

Patrick N. Currier, Ph.D.

Curriculum Vitae

Education

- 2008–2011 **Ph.D. Mechanical Engineering**, Virginia Tech, Blacksburg, VA
Dissertation: A Method for Modeling and Prediction of Ground Vehicle Dynamics and Stability in Autonomous Systems
- 2005–2008 **M.S. Mechanical Engineering**, Virginia Tech, Blacksburg, VA
Thesis: Development of an Automotive Ground Vehicle Platform for Autonomous Urban Operations
- 2000–2005 **B.S. Mechanical Engineering**, Tennessee Tech University, Cookeville, TN
Magna Cum Laude, In Cursu Honorum

Research Interests

- Autonomous and unmanned ground vehicle systems
- Vehicle dynamics and high performance vehicle systems
- Novel applications for mechatronic, electro-mechanical, and embedded systems
- Hybrid powertrain technologies

Relevant Experience

- 2017–present **Associate Chair, Mechanical Engineering**
- 2011–present **Assistant (2011-2016) then Associate (2016-present) Professor**, Embry-Riddle Aeronautical University, Daytona Beach, FL
- Lead Advisor: DOE EcoCAR Mobility Challenge, EcoCAR 3, and EcoCAR 2
 - EcoCAR 2 NSF Outstanding Incoming Faculty Advisor, 2014
 - Funded Research Projects
 - Unmanned Aerial Vehicle (UAV) Prototype Concept Maturation
 - Sponsor: The Boeing Company
 - Ranger II By-Wire Robotic Applique Kit
 - Sponsor: QinetiQ North America
 - Conversion of Polaris Ranger EV for Autonomous Operation
 - Sponsor: Robotic Research, LLC
 - Maritime RobotX Challenge
 - Sponsor: Office of Naval Research
 - SCR Diesel Emissions Test Stand
 - Sponsor: Environmental Protection Agency
 - Autonomous Service Vehicles
 - Sponsor: Florida Department of Transportation
 - The World is Not Enough (WINE): Harvesting Local Resources for Eternal Exploration of Space
 - Sponsor: NASA

- Multi-Domain Approach to Increased USV Capability for Future Naval Missions
 - Sponsor: Office of Naval Research

2005–2011 **Graduate Research Assistant**, Virginia Tech, Blacksburg, VA

- Ground Unmanned Support Surrogate (GUSS)
- Autonomous Mining Truck Dynamic Model
- 2007 DARPA Urban Challenge
 - Achieved 3rd place finish, winning \$500,000 prize
- 2005 DARPA Grand Challenge

2005–2011 **Graduate Teaching Assistant**, Virginia Tech, Blacksburg, VA

- Supervised and mentored senior design project groups
- Assisted in development of and lecturing in undergraduate mechatronics course

2003–2004 **Co-op, Production Engineering**, Denso Manufacturing TN, Maryville, TN

- Process development and quality verification for alternator rotor production.
- Line troubleshooting and Kaizen for new product mass production startup

2000–2005 **SAE Baja**, Tennessee Tech University, Cookeville, TN

- Winner of 3 international competitions, 2002 & 2003 Team of the Year.

Service & Professional

Professional Societies

- Association of Unmanned Vehicles Systems International
- American Society of Mechanical Engineers
- Institute of Electrical and Electronics Engineers
- Society of Automotive Engineers

Student Projects Advisor: Robotics Association at Embry-Riddle (2011-present)

- 2017 Office of Undergraduate Research Faculty Mentor of the Year
- AUVSI Intelligent Ground Vehicle Competition
- AUVSI Student Unmanned Aerial Systems Competition
- AUVSI RoboBoat Competition
- AUVSI RoboSub Competition
- AUVSI International Aerial Robotics Competition
- AUVSI Maritime RobotX Competition
- NASA Robotic Mining Competition

Publications and Presentations

1. Freeman, T. B., Spitzer, D., Currier, P. N., Rollin, V., and Boetcher, S. K. (March 22, 2019). "Phase-Change Materials/HDPE Composite Filament: A First Step Toward Use With 3D Printing for Thermal Management Applications." ASME. J. Thermal Sci. Eng. Appl. October 2019; 11(5): 054502. <https://doi.org/10.1115/1.4042592>

