

# Tulga Ersal

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Dr. Tulga Ersal's research is in the field of system dynamics and control. He is interested in mathematical modeling of dynamic systems, system identification, and advanced control systems with applications to vehicle and energy systems. Example vehicle applications include unmanned ground vehicles at all levels of autonomy ranging from teleoperation to semi and full autonomy; connected and automated vehicles; and connected powertrain testbeds. Example applications in the energy domain include fuel cells; batteries; microgrids; and vehicle powertrains.

## EDUCATION

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<b>University of Michigan</b> PhD, Mechanical Engineering (GPA 4.00/4.00)	Ann Arbor, MI Dec 2007
<b>University of Michigan</b> MSE, Mechanical Engineering (GPA 4.00/4.00)	Ann Arbor, MI Dec 2003
<b>Istanbul Technical University</b> BSE, Mechanical Engineering (GPA 3.90/4.00, best in University)	Istanbul, Turkey Jul 2001

## ACADEMIC APPOINTMENTS

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<b>Department of Mechanical Engineering, University of Michigan</b> Associate Research Scientist	Ann Arbor, MI Sep 2017 – present
<b>Department of Mechanical Engineering, University of Michigan</b> Assistant Research Scientist	Ann Arbor, MI Jan 2011 – Aug 2017

## PROFESSIONAL EXPERIENCE

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<b>Automotive Research Center, University of Michigan</b> Center Research Integration Lead	Ann Arbor, MI Sep 2011 – present
Coordinating research integration activities of the Center • Preparing case studies for the Center Annual Review • Participating in Center administration • Representing the Center during visits	
<b>Automated Modeling Laboratory, University of Michigan</b> Associate Director	Ann Arbor, MI Jan 2011 – present
Assisting with the administration of the Laboratory • Mentoring the students in the Laboratory • Raising and managing funding for the Laboratory	
<b>Energy Institute, University of Michigan</b> Research Initiatives Lead	Ann Arbor, MI Sep 2019 – Dec 2020
Identified center level funding opportunities • Led proposal teams and efforts	
<b>Automotive Research Center, University of Michigan</b> Dynamics and Control of Vehicles Thrust Area Leader	Ann Arbor, MI Sep 2012 – Jun 2018
Coordinated the research activities of the Dynamics and Control of Vehicles Thrust Area, one of the five Thrust Areas of the Automotive Research Center • Facilitated the communication among the Thrust Area members • Created the Thrust Area road maps	
<b>Automated Modeling Laboratory, University of Michigan</b> Post-Doctoral Research Fellow	Ann Arbor, MI Nov 2007 – Dec 2010
Developed an internet-distributed hardware-in-the-loop simulation platform and analyzed and improved its performance • Developed machine learning models and methods to detect driver distraction • Developed models to evaluate and improve the design of a balance prosthesis for patients with vestibular loss • Analyzed stability of microgrids • Wrote grant applications	
<b>Department of Mechanical Engineering, University of Michigan</b> Graduate Student Research Assistant	Ann Arbor, MI Sep 2002 – Oct 2007
Developed energy based, realization preserving, trajectory dependent structural simplification and order and structure reduction methods for dynamic system models with application to a multibody model of a military vehicle (High Mobility Multipurpose Wheeled Vehicle) • Developed a bond graph based, acausal, modular modeling framework for multibody systems with application to reconfigurable machine tools	
<b>Department of Mechanical Engineering, University of Michigan</b> Graduate Student Instructor	Ann Arbor, MI Jan 2006 – Apr 2006
Assisted with the instruction of 141 undergraduate students in both sections of ME 360 (Modeling, Analysis, and Control of Dynamic Systems) by holding weekly recitations, creating homework solutions, grading exams, and holding office hours	

**NSF ERC for Reconfigurable Manufacturing Systems, University of Michigan**

Technical Advisory Committee/Site Visit Coordinator

Ann Arbor, MI  
Sep 2004 – May 2005

Elected by the 50+ students in the ERC as one of the six members of the Student Leadership Committee • Organized and managed student responsibilities for the quarterly Technical Advisory Committee meetings and the annual NSF site visit • Facilitated the collaboration with Morgan State University (MSU) by helping the MSU students form a local Student Leadership Committee and supervising their operation • Organized and managed the student responsibilities for the 3rd CIRP International Conference on Reconfigurable Manufacturing • Prepared, conducted and analyzed the annual Strengths, Weaknesses, Opportunities and Threats survey for students • Organized weekly facility tours for prospective students during the Winter term

**Pattengill Elementary School**

Mentor

Ann Arbor, MI  
Jan 2006 – Apr 2006

Helped 3rd to 5th graders do weekly science projects as part of the Reach Out! program

**EMO Teknik Malz. Tic. ve San. Ltd. Şti**

Intern

Istanbul, Turkey  
Aug – Sep 2000

Assisted in the design of building automation systems by performing valve calculations and selections, and preparing quotes

**FAS GmbH**

Intern

Erlensee, Germany  
Jul – Aug 1999

Manufactured parts for and performed assembly and maintenance of custom designed machines and conveyors

**Istanbul Technical University Machining Shop**

Intern

Istanbul, Turkey  
Jul 1998

Developed milling, casting, welding, turning and planing skills

**MENTORING****PhD Students**

- [1] **Jiechao Liu**  
Vehicle-Dynamics-Conscious Real-Time Hazard Avoidance in Autonomous Ground Vehicles, 2016
- [2] **Xin Zhou**  
Data-Based Techniques for Battery-Health Prediction, 2017
- [3] **Xinyi Ge**  
A Frequency Domain Design Approach for Norm-Optimal Iterative Learning Control, 2017
- [4] **Yingshi Zheng**  
Improving Mobility Through Latency Compensation in Teleoperated Ground Vehicles, 2018
- [5] **Huckleberry Febbo**  
Real-time Trajectory Planning to Enable Safe and Performant Automated Vehicles Operating in Unknown Dynamic Environments, 2019
- [6] **Alireza Goshtasbi**  
Modeling, Parameter Identification, and Degradation-Conscious Control of Polymer Electrolyte Membrane (PEM) Fuel Cells, 2019
- [7] **John Wurts**  
Collision Avoidance Guardian at the Dynamic Limits of Handling, 2020
- [8] **Chunan Huang**  
Energy and Emissions Conscious Optimal Speed Planning for Diesel-Powered Vehicles, expected 2021
- [9] **Su-Yang Shieh**  
Periodic Control of Automotive Vehicles to Improve Fuel Economy, expected 2021
- [10] **James Dallas**  
Terrain-Aware Autonomous Navigation, expected 2021
- [11] **Yifan Weng**  
Mutually-Adaptive Shared Control between Human Operators and Autonomy in Ground Vehicles, expected 2022
- [12] **Chen Li**  
Cognitive Modeling of Human Operator Behavior during Interaction with Autonomous Systems, expected 2022

## PhD Committee Memberships

- [1] **Youngki Kim**  
Power Capability Estimation Accounting for Thermal and Electrical Constraints of Lithium-Ion Batteries, 2014
- [2] **Ingyu Lim**  
Multi-Objective Iterative Learning Control: An Advanced ILC Approach for Application Diversity, 2016
- [3] **Tianyou Guo**  
Power Consumption Models for Tracked and Wheeled Small Unmanned Ground Vehicles on Deformable Terrains, 2016
- [4] **Zicheng Li**  
Enhancing the Sustainability of Electrified Vehicles by Wireless Charging: A Life Cycle Framework to Assess and Optimize the Sustainability Performance of Wireless Charging Electric Vehicle Systems, 2018
- [5] **Ziheng Pan**  
Design and Control Optimization of All-Wheel-Drive Hybrid Electric Vehicles, 2018
- [6] **Isaac Spiegel**  
Hybrid Systems, Iterative Learning Control, and Non-minimum Phase, 2021
- [7] **Ruikun Luo**  
Real-time Human Workload Estimation and Its Application in Adaptive Haptic Shared Control, expected 2021
- [8] **Akshay Bhardwaj**  
Intuitive Steering Interfaces to Support Driver-Automation Control Sharing, expected 2021

