program

2.4 Other Research Accomplishments

2.4.1 Infrastructure Available to Community

- **Nebraska Intelligent MoBile Unmanned Systems (NIMBUS) Lab**
  The NIMBUS Lab has the systems and facilities to develop and prototype hardware and algorithms on Unmanned Aircraft Systems (UASs) as well as other robot platforms. These facilities are highlighted on department tours and are used by a number of faculty and students (http://nimbus.unl.edu).

With a MS student from the MME department I've been developing the capability within the NIM-BUS lab to retrieve objects with a UAS using a claw-like mechanism.

3 TEACHING ACCOMPLISHMENTS (OTHER THAN CLASSROOM INSTRUCTION)

3.1 PhD Students

3.1.1 PhD Students Currently in Progress

1. Balaji Balasubramaniam   Aug 2016–current
   - Computer Science
   - Co-advised with Sebastian Elbaum
   - Funded 50% each by Bradley and Elbaum
   - Expected graduation: Aug 2020
2. Chandima Fernando   Jan 2017–current
   - Computer Science
   - Co-advised with Carrick Detweiler
   - Fully funded by Bradley
   - Expected graduation: May 2021
3. Adam Plowcha   Jun 2016–current
   - Computer Science
   - Fully funded by Bradley
   - Expected graduation: Aug 2020

3.2 MS Students

3.2.1 MS Students (thesis option) Currently in Progress

1. Seth Doebbeling   Nov 2015–current
   - Mechanical Engineering
   - Fully funded by Bradley
   - Expected graduation: Aug 2017

3.3 Undergraduate Students

3.3.1 Undergraduate Students Supervised in Independent Research Study

1. Shreya Rawal   May 2016–current
   - Funded by UNL UCARE Award for Fall 2016 - Spring 2017
2. Lucas Hall   Jan 2017–current
   - Funded by Bradley
3. Liam Kruse   Jan 2017–current
   - Funded by Bradley

3.4 Other Student Mentoring

3.4.1 Regular Informal Mentoring

1. Ajay Shankar (control, real-time systems, 2015–current)

2. Nishant Sharma (control, real-time systems, 2015–current)

3.4.2 *Dissertation and Thesis Committees*

- Haibo Li, PhD Student, Electrical and Computer Engineering, UNL (PhD in progress)
- Fujuan Guo, PhD Student, Computer Science and Engineering, UNL (PhD in progress)
- Lizhi Qu, PhD Student, Electrical and Computer Engineering, UNL (PhD in progress)
- Willie Wells, MS Student, Computer Science and Engineering, UNL (MS Fall 2016)

4 TEACHING ACCOMPLISHMENTS (IN CLASSROOM)

4.1 Courses Developed

CSCE 936: Cyber-Physical Systems (formerly CSCE 990)

This course introduces students to the research, design, and analysis of cyber-physical systems - the tight integration of computing, control, and communication. Applications for CPS research are far reaching and span medical devices, smart buildings, vehicle systems, and mobile computing. The application domain for this course will be cyber-physical (aerospace) vehicle systems though techniques are more broadly applicable. Control theory, real-time systems, automata, guidance, and planning will be discussed.

CSCE 496/896: Real-Time Systems

This course introduces students to the design of real-time computing systems and corresponding theory. Real-time systems applications typically involve safety or mission critical systems where timing guarantees must be maintained. Real-time task design, dependability, communication, power and energy awareness, scheduling, and real-time control are some of the topics that will be covered. The course will be biased toward real-time system design including the interactions between the physical and real-time systems - dubbed "cyber-physical systems."

4.2 Courses Taught

- CSCE 496/896: Real-Time Systems   Spring 2017
  13 students (3 MECH, 1 HUMS, 5 CENG, 3 COMP, 1 ELEC)
  Instructor Effectiveness Rating: (in progress)
- CSCE 990: Cyber-Physical Systems   Fall 2016
  13 students (1 MECH, 1 HUMS, 2 CENG, 10 COMP)
  Instructor Effectiveness Rating: mean 4.49/5.00, std. dev 0.71
- CSCE 496/896: Real-Time Systems   Spring 2016
  14 students (1 MECH, 3 ELEC, 2 CENG, 7 COMP, 1 ABSE)
  Instructor Effectiveness Rating: mean 4.62/5.00, std. dev 0.63
- CSCE 990: Cyber-Physical Systems   Fall 2015
  9 students (3 MEAM, 1 ELEC, 3 ENGR, 2 COMP)
  Instructor Effectiveness Rating: mean 4.77/5.00, std. dev. 0.50

4.3 Teaching Innovations

- Introduced new course: "Cyber-Physical Systems" Computer Science and Engineering 990 University of Nebraska, Fall 2015.
- Transitioned two research projects started in CSCE 990 into publications.
- Developed labs to help students develop real-time systems programming skills using a small mobile robot. These new labs were introduced Spring 2017 semester.

5 SERVICE ACCOMPLISHMENTS

5.1 Professional Service

5.1.1 Journal Paper Reviewer

1. AIAA Journal of Aerospace Information Systems (2014, 2015)
2. IEEE Transactions on Wireless Communications (2016)
3. MDPI Applied Sciences (ISSN 2076-3417) (2016)

5.1.2 Conferences Paper Reviewer

1. IEEE International Conference on Robotics and Automation (ICRA) (2015, 2016)
2. IEEE International Conference on Intelligent Robots and Systems (IROS) (2016)
3. AIAA Infotech@Aerospace (2015)

5.1.3 Leadership Positions in International and National Organizations

1. Technical Program Committee, ACM/IEEE International Conference on Cyber-Physical Systems, 2016-2017
2. Intelligent Systems Technical Committee, AIAA, 2016–current

5.1.4 Memberships in Professional Organizations

1. ACM Member, since 2015
2. IEEE Member, since 2011
3. AIAA Member Senior Member, since 2007
4. Member, Eta Kappa Nu (HKN) Electrical Engineering Honor Society, since 2005

5.1.5 Research Review Panels

1. National Science Foundation Review Panel, 2016
2. National Institute of Health Review Panel, 2017

5.2 College Service

5.2.1 Leadership Positions on College Wide Committees

1. Robotics Minor Committee, 2016–current, Chair

5.2.2 Membership Positions on College Wide Committees

1. Robotics Minor Committee, 2015–current, member

5.3 Unit Service

5.3.1 Leadership Positions on Unit Committees

1. ACM Programming Contest, Fall 2016–current, Chair

5.3.2 Membership Positions on Unit Committees

1. Graduate Admissions Committee, 2015–current, member
2. Graduate Recruiting and Outreach Committee, 2015–2016, member

5.4 Other Service Accomplishments

- Organized National Robotics Week where public can come tour robotics labs at UNL, April 2016