2. Freeman, Thomas B., Nabutola, Kaloki, Spitzer, David, Currier, Patrick N., and Boetcher, Sandra K. S. "3D-Printed PCM/HDPE Composites for Battery Thermal Management." Proceedings of the ASME 2018 International Mechanical Engineering Congress and Exposition. Volume 8B: Heat Transfer and Thermal Engineering. Pittsburgh, Pennsylvania, USA. November 9–15, 2018. V08BT10A041. ASME. <https://doi.org/10.1115/IMECE2018-86081>
3. Compere, M., K. Adkins, O. Legon, P. Currier. "MoVE: A Mobility Virtual Environment for Testing Multi-Vehicle Scenarios." NDIA Ground Vehicle Systems Engineering and Technology Symposium. August 2019.
4. Freeman, T., D. Spitzer, P. Currier, V. Rollin, S. Boetcher. "Phase-Change Materials/HDPE Composite Filament: A First Step Toward Use With 3D Printing for Thermal Management Applications." J. Thermal Sci. Eng. Appl 11(5), 054502 (Mar 22, 2019)
5. Zhu, F., Lei, J., Du, X., Currier, P. et al., "Crushing Behavior of Vehicle Battery Pouch Cell and Module: A Combined Experimental and Theoretical Study," SAE Int. J. Mater. Manf. 11(4):341-348, 2018, <https://doi.org/10.4271/2018-01-144>
6. Zhu, F., J. Lei, X. Du, P. Currier, A. Gbaquidi, D. Sypeck. "Crushing Behavior of Vehicle Battery Pouch Cell and Module: A Combined Experimental and Theoretical Study". SAE World Congress, April 2018.
7. Allam, Y., P. Currier, B. Bezaire, C. Gribbins. "Pre-Capstone Design: Keystone Design For Junior Year Engineering Students." Clive L. Dym Mudd Design Workshop 10. 2017
8. T. Zuercher, E. Coyle, P. Currier. Development of the Embry-Riddle Aeronautical University Wave Adaptive Modular Vessel as an Integral Part Of a Heterogeneous Intelligent Teaming System. *Proceedings of AUVSI Xponential*. May, 2017.
9. Y. Meng and P. Currier. A System Efficiency Approach to Power-Split Hybrid Control Strategies. *SAE World Congress 2016*.
10. M. Compere, P. Currier, D. Bonderczuk, M. Nelson, H. Khalifi. Improving 0-60mph Launching Performance of a Series Hybrid Vehicle. *International Journal of Vehicle Performance*. Vol. 2, No. 3, 2016.
11. Y. Meng, R. Gulati, A. Karamastaji, H. Khalifi, A. Szechy, P. Currier. Modeling and Control Strategy Development of a Parallel-Series Plug-in Hybrid Electric Vehicle. *Proceedings of the International Federation of Automatic Control E-COSM 15*. August 2015.
12. S. Waterman, P. Currier, J. Longshore. Group Dynamics and Project Management in EcoCAR 3. *Proceedings of ASEE 2015*. June 2015.
13. H. Khalifi, M. Compere, P. Currier. Parameter Estimation for Model Validation of an Energy Storage System During Operation in a Series Hybrid Electric Vehicle. *Proceedings of IMECE*. November, 2015.
14. C. Hockley, T. Zuercher, C. Kennedy, H. Patel, E. Coyle, P. Currier, B. Butka, C. Reinholtz. Results From The Development Of The ERAU Maritime RobotX Entry. *Proceedings of AUVSI Unmanned Systems North America 2015*. May, 2015.
15. R. Stansbury, H. Moncayo, P. Currier. A Graduate Program In Unmanned And Autonomous Systems Engineering. *Proceedings of ASEE-SE*. April, 2015.
16. C. Rowe, D. Bonderczuk, I. Demirkiran, P. Currier. An Approach to Enhance the Efficiency and Consumer Acceptability of Series Plug-in Hybrid Vehicle. *Proceedings of IEEE-SE*. March, 2015.