## MSc Students

- [1] Akshar Tandon, 2012
- [2] Yue Tang, 2018
- [3] Kshitij Jain, 2018
- [4] Jiahui Fu, 2018
- [5] Yifan Weng, 2018
- [6] James Dallas, 2018
- [7] Zheng Dong, 2019
- [8] Peter Westra, 2021
- [9] Siyuan Yu, 2022
- [10] Congkai Shen, 2022

## Undergraduate Researchers

- [1] Yingshi Zheng, 2012-2014
- [2] Sicong Guo, 2018-2019
- [3] Yuzhang Liu, 2018-2019
- [4] Siyuan Yu, 2019-2020
- [5] Congkai Shen, 2019-2020
- [6] Junsik Eom, 2020-

## Post Doctoral Scholars

- [1] Hossein Mirinejad (May 2016 - Oct 2017)

## MEMBERSHIPS

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American Society of Mechanical Engineers (ASME)

## PUBLICATIONS

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### Archival Publications

- [1] **A workload adaptive haptic shared control scheme for semi-autonomous driving**  
R. Luo, Y. Weng, Y. Wang, P. Jayakumar, M. J. Brudnak, V. Paul, V. Desaraju, J. L. Stein, T. Ersal and X. J. Yang  
Accident Analysis and Prevention 152, pp. 105968, 2021 [\[PDF\]](#)
- [2] **Effects of cycle duration and test hardware in relative humidity cycling of a polymer electrolyte membrane**  
J. Chen, A. Goshtasbi, A. P. Soleymani, M. Ricketts, J. Waldecker, C. Xu, J. Yang, T. Ersal and J. Jankovic  
Journal of Power Sources 476, pp. 228576, 2020 [\[PDF\]](#)
- [3] **Evaluation of a predictor based framework in high-speed teleoperated military UGVs**  
Y. Zheng, M. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
IEEE Transactions on Human-Machine Systems 50(6), pp. 561-572, 2020 [\[PDF\]](#)
- [4] **Modeling human steering behavior in teleoperation of unmanned ground vehicles with varying speed**  
C. Li, Y. Tang, Y. Zheng, P. Jayakumar and T. Ersal  
Human Factors, doi:10. 1177/ 0018 7208 20948982, 2020 [\[PDF\]](#)
- [5] **Model-free speed management for a heterogeneous platoon of connected ground vehicles**  
Y. Weng, R. Salehi, X. Ge, D. Rizzo, M. P. Castanier, S. Heim and T. Ersal  
Journal of Intelligent Transportation Systems: Technology, Planning, and Operations, doi:10.1080/15472450.2020.1797506, 2020 [\[PDF\]](#)
- [6] **Collision imminent steering at high speed using nonlinear model predictive control**  
J. Wurts, J. L. Stein and T. Ersal  
IEEE Transactions on Vehicular Technology 69(8), pp. 8278-8289, 2020 [\[PDF\]](#)
- [7] **Online terrain estimation for autonomous vehicles on deformable terrains**  
J. Dallas, K. Jain, Z. Dong, M. P. Cole, P. Jayakumar and T. Ersal  
Journal of Terramechanics 91, pp. 11-22, 2020 [\[PDF\]](#)
- [8] **Degradation-conscious control for enhanced lifetime of automotive polymer electrolyte membrane fuel cells**  
A. Goshtasbi and T. Ersal  
Journal of Power Sources 457, 2020 [\[PDF\]](#)
- [9] **Connected and automated road vehicles: State of the art and future challenges**  
T. Ersal, I. Kolmanovsky, N. Masoud, N. Ozay, J. Scruggs, R. Vasudevan and G. Orosz  
Vehicle System Dynamics 58(5), pp. 672-704, 2020 [\[PDF\]](#)
- [10] **An energy and emissions conscious adaptive cruise controller for a connected automated diesel truck**  
C. Huang, R. Salehi, T. Ersal and A. Stefanopoulou  
Vehicle System Dynamics 58(5), pp. 805-825, 2020 [\[PDF\]](#)
- [11] **Effective parameterization of PEM fuel cell models - Part II: Robust parameter subset selection, robust optimal experimental design, and parameter identification algorithm**  
A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
Journal of the Electrochemical Society 167(4), pp. 044505, 2020 [\[PDF\]](#)
- [12] **Effective parameterization of PEM fuel cell models - Part I: Sensitivity analysis and parameter identifiability**  
A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
Journal of the Electrochemical Society 167(4), pp. 044504, 2020 [\[PDF\]](#) (Editor's Choice paper)
- [13] **A mathematical model toward real-time monitoring of automotive PEM fuel cells**  
A. Goshtasbi, B. Pence, J. Chen, M. DeBolt, C. Wang, J. Waldecker, S. Hirano and T. Ersal  
Journal of the Electrochemical Society 167(2), pp. 024518, 2020 [\[PDF\]](#)
- [14] **Who's the boss? Arbitrating control authority between a human driver and automation system**  
A. Bhardwaj, A. Ghasemi, Y. Zheng, H. Febbo, P. Jayakumar, T. Ersal, J. L. Stein and B. Gillespie  
Transportation Research Part F: Psychology and Behaviour 68, pp. 144-160, 2020 [\[PDF\]](#)

- [15] **Predictive cruise control with private vehicle-to-vehicle communication for improving fuel consumption and emissions**  
X. Zhang, C. Huang, M. Liu, A. Stefanopoulou and T. Ersal  
IEEE Communications Magazine 57(10), pp. 91-97, 2019 [\[PDF\]](#)
- [16] **A delay compensation framework for predicting heading in teleoperated ground vehicles**  
Y. Zheng, M. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
IEEE/ASME Transactions on Mechatronics 24(5), pp. 2365-2376, 2019 [\[PDF\]](#)
- [17] **Through-the-membrane transient phenomena in PEM fuel cells: A modeling study**  
A. Goshtasbi, P. García-Salaberri, J. Chen, K. Talukdar, D. Sanchez and T. Ersal  
Journal of The Electrochemical Society 166(7), pp. F3154-F3179, 2019 [\[PDF\]](#)
- [18] **Optimality of norm-optimal iterative learning control among linear time invariant iterative learning control laws in terms of balancing robustness and performance**  
X. Ge, J. L. Stein and T. Ersal  
Journal of Dynamic Systems Measurement and Control 141(4), pp. 044502 , 2019 [\[PDF\]](#)
- [19] **Power loss minimization in islanded microgrids: A communication-free decentralized power control approach using extremum seeking**  
S.-Y. Shieh, T. Ersal and H. Peng  
IEEE Access 7(1), pp. 20879-20893, 2019 [\[PDF\]](#)
- [20] **Workload management in teleoperation of unmanned ground vehicles: Effects of a delay compensation aid on human operators' workload and teleoperation performance**  
S. Lu, M. Y. Zhang, T. Ersal and X. J. Yang  
Human-Computer Interaction 35(19), pp. 1820-1830, 2019 [\[PDF\]](#)
- [21] **Improving the robustness of an MPC-based obstacle avoidance algorithm to parametric uncertainty using worst-case scenarios**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
Vehicle System Dynamics 57(6), pp. 874-913, 2019 [\[PDF\]](#)
- [22] **A predictor based framework for delay compensation in networked closed-loop systems**  
Y. Zheng, M. J. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
IEEE/ASME Transactions on Mechatronics 23(5), pp. 2482-2493, 2018 [\[PDF\]](#)
- [23] **Wireless charger deployment for an electric bus network: A multi-objective life cycle optimization**  
Z. Bi, G. A. Keolelian and T. Ersal  
Applied Energy 225, pp. 1090-1101, 2018 [\[PDF\]](#) (Selected for the Progress in Applied Energy special section)
- [24] **Model-based analysis of PFSA membrane mechanical response to relative humidity and load cycling in PEM fuel cells**  
M. Hasan, A. Goshtasbi, J. Chen, M. H. Santare and T. Ersal  
Journal of the Electrochemical Society 165(6), pp. F3359-F3372, 2018 [\[PDF\]](#)
- [25] **Modeling human steering behavior during path following in teleoperation of unmanned ground vehicles**  
H. Mirinejad, P. Jayakumar and T. Ersal  
Human Factors 60(5), pp. 669-684, 2018 [\[PDF\]](#)
- [26] **A nonlinear model predictive control formulation for obstacle avoidance in high-speed autonomous ground vehicles in unstructured environments**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
Vehicle System Dynamics 56(6), pp. 853-882, 2018 [\[PDF\]](#)
- [27] **Evaluating mobility vs. latency in unmanned ground vehicles**  
D. Gorsich, P. Jayakumar, M. Cole, C. Crean, A. Jain, and T. Ersal  
Journal of Terramechanics 80, pp. 11-19, 2018 [\[PDF\]](#)
- [28] **A frequency-dependent filter design approach for norm-optimal iterative learning control and its fundamental trade-off between robustness, convergence speed and steady state error**  
X. Ge, J. L. Stein and T. Ersal  
Journal of Dynamic Systems Measurement and Control 140(2), pp. 021004, 2017 [\[PDF\]](#)
- [29] **Battery state of health monitoring by estimation of the number of cyclable Li-ions**  
X. Zhou, J. L. Stein and T. Ersal  
Control Engineering Practice 66(Sep 2017), pp. 51-63, 2017 [\[PDF\]](#)

- [30] **Combined speed and steering control in high speed autonomous ground vehicles for obstacle avoidance using model predictive control**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
IEEE Transactions on Vehicular Technology 66(10), pp. 8746-8763, 2017 [\[PDF\]](#)
- [31] **Frequency domain analysis of robust monotonic convergence of norm-optimal iterative learning control**  
X. Ge, J. L. Stein and T. Ersal  
IEEE Transactions on Control Systems Technology 26(2), pp. 637-651, 2018 [\[PDF\]](#)
- [32] **Battery state of health monitoring by estimation of side reaction current density via retrospective-cost subsystem identification**  
X. Zhou, D. S. Bernstein, J. L. Stein and T. Ersal  
Journal of Dynamic Systems Measurement and Control 139(9), pp. 091007-1 - 091007-15, 2017 [\[PDF\]](#)
- [33] **Computationally efficient pseudo-2d non-isothermal modeling of polymer electrolyte membrane fuel cells with two-phase phenomena**  
A. Goshtasbi, B. Pence and T. Ersal  
Journal of The Electrochemical Society 163(3), pp. F1412-F1432, 2016 [\[PDF\]](#)
- [34] **A study on model fidelity for model predictive control based obstacle avoidance in high speed autonomous ground vehicles**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
Vehicle System Dynamics 54(11), pp. 1629-1650, 2016 [\[PDF\]](#)
- [35] **Sustainability, resiliency, and grid stability of the coupled electricity and transportation infrastructures: Case for an integrated analysis**  
J. C. Kelly, T. Ersal, C.-T. Li, B. M. Marshall, S. Kundu, G. A. Keoleian, I. A. Hiskens, J. L. Stein and H. Peng  
Journal of Infrastructure Systems 21(4), pp. 11, 2015 [\[PDF\]](#)
- [36] **Reducing soot emissions in a diesel series hybrid electric vehicle using a power rate constraint map**  
Y. Kim, A. Salvi, A. Stefanopoulou and T. Ersal  
IEEE Transactions on Vehicular Technology 64(1), pp. 2-12, 2015 [\[PDF\]](#)
- [37] **An iterative learning control approach to improving fidelity in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, M. J. Brudnak, A. Salvi, Y. Kim, J. B. Siegel and J. L. Stein  
Journal of Dynamic Systems Measurement and Control 136(6), pp. 061012-061012-8, 2014 [\[PDF\]](#)
- [38] **Hardware-in-the-loop validation of a power management strategy for hybrid powertrains**  
Y. Kim, A. Salvi, J. B. Siegel, Z. Filipi, A. Stefanopoulou and T. Ersal  
Control Engineering Practice 29, pp. 277-286, 2014 [\[PDF\]](#)
- [39] **Keeping ground robots on the move through battery and mission management**  
T. Ersal, Y. Kim, J. Broderick, T. Guo, A. Sadrpour, A. Stefanopoulou, J. B. Siegel, D. Tilbury, E. Atkins, H. Peng, J. Jin and A. G. Ulsoy  
ASME Dynamic Systems and Control Magazine 2(2), pp. 1-6, 2014 [\[PDF\]](#)
- [40] **Theoretical and experimental indicators of falls during pregnancy as assessed by postural perturbations**  
T. Ersal, J. L. McCrory and K. H. Sienko  
Gait and Posture 39(1), pp. 218-223, 2014 [\[PDF\]](#)
- [41] **Coupling between component sizing and regulation capability in microgrids**  
T. Ersal, C. Ahn, D. L. Peters, J. Whitefoot, A. R. Mechtenberg, I. A. Hiskens, H. Peng, A. Stefanopoulou, P. Y. Papalambros and J. L. Stein  
IEEE Transactions on Smart Grid 4(3), pp. 1576-1585, 2013 [\[PDF\]](#)
- [42] **A mathematical model for incorporating biofeedback into human postural control**  
T. Ersal and K. H. Sienko  
Journal of NeuroEngineering and Rehabilitation 10(14), pp.12, 2013 [\[PDF\]](#)
- [43] **Effect of coupling point selection on distortion in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, R. B. Gillespie, M. Brudnak, J. L. Stein and H. K. Fathy  
International Journal of Vehicle Design 61(1-4), pp. 67-85, 2013 [\[PDF\]](#)

- [44] **Statistical transparency analysis in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, M. Brudnak, J. L. Stein and H. K. Fathy  
IEEE/ASME Transactions on Mechatronics 17(2), pp. 228-238 , 2012 [\[PDF\]](#)
- [45] **Development and model-based transparency analysis of an internet-distributed hardware-in-the-loop simulation platform**  
T. Ersal, M. Brudnak, A. Salvi, J. L. Stein, Z. Filipi and H. K. Fathy  
Mechatronics 21(1), pp. 22-29, 2011 [\[PDF\]](#)
- [46] **Model-based analysis and classification of driver distraction under secondary tasks**  
T. Ersal, H. J. A. Fuller, O. Tsimhoni, J. L. Stein and H. K. Fathy  
IEEE Transactions on Intelligent Transportation Systems 11(3), pp. 692-701, 2010 [\[PDF\]](#)
- [47] **Model reduction in vehicle dynamics using importance analysis**  
T. Ersal, B. Kittirungsi, H. K. Fathy and J. L. Stein  
Vehicle System Dynamics 47(7), pp. 851–865, 2009 [\[PDF\]](#)
- [48] **Structural simplification of modular bond-graph models based on junction inactivity**  
T. Ersal, H. K. Fathy and J. L. Stein  
Simulation Modelling Practice and Theory 17(1), pp. 175-196, 2009 [\[PDF\]](#)
- [49] **Orienting body coordinate frames using Karhunen-Loève expansion for more effective structural simplification**  
T. Ersal, H. K. Fathy and J. L. Stein  
Simulation Modelling Practice and Theory 17(1), pp. 197-210, 2009 [\[PDF\]](#)
- [50] **Realization-preserving structure and order reduction of nonlinear energetic system models using energy trajectory correlations**  
T. Ersal, H. K. Fathy and J. L. Stein  
Journal of Dynamic Systems Measurement and Control 131(3), pp. 031004 (8p), 2009 [\[PDF\]](#)
- [51] **A review of proper modeling techniques**  
T. Ersal, H. K. Fathy, L. S. Louca, D. G. Rideout and J. L. Stein  
Journal of Dynamic Systems Measurement and Control 130(6), pp. 061008, 2008 [\[PDF\]](#)