17. C. Hockley, T. Zuercher, C. Kennedy, G. Gamble, H. Patel, P. Currier. System Architecture, Development and Results of the Embry-Riddle Aeronautical University Maritime RobotX Platform. *Proceedings of AIAA Scitech*. January, 2015.
18. D. Bonderczuk, M. Nelson, P. Currier. Application of Principles from the Scrum Agile Method to a Prototype Vehicle Control Development Cycle. *Proceedings of IMECE*. November, 2014.
19. R. Stansbury, P. Currier, H. Moncayo. A Graduate Program to Develop the Engineering Workforce for Unmanned and Autonomous Systems. *Aerospace Testing International*. 2014.
20. C. Hockley, T. Zuercher, G. Gamble, E. Coyle, P. Currier, C. Reinholtz, The Development Of The ERAU Maritime RobotX Challenge Autonomous System. *Proceedings of AUVSI Unmanned Systems North America 2014*, May 2014.
21. C. Rowe, C. Rowe, I. Demirkiran, P. Currier, A Vehicle That Brings Together Industry and Academia to Educate the Next Generation of Engineers. *Proceedings of IEEE-SE*. March, 2014.
22. C. Breingan and P. Currier. Autopilot Architecture for Advanced Autonomy. *Proceedings of AUVSI Unmanned Systems North America 2013*, August 2013.
23. J. Tabaracci and P. Currier. A Blueprint for a Fixed-wing Autopilot on an Android Smartphone. *Proceedings of IEEE-SE*. April, 2013.
24. R. Finta and P. Currier. Kalman filter for Improved PO2 Management in Closed Circuit Rebreathers. *Proceedings of IEEE-SE*. April, 2013.
25. P. Currier and A. Wicks. A Novel Method for Prediction of Mobile Robot Maneuvering Spaces. *Journal of Terramechanics*. Vol 50, Issue 2, pp 85-97. April 2013.
26. C. Breingan and P. Currier. Development of a Rockband Robot Using Vision Based Note Detection. *Proceedings of IEEE-SE*. March, 2012.
27. G. Gamble, C. Hockley, A. Yatsko, P. Currier. Issues Facing the Development of a Monocopter Control System. *Proceedings of IEEE-SE*. March, 2012.
28. P. Currier, A. Wicks. A Novel Method for Prediction of Mobile Robot Maneuvering Spaces. In *Proceedings of ISTVS 2011*. September, 2011.
29. Currier, Patrick, et al. "The VictorTango Architecture for Autonomous Navigation in the DARPA Urban Challenge." Experience from the DARPA Urban Challenge. Springer London, 2012. 93-131.
30. P. Reynolds, P. Currier, et al. Development of the Ground Unmanned Support Surrogate. In *Proceedings of AUVSI North America 2011*, August 2011.
31. P. Currier, R. Goff, and J. Terpenney. A Proposed Learner-Centered Mechatronics Engineering Instructional Program. In *Proceedings of the 2010 ASEE Southeastern Section*, April 2010.
32. J. Hurdus, P. Currier, et al. The VictorTango Architecture for Autonomous Navigation in the DARPA Urban Challenge. *AIAA Journal of Aerospace Computing, Information, and Communication*, Vol 5:506–544, December 2008.
33. P. Currier, J Hurdus, et al. Team VictorTango's Odin: Autonomous Driving with LabVIEW in the DARPA Urban Challenge. In *Proceedings of NI Week 2008*, August 2008.
34. P. Currier. Technical Enablers for Team VictorTango in the DARPA Urban Challenge. Invited presentation for Draper Laboratory 'Beyond the Urban Challenge' Symposium., June 2008.
35. P. Currier. Odin: Team VictorTango's Entry in the DARPA Urban Challenge. Invited presentation for ICRA 2008 Urban Challenge Workshop, May 2008.
36. A. Bacha, P. Currier, et al. Odin: Team VictorTango's Entry in the DARPA Urban Challenge. *Journal of Field Robotics*, Vol 25(8):467–492, 2008.
37. P. Currier. Development of an Automotive Ground Vehicle Platform for Autonomous Urban Operations. Master's Thesis, Virginia Polytechnic Institute and State University, 2008.

38. P. Currier. Team VictorTango: DARPA Urban Challenge, An Overview of Autonomous Behavior Development. Invited presentation for NIPS 2007 Urban Challenge Workshop, December 2007.
39. P. Currier and D. Anderson. HELIUM RED: A Prototype JAUS UGV Deployable from a UAV. Presentation for NI Week 2006 Unmanned Systems Summit, August 2006.