### Conference Publications

- [1] **Combined trajectory planning and tracking for autonomous vehicles on deformable terrains**  
**J. Dallas, Y. Weng and T. Ersal**  
Dynamic Systems and Control Conference, 2020 [\[PDF\]](#)
- [2] **Contingent nonlinear model predictive control for collision imminent steering in uncertain environments**  
J. Dallas, J. Wurts, J. L. Stein and T. Ersal  
IFAC World Congress, 2020 [\[PDF\]](#)
- [3] **A robust energy and emissions conscious speed control framework for connected vehicles with privacy considerations**  
C. Huang, X. Zhang, R. Salehi, T. Ersal and A. G. Stefanopoulou  
American Control Conference, 2020 [\[PDF\]](#) (ASME Automotive and Transportation Systems Best Paper Award Finalist)
- [4] **Design and evaluation of a workload-adaptive haptic shared control framework for semi-autonomous driving**  
Y. Weng, R. Luo, P. Jayakumar, M. Brudnak, V. Paul, V. Desaraju, J. L. Stein, X. J. Yang and T. Ersal  
American Control Conference, 2020 [\[PDF\]](#)
- [5] **Adaptive nonlinear model predictive control for collision imminent steering with uncertain coefficient of friction**  
J. Wurts, J. Dallas, J. L. Stein and T. Ersal  
American Control Conference, 2020 [\[PDF\]](#)
- [6] **Robust parameter subset selection and optimal experimental design for effective parameterization of PEM fuel cell models**  
A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
American Control Conference, 2020 [\[PDF\]](#)

- [7] **Synchronization of pulse-and-glide operation in vehicle platooning using cooperative adaptive cruise control**  
S.-Y. Shieh, T. Ersal and H. Peng  
American Control Conference, 2020 [\[PDF\]](#) (ASME Automotive and Transportation Systems Best Paper Award Finalist)
- [8] **Minimum slip collision imminent steering in curved roads using nonlinear model predictive control**  
J. Wurts, J. L. Stein and T. Ersal  
American Control Conference, 2019 [\[PDF\]](#)
- [9] **Pulse-and-glide operation for parallel hybrid electric vehicles with step-gear transmission in automated car-following scenario with ride comfort consideration**  
S.-Y. Shieh, T. Ersal and H. Peng  
American Control Conference, 2019 [\[PDF\]](#)
- [10] **Toward real-time assessment of workload: A Bayesian inference approach**  
R. Luo, Y. Wang, Y. Weng, V. Paul, M. J. Brudnak, P. Jayakumar, M. Reed, J. L. Stein, T. Ersal and J. Yang  
Annual Meeting of the Human Factors and Ergonomics Society, 2019 [\[PDF\]](#)
- [11] **LQ-MPC design for degradation-conscious control of PEM fuel cells**  
A. Goshtasbi and T. Ersal  
American Control Conference, 2019 [\[PDF\]](#)
- [12] **On parameterizing PEM fuel cell models**  
A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
American Control Conference, 2019 [\[PDF\]](#)
- [13] **Degradation-conscious control for PEM fuel cell systems**  
A. Goshtasbi and T. Ersal  
236th ECS Meeting, 2019 [\[PDF\]](#)
- [14] **Optimal experimental design for parameter identification of PEM fuel cell models**  
A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
236th ECS Meeting, 2019 [\[PDF\]](#)
- [15] **Soft sensor for real-time monitoring of automotive PEM fuel cell systems**  
A. Goshtasbi, B. Pence, J. Chen, J. Waldecker, S. Hirano and T. Ersal  
236th ECS Meeting, 2019 [\[PDF\]](#)
- [16] **Modeling mechanical behaviors and lifetime of a polymer electrolyte membrane in fuel cell dynamic operations**  
M. Hasan, A. Goshtasbi, J. Chen, M. H. Santare and T. Ersal  
236th ECS Meeting, 2019 [\[PDF\]](#)
- [17] **Increasing computational speed of nonlinear model predictive control using analytic gradients of the explicit integration scheme with application to collision imminent steering**  
J. Wurts, J. L. Stein and T. Ersal  
IEEE Conference on Control Technology and Applications, 2018 [\[PDF\]](#)
- [18] **Collision imminent steering using nonlinear model predictive control**  
J. Wurts, J. L. Stein and T. Ersal  
American Control Conference, 2018 [\[PDF\]](#)
- [19] **Optimal speed planning using limited preview for connected vehicles with diesel engines**  
C. Huang, R. Salehi, T. Ersal and A. G. Stefanopoulou  
International Symposium on Advanced Vehicle Control, 2018 [\[PDF\]](#)
- [20] **Modeling mechanical behaviors of a polymer electrolyte membrane in fuel cell dynamic operations**  
M. Hasan, A. Goshtasbi, J. Chen, M. H. Santare and T. Ersal  
233rd ECS Meeting, 2018 [\[PDF\]](#)
- [21] **Effects of a delay compensation aid on teleoperation of unmanned ground vehicles**  
S. Lu, M. Y. Zhang, T. Ersal and X. J. Yang  
Human-Robot Interaction, 2018 [\[PDF\]](#)
- [22] **A 2d through-the-membrane transient model for polymer electrolyte membrane fuel cells**  
A. Goshtasbi, B. Pence and T. Ersal  
232nd ECS Meeting, 2017 [\[PDF\]](#)



- [23] **A communication-free distributed power control approach for power loss minimization in microgrids using extremum seeking**  
S.-Y. Shieh, T. Ersal and H. Peng  
Dynamic Systems and Control Conference, 2017 [\[PDF\]](#) (ASME Energy Systems Best Paper Award)
- [24] **A real-time pseudo-2D bi-domain model of PEM fuel cells for automotive applications**  
A. Goshtasbi, B. Pence and T. Ersal  
Dynamic Systems and Control Conference, 2017 [\[PDF\]](#)
- [25] **A driver model for predicting human steering performance in teleoperated path following of unmanned ground vehicles**  
H. Mirinejad, P. Jayakumar and T. Ersal  
Dynamic Systems and Control Conference, 2017 [\[PDF\]](#)
- [26] **Moving obstacle avoidance for large, high-speed autonomous ground vehicles**  
H. Febbo, J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
American Control Conference, 2017 [\[PDF\]](#) (ASME DSCD Automotive and Transportation Systems Best Paper Award)
- [27] **A double-worst-case formulation for improving the robustness of an MPC-based obstacle avoidance algorithm to parametric uncertainty**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
American Control Conference, 2017 [\[PDF\]](#)
- [28] **Battery state of health monitoring by estimation of the number of cyclable Li-ions**  
**X. Zhou, J. L. Stein and T. Ersal**  
ASME Dynamic Systems and Control Conference, 2016 [\[PDF\]](#) (ASME Energy Systems Best Paper Award Finalist; Best Student Paper Finalist)
- [29] **Optimization based weighting matrices design for norm optimal iterative learning control**  
X. Ge, J. L. Stein and T. Ersal  
ASME Dynamic Systems and Control Conference, 2016 [\[PDF\]](#)
- [30] **An experimental evaluation of a model-free predictor framework in teleoperated vehicles**  
Y. Zheng, M. J. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
IFAC Workshop on Time Delay Systems, 2016 [\[PDF\]](#)
- [31] **A combined plant/controller optimization framework for hybrid vehicles with mpg, emissions and drivability considerations**  
H. Febbo, T. Ersal and J. L. Stein  
ASME International Design Engineering Technical Conference, 2016 [\[PDF\]](#)
- [32] **1+1d non-isothermal and two-phase transient model of PEM fuel cells for real-time estimation**  
A. Goshtasbi, B. Pence and T. Ersal  
ECS Meeting, 2016 [\[PDF\]](#)
- [33] **A frequency domain approach for designing filters for norm-optimal iterative learning control and its fundamental tradeoff between robustness, convergence speed and steady state error**  
X. Ge, J. L. Stein and T. Ersal  
American Control Conference, 2016 [\[PDF\]](#)
- [34] **An MPC algorithm with combined speed and steering control for obstacle avoidance in autonomous ground vehicles**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
Dynamic Systems and Control Conference, 2015 [\[PDF\]](#) (Best Student Paper Finalist)
- [35] **Performance analysis of a model-free predictor for delay compensation in networked systems**  
X. Ge, Y. Zheng, M. J. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
IFAC Workshop on Time Delay Systems, 2015 [\[PDF\]](#)
- [36] **A model-free predictor framework for tele-operated vehicles**  
X. Ge, M. J. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
American Control Conference, 2015 [\[PDF\]](#)
- [37] **A subsystem identification technique towards battery state of health monitoring under state of charge estimation errors**  
X. Zhou, T. Ersal, J. L. Stein and D. S. Bernstein  
American Control Conference, 2015 [\[PDF\]](#)

- [38] **A multi-stage optimization formulation for MPC-based obstacle avoidance in autonomous vehicles using a LIDAR sensor**  
J. Liu, P. Jayakumar, J. L. Stein and T. Ersal  
ASME Dynamic Systems and Control Conference, 2014 [\[PDF\]](#)
- [39] **Battery state of health monitoring by side reaction current density estimation via retrospective-cost subsystem identification**  
X. Zhou, T. Ersal, J. L. Stein and D. S. Bernstein  
ASME Dynamic Systems and Control Conference, 2014 [\[PDF\]](#) (Best Student Paper Finalist)
- [40] **A norm optimal iterative learning control framework towards internet-distributed hardware-in-the-loop simulation**  
X. Ge, M. J. Brudnak, J. L. Stein and T. Ersal  
American Control Conference, 2014 [\[PDF\]](#)
- [41] **Battery health diagnostics using retrospective-cost system identification: Sensitivity to noise and initialization errors**  
X. Zhou, T. Ersal, J. L. Stein and D. S. Bernstein  
Dynamic Systems and Control Conference, 2013 [\[PDF\]](#) (Best Student Paper Finalist)
- [42] **An observer based framework to improve fidelity in internet-distributed hardware-in-the-loop simulations**  
A. Tandon, M. J. Brudnak, J. L. Stein and T. Ersal  
Dynamic Systems and Control Conference, 2013 [\[PDF\]](#)
- [43] **The role of model fidelity in model predictive control based hazard avoidance in unmanned ground vehicles using lidar sensors**  
J. Liu, P. Jayakumar, J. L. Overholt, J. L. Stein and T. Ersal  
Dynamic Systems and Control Conference, 2013 [\[PDF\]](#)
- [44] **Engine-in-the-loop validation of a frequency domain power distribution strategy for series hybrid powertrains**  
Y. Kim, T. Ersal, A. Salvi, Z. Filipi and A. Stefanopoulou  
IFAC Workshop on Engine and Powertrain Control, Simulation and Modeling, 2012 [\[PDF\]](#)
- [45] **Characterizing postural stability in pregnant fallers and nonfallers**  
T. Ersal, J. L. McCrory and K. H. Sienko  
Gait and Clinical Movement Analysis Society Conference, 2012 [\[PDF\]](#)
- [46] **An iterative learning control approach to improving fidelity in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, M. Brudnak and J. L. Stein  
ASME Dynamic Systems and Control Conference, 2012 [\[PDF\]](#) (Semi-Plenary Paper Award)
- [47] **A method to achieve high fidelity in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, M. Brudnak, Y. Kim, A. Salvi, J. B. Siegel, A. Stefanopoulou, J. L. Stein and Z. Filipi  
NDIA Ground Vehicle Systems Engineering and Technology Symposium, 2012 [\[PDF\]](#)
- [48] **On the effect of dc source voltage on inverter-based frequency and voltage regulation in a military microgrid**  
T. Ersal, C. Ahn, I. A. Hiskens, H. Peng, A. G. Stefanopoulou and J. L. Stein  
American Control Conference, 2012 [\[PDF\]](#)
- [49] **Noninvasive battery-health diagnostics using retrospective-cost identification of inaccessible subsystems**  
A. M. D'Amato, J. Forman, T. Ersal, A. A. Ali, J. L. Stein, H. Peng and D. S. Bernstein  
ASME Dynamic Systems and Control Conference, 2012 [\[PDF\]](#)
- [50] **Effect of coupling point selection on distortion in internet-distributed hardware-in-the-loop simulation**  
T. Ersal, R. B. Gillespie, M. Brudnak, J. L. Stein and H. K. Fathy  
American Control Conference, 2011 [\[PDF\]](#)
- [51] **Impact of controlled plug-in EVs on microgrids: A military microgrid example**  
T. Ersal, C. Ahn, I. A. Hiskens, H. Peng and J. L. Stein  
IEEE Power and Energy Society General Meeting, 2011 [\[PDF\]](#)

- [52] **Integration of vibrotactile feedback in a 3D model of human balance**  
T. Ersal, V. V. Vichare and K. H. Sienko  
The Annual Meeting for the American Society of Biomechanics, 2009 [\[PDF\]](#)
- [53] **Variation-based transparency analysis of an internet-distributed hardware-in-the-loop simulation platform for vehicle powertrain systems**  
T. Ersal, M. Brudnak, J. L. Stein and H. K. Fathy  
ASME Dynamic Systems and Control Conference, 2009 [\[PDF\]](#)
- [54] **Development of an internet-distributed hardware-in-the-loop simulation platform for an automotive application**  
T. Ersal, M. Brudnak, A. Salvi, J. L. Stein, Z. Filipi and H. K. Fathy  
ASME Dynamic Systems and Control Conference, 2009 [\[PDF\]](#)
- [55] **Model reduction in vehicle dynamics using importance analysis**  
T. Ersal, B. Kittirungsi, H. K. Fathy and J. L. Stein  
ASME Dynamic Systems and Control Conference, 2008 [\[PDF\]](#)
- [56] **Realization-preserving structure and order reduction of nonlinear energetic system models using energy trajectory correlations**  
T. Ersal, H. K. Fathy and J. L. Stein  
ASME International Mechanical Engineering Congress and Exposition, 2007 [\[PDF\]](#)
- [57] **A review of proper modeling techniques**  
T. Ersal, H. K. Fathy, L. S. Louca, D. G. Rideout and J. L. Stein  
ASME International Mechanical Engineering Congress and Exposition, 2007 [\[PDF\]](#)
- [58] **Orienting body coordinate frames using Karhunen-Loève expansion for more effective structural simplification**  
T. Ersal, H. K. Fathy and J. L. Stein  
ASME International Mechanical Engineering Congress and Exposition, 2006 [\[PDF\]](#)
- [59] **Structural simplification of modular bond-graph models based on junction inactivity**  
T. Ersal, H. K. Fathy and J. L. Stein  
ASME International Mechanical Engineering Congress and Exposition, 2006 [\[PDF\]](#)
- [60] **A bond graph based modular modeling approach towards an automated modeling environment for reconfigurable machine tools**  
T. Ersal, J. L. Stein and L. S. Louca  
International Conference on Integrated Modeling and Analysis in Applied Control and Automation, 2004 [\[PDF\]](#)
- [61] **A modular modeling approach for the design of reconfigurable machine tools**  
T. Ersal, J. L. Stein and L. S. Louca  
ASME International Mechanical Engineering Congress and Exposition, 2004 [\[PDF\]](#)

## Book Chapters

- [1] **Analysis of a model-free predictor for delay compensation in networked systems**  
X. Ge, Y. Zheng, M. J. Brudnak, P. Jayakumar, J. L. Stein and T. Ersal  
Time-Delay Systems - Theory, Numerics, Applications and Experiments, T. Insperger, T. Ersal and G. Orosz (Ed.), vol. 7 of Advances in Delays and Dynamics, Springer, 2017 [\[PDF\]](#)
- [2] **Energy-based bond graph model reduction**  
L. S. Louca, D. G. Rideout, T. Ersal and J. L. Stein  
Bond graph modelling of engineering systems, W. Borutzky (Ed.), Springer: New York, 2011 [\[PDF\]](#)

## Theses

- [1] **Realization-preserving simplification and reduction of dynamic system models at the graph level**  
T. Ersal  
Ph.D. Dissertation, University of Michigan, Ann Arbor, 2007
- [2] **A modular modeling system for reconfigurable machine tools**  
T. Ersal  
Master's Thesis, University of Michigan, Ann Arbor, 2003

## Other Publications

- [1] **Energy Intelligence**  
T. Ersal  
TARDEC Accelerate Magazine, pp. 16-19, 2014

## PATENTS

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- [1] **Collision imminent steering control systems and methods**  
T. Ersal, J.L. Stein, J. Wurts  
U.S. Patent 10,836,383, November 17, 2020

## PRESENTATIONS

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- [1] **Terrain Adaptive Autonomous Vehicles for Uncertain Off-Road Environments**  
ARC Research Seminar Series, online, Jan 29, 2021.
- [2] **Pushing the Capabilities of Advanced Driver Assistance Systems on the Way to Full Autonomy**  
GM UXT Seminar, online, Nov 17, 2020.
- [3] **Degradation Conscious Control of PEM Fuel Cells**  
Finland-Michigan Energy Circle Webinar, online, Nov 10, 2020.
- [4] **Pushing the Capabilities of Advanced Driver Assistance Systems on the Way to Full Autonomy**  
GM R&D Seminar, online, Oct 26, 2020.
- [5] **Combined Trajectory Planning and Tracking for Autonomous Vehicles on Deformable Terrains**  
NATO Science and Technology Organization Panel Business Meeting, online, Oct 2, 2020.
- [6] **Autonomy for Mobility Assessment Methods and Tools for Autonomous Military Ground Systems**  
NATO Science and Technology Organization Panel Business Meeting, online, Sep 23, 2020.
- [7] **Introduction to Scenario for Mobility Assessment Methods and Tools for Autonomous Military Ground Systems**  
NATO Science and Technology Organization Panel Business Meeting, online, Sep 21, 2020.
- [8] **Collision Avoidance Guardian at the Dynamic Limits of Handling**  
Toyota Research Institute Joint University Workshop, Stanford, CA, Jan 14, 2020.
- [9] **Collision Avoidance Guardian at the Dynamic Limits of Handling**  
Toyota Research Institute Annual Review, Ann Arbor, MI, Oct 30, 2019.
- [10] **Scope, Definitions and Scenarios & Perception, Planning, and Control**  
NATO Science and Technology Organization Panel Business Meeting, Trondheim, Norway, Oct 8, 2019.
- [11] **Mutually-Adaptive Shared Control between Human Operators and Autonomy in Ground Vehicles**  
ARC Research Seminar Series, Ann Arbor, MI, Mar 29, 2019.
- [12] **Collision Avoidance Guardian at the Dynamic Limits of Handling**  
Toyota Research Institute Joint University Workshop, Ann Arbor, MI, Jan 17, 2019.
- [13] **Increasing Mobility of Unmanned Ground Vehicles across different Modes of Control – From Teleoperation to Full Autonomy**  
Keynote, 2018 Turkish Automatic Control Conference, Kayseri, Turkey, Sep 13, 2018.
- [14] **Connected Testbeds for Connected Automated Vehicles**  
14th IFAC Workshop on Time Delay Systems, Budapest, Hungary, Jun 30, 2018.
- [15] **Latency Compensation and Human Performance in Teleoperated Unmanned Ground Vehicles**  
Annual Review of the Automotive Research Center, Ann Arbor, MI, May 16, 2018.
- [16] **An overview of the autonomy thrust**  
2017 TRI Joint University Workshop, Cambridge, MA, Dec 20, 2017.
- [17] **Pushing autonomous vehicles to their dynamic limits**  
Invited Seminar, Clemson University Automotive Engineering Department and CU-ICAR Seminar Series, Greenville, SC, Nov 21, 2017.
- [18] **Collision Avoidance Guardian at the Dynamic Limits of Handling**  
Toyota Research Institute Annual Review, Ann Arbor, MI, Oct 26, 2017.

- [19] **Pushing autonomous vehicles to their dynamic limits**  
UM Alumni Event, Ann Arbor, MI, Jul 28, 2017.
- [20] **A Double-Worst-Case Formulation for Improving the Robustness of an MPC-Based Obstacle Avoidance Algorithm to Parametric Uncertainty**  
American Control Conference, Seattle, WA, May 26, 2017.
- [21] **Who's the Boss: A Haptic Interface for Negotiating Control Authority between Human Drivers and Automation Systems**  
Plenary Case Study Presentation, Annual Review of the Automotive Research Center, Ann Arbor, MI, May 9, 2017.
- [22] **Pushing autonomous vehicles to their dynamic limits during obstacle avoidance**  
Invited Talk, IEEE Robotics and Automation Meeting, Mar 18, 2017.
- [23] **Pushing autonomous vehicles to their dynamic limits: A control-centric approach to obstacle avoidance**  
Invited Talk, Fall 2016 Meeting of the IEEE Southeast Michigan Section, Nov 30, 2016.
- [24] **Enabling High-Fidelity Closed-Loop Integration of Remotely Accessible Testbeds**  
Invited Talk, NSF Workshop on Accessible Remote Testbeds, Arlington, VA, November 12, 2015.
- [25] **Driving Unmanned Ground Vehicles at High Speeds: From Teleoperation to Full Autonomy**  
Invited Talk, TARDEC Innovation Talk Series, Warren, MI, Nov 2, 2015.
- [26] **No Driver? No Problem! Mobility Across the Autonomy Spectrum in Unmanned Ground Vehicles**  
ARC Annual Program Review, Ann Arbor, MI, May 20, 2015
- [27] **Pushing autonomous vehicles to their dynamic limits: A model predictive control formulation for obstacle avoidance in high speed**  
Invited Talk, CrIS University Transportation Center (UTC) Seminar Series at The Ohio State University, Columbus, OH, May 11, 2015.
- [28] **Improving Mobility Through Latency Compensation in Teleoperated Ground Vehicles**  
Invited Talk, Quantum Signal, Saline, MI, Mar 17, 2015.
- [29] **Improving Mobility Through Latency Compensation in Teleoperated Ground Vehicles**  
ARC Research Seminar Series, Ann Arbor, MI, Feb 13, 2015.
- [30] **Internet-Distributed Hardware-in-the-Loop Simulation**  
Invited Talk, North American PUMA Open User Group Meeting, May 20, 2014.
- [31] **Demonstration of Internet-Distributed Hardware-in-the-Loop Simulation technology in an ADI setup**  
Invited Seminar, Applied Dynamics International, Ann Arbor, MI, May 13, 2014.
- [32] **Embedding Energy Intelligence in Robotic Mobility**  
ARC Annual Program Review, Ann Arbor, MI, 2013.
- [33] **Vehicle-Dynamics-Conscious Real-Time Hazard Avoidance in Autonomous Ground Vehicles**  
Invited Seminar, Army Research Laboratory, Aberdeen, MD, May 8, 2013.
- [34] **Enabling Integrated Powertrain Experiments in Networked Distributed Laboratories**  
SAE World Congress, Detroit, MI, April 17, 2013.
- [35] **Vehicle-Dynamics-Conscious Real-Time Hazard Avoidance in Autonomous Ground Vehicles**  
Invited Seminar, U.S. Army TARDEC, Warren, MI, Feb 20, 2013.
- [36] **An iterative learning control approach to improving fidelity in internet-distributed hardware-in-the-loop simulation**  
ASME Dynamic Systems and Control Conference, Ft. Lauderdale, FL, Oct 19, 2012.
- [37] **The evolution and future of Internet-distributed hardware-in-the-loop simulation from a dynamic systems and control perspective**  
Semi-plenary presentation, ASME Dynamic Systems and Control Conference, Ft. Lauderdale, FL, Oct 17, 2012.
- [38] **Internet-Distributed Hardware-in-the-Loop Simulation: A Sliding Mode Control Approach to Improving Fidelity and an Overview of Efforts to Expand into Multi-Site ID-HIL**  
ARC Collaborative Research Seminar Series, Ann Arbor, MI, Jan 27, 2012.

- [39] **Effect of Coupling Point Selection on Distortion in Internet-Distributed Hardware-in-the-Loop Simulation**  
American Control Conference, San Francisco, CA, Jun 30, 2011.
- [40] **Vehicle supported military microgrids: Design, Scheduling, and Regulation for a Forward Operating Base**  
Invited Seminar, TARDEC, Warren, MI, Jun 23, 2011
- [41] **Internet-distributed hardware-in-the-loop simulation: development of a linear experimental platform**  
2011 ARC Conference, Ypsilanti, MI, May 24, 2011.
- [42] **Vehicle supported military microgrids: Design, Scheduling, and Regulation for a Forward Operating Base**  
2011 ARC Conference, Ypsilanti, MI, May 24, 2011.
- [43] **A control theoretic perspective to characterizing and improving transparency in internet-distributed hardware-in-the-loop simulation**  
ARC Collaborative Research Seminar Series, Ann Arbor, MI, Mar 11, 2011.
- [44] **Internet-distributed hardware-in-the-loop simulation**  
Invited Seminar, TARDEC, Warren, MI, Jul 29, 2010.
- [45] **Effect of coupling point selection on Internet-distributed hardware-in-the-loop simulation**  
2010 ARC Conference, Ann Arbor, MI, May 10-11, 2010.
- [46] **Model-based analysis and classification of driver distraction under secondary tasks**  
ARC Collaborative Research Seminar Series, Ann Arbor, MI, Oct 28, 2009.
- [47] **Variation-based transparency analysis of an Internet-distributed hardware-in-the-loop simulation platform for vehicle powertrain systems**  
ASME Dynamic Systems and Control Conference, Hollywood, California, Oct 12-14, 2009.
- [48] **Development of an Internet-distributed hardware-in-the-loop simulation platform for an automotive application**  
ASME Dynamic Systems and Control Conference, Hollywood, California, Oct 12-14, 2009.
- [49] **Integration of vibrotactile feedback in a 3D model of human balance**  
The Annual Meeting for the American Society of Biomechanics, State College, Pennsylvania, Aug 26–29, 2009.
- [50] **Internet-distributed hardware-in-the-loop simulation for cyber-enabled concurrent powertrain systems engineering**  
15th Annual ARC Conference, Ann Arbor, MI, May 12-13, 2009.
- [51] **Internet-distributed hardware-in-the-loop simulation for cyber-enabled concurrent automotive systems engineering: A TARDEC/UM case study**  
ARC Collaborative Research Seminar Series, Ann Arbor, MI, Dec 2008.
- [52] **Model reduction in vehicle dynamics using importance analysis**  
2008 ASME Dynamic Systems and Control Conference", Ann Arbor, MI, Oct 2008.
- [53] **Progress towards Internet-distributed hardware-in-the-loop simulation**  
14th Annual ARC Conference, Ann Arbor, MI, May 2008.
- [54] **A review of proper modeling techniques**  
2007 International Mechanical Engineering Congress and Exposition, Seattle, WA, Nov 2006.
- [55] **Realization-preserving structure and order reduction of nonlinear energetic system models using energy trajectory correlations**  
2007 International Mechanical Engineering Congress and Exposition, Seattle, WA, Nov 2006.
- [56] **HMMWV model reduction using energy trajectory correlations**  
ARC Collaborative Research Seminar Series, Ann Arbor, MI, Oct 2007.
- [57] **Realization-preserving simplification and reduction of dynamic system models at the graph level**  
Ph.D. Defense, Ann Arbor, MI, Sep 2007.
- [58] **Structural reduction of dynamic system models with application to HMMWV multibody dynamics model**  
13th Annual ARC Conference, Ann Arbor, MI, May 2007.

- [59] **Structural simplification of modular models based on inactivity of energetic connections**  
invited presentation, MSC Software, Ann Arbor, MI, Dec 2006.
- [60] **Structural simplification of modular bond-graph models based on junction inactivity**  
2006 International Mechanical Engineering Congress and Exposition, Chicago, IL, Nov 2006.
- [61] **Orienting body coordinate frames using Karhunen-Loève expansion for more effective structural simplification**  
2006 International Mechanical Engineering Congress and Exposition, Chicago, IL, Nov 2006.
- [62] **Structural simplification of modular bond-graph models based on junction inactivity**  
Engineering Graduate Student Symposium, Ann Arbor, MI, Nov 2006.
- [63] **A simplification technique for modular models of reconfigurable machine tools**  
Student-Faculty Seminar, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, Nov 2005.
- [64] **A simplification technique for modular models of reconfigurable machine tools**  
Graduate Student Symposium, University of Michigan, Oct 2005.
- [65] **Arch-type reconfigurable machine tool**  
J. Dhupia and T. Ersal, 3rd International CIRP Conference on Reconfigurable Manufacturing, May 2005.
- [66] **Design of reconfigurable machine tools**  
T. Ersal and J. Dhupia, Guest Lecture, ME583 Scientific Basis for Reconfigurable Manufacturing, University of Michigan, Mar 2005.
- [67] **Modeling Reconfigurable Machine Tools**  
Student-Faculty Seminar, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, Jan 2005.
- [68] **A modular modeling approach for the design of reconfigurable machine tools**  
2004 International Mechanical Engineering Congress and Exposition, Anaheim, CA, Nov 2004.
- [69] **A bond graph based modular modeling approach towards an automated modeling environment for reconfigurable machine tools**  
IMAACA '04, Bond Graph Techniques for Modeling Dynamic Systems, Genoa, Italy, Oct 2004.
- [70] **Integrated machine and control design of reconfigurable machine tools**  
Technical Advisory Committee Meeting, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, May 2004.
- [71] **RMT Mechatronics Design**  
Student Meeting, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, Feb 2004.
- [72] **Modeling and performance analysis of reconfigurable machine tools**  
T. Ersal and J. Dhupia, Technical Advisory Committee Meeting, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, Oct 2003.
- [73] **Arch-type reconfigurable machine tool**  
J. Dhupia and T. Ersal, 2nd International CIRP conference on Reconfigurable Manufacturing, Ann Arbor, Aug 2003.
- [74] **Integrated machine and control design of reconfigurable machine tools**  
Technical Advisory Committee Meeting, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, May 2003.
- [75] **Reconfigurable models for reconfigurable machine tools**  
Student Meeting, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, Mar 2003.

## GRANTS

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- [1] **Terrain Adaptive Autonomous Vehicles for Uncertain Off-Road Environments**  
Tulga Ersal (PI)  
Automotive Research Center, 09/01/2020 - 08/31/2021, Total: \$112,220.
- [2] **Cognitive Modeling of Human Operator Behavior during Interaction with Autonomous Systems**  
Tulga Ersal (PI)  
Automotive Research Center, 05/01/2019 - 12/31/2021, Total: \$255,990.

- [3] **Automotive Research Center Phase V**  
Bogdan Epureanu (PI), Tulga Ersal (Center Research Integration Lead)  
US Army, 01/01/2019 - 12/31/2024, Total: \$50,000,000.
- [4] **Complexity Reduction for Control Oriented Fuel Cell Modeling: Part 2**  
Tulga Ersal (PI)  
Ford Motor Company, 04/01/2018 - 10/27/2020, Total: \$209,809.
- [5] **Mutually-Adaptive Shared Control between Human Operators and Autonomy in Ground Vehicles**  
Tulga Ersal (PI), Xi Jessie Yang (Co-PI), Jeffrey L. Stein (Co-PI), Matt Reed (Co-PI)  
Automotive Research Center, 01/01/2018 - 06/30/2021, Total: \$581,337.
- [6] **STTR: Terrain Aware Mobility Planning**  
Robotic Research, LLC (Lead institution), Tulga Ersal (Academic PI)  
US Army, 09/01/2017 - 02/28/2019, Total: \$1,000,000.
- [7] **Simultaneous Optimization of Vehicle and Powertrain Operation Using Connectivity and Automation**  
Andreas Malikopoulos (PI)  
Advanced Research Projects Agency - Energy (ARPA-E), U.S. Department of Energy, 03/29/2017 - 12/31/2020, Total: \$4,220,000.
- [8] **CPS: Synergy: Connected Testbeds for Connected Vehicles**  
Tulga Ersal (PI), Anna Stefanopoulou (Co-PI), Mingyan Liu (Co-PI)  
National Science Foundation, 01/01/2017 - 09/30/2020, Total: \$800,001.
- [9] **Collision Avoidance Guardian at the Dynamic Limits of Handling**  
Tulga Ersal (PI), Jeffrey L. Stein (Co-PI)  
Toyota Research Institute, 01/01/2017 - 03/31/2021, Total: \$584,462.
- [10] **Connected Laboratories for Connected Automated Vehicles**  
Tulga Ersal (PI)  
Automotive Research Center, 09/01/2016 - 06/30/2017, Total: \$186,902.
- [11] **Advanced Hazard Avoidance in Autonomous Ground Vehicles**  
Jeffrey L. Stein (PI), Tulga Ersal (Co-PI)  
Automotive Research Center, 09/01/2016 - 08/31/2018, Total: \$160,116.
- [12] **Modeling Human Performance in Operating Unmanned Ground Vehicles**  
Tulga Ersal (PI)  
Automotive Research Center, 10/01/2015 - 03/31/2019, Total: \$175,383.
- [13] **SBIR: Compact Auxiliary Diesel Generator Enhanced with Electronic Fuel Injection**  
Busek (Lead institution), Jeffrey L. Stein (Academic PI), Tulga Ersal (Academic Co-PI)  
US Navy, 10/01/2015 - 11/30/2015, Total: \$15,000.
- [14] **Complexity Reduction for Control Oriented Fuel Cell Modeling**  
Tulga Ersal (PI)  
Ford Motor Company, 06/01/2015 - 12/31/2017, Total: \$209,992.
- [15] **STTR: Robust Terrain-Adaptive Vehicle Planning and Control**  
Quantum Signal (Lead institution), Tulga Ersal (Academic PI), Karl Iagnemma (Academic PI, MIT)  
US Army, 10/01/2014 - 03/31/2015, Total: \$150,000.
- [16] **Collaborative Research: Control of Reconfigurable Microgrids with Significant Renewable Power Sources**  
Huei Peng (PI), Tulga Ersal (Co-PI)  
National Science Foundation, 09/01/2014 - 08/31/2017, Total: \$200,000.
- [17] **Road Map of Autonomous Vehicle Deployment Priorities in Ann Arbor: Travel Demand, Vehicle Design and Sustainability Performance**  
Gregory Keoleian (PI), Tulga Ersal (Co-PI), Jeffrey L. Stein (Co-PI), Lidia Kostyniuk (Co-PI)  
Mobility Transformation Center, 05/01/2014 - 04/30/2016, Total: \$91,404.
- [18] **Improving Mobility through Latency Compensation in Teleoperated Ground Vehicles**  
Tulga Ersal (PI)  
Automotive Research Center, 05/01/2014 - 12/31/2017, Total: \$420,856.



- [19] Automotive Research Center Phase IV**  
Anna Stefanopoulou (PI), Tulga Ersal (Thrust Area 1 Leader, Center Research Integration Lead)  
US Army, 01/01/2014 - 12/31/2018, Total: \$40,000,000.
- [20] Sustainable Transportation for a 3rd Century: An Interdisciplinary Approach to Addressing the Last Mile Problem for Enhanced Accessibility**  
Jeffrey L. Stein (PI), Tulga Ersal (Co-PI), Jonathan Levine (Co-PI), Ian Hiskens (Co-PI), Gregory Keoleian (Co-PI), Shobita Parthasarathy (Co-PI), Owen Wu (Co-PI), Jarod Kelly (Co-PI)  
Office of the Provost, University of Michigan, 06/01/2013 - 12/01/2014, Total: \$299,878.
- [21] Data-Based Techniques for Battery-Health Prediction**  
Jeffrey L. Stein (PI), Tulga Ersal (Co-PI), Dennis Bernstein (Co-PI)  
US-China Clean Energy Research Center-Clean Vehicles Consortium, 09/01/2012 - 08/31/2016, Total: \$297,436.
- [22] Vehicle-Dynamics-Conscious Real-Time Hazard Avoidance in Autonomous Ground Vehicles**  
Jeffrey L. Stein (PI), Tulga Ersal (Co-PI)  
Automotive Research Center, 01/01/2012 - 08/31/2016, Total: \$639,519.
- [23] Internet-Distributed Hardware-in-the-Loop Simulation**  
Tulga Ersal (PI)  
Automotive Research Center, 01/01/2011 - 12/31/2013, Total: \$319,627.
- [24] Modeling, Design and Control of Military V2MG2V Micro-Grid Systems**  
Panos Papalambros (PI), Huei Peng (Co-PI), Ian Hiskens (Co-PI), Jeffrey L. Stein (Co-PI), Tulga Ersal (Senior Personnel)  
Automotive Research Center, 01/06/2010 - 05/31/2011, Total: \$350,000.

## SERVICE

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- Autonomy Task Leader, NATO Research Task Group AVT-341: Mobility Assessment Methods and Tools for Autonomous Military Ground Systems (2021)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2021)
- Best Paper Award Judge, ASME Dynamic Systems and Control Division Energy Systems Technical Committee (2020)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2020)
- Scenarios and Autonomy Task Leader, NATO Research Task Group AVT-341: Mobility Assessment Methods and Tools for Autonomous Military Ground Systems (2020)
- Task Leader, NATO Exploratory Team AVT-ET-194: Mobility Assessment Methods and Tools for Autonomous Military Ground Systems (2019)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2019)
- Invited Session Organizer, American Control Conference (2019)
- Co-Organizer, 3rd IAVSD Workshop on Dynamics of Road Vehicles (2019)
- Associate Editor, 14th IFAC Workshop on Time Delay Systems (2018)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2018)
- International Program Committee Member of the 14th IFAC Workshop on Time Delay Systems (2017-2018)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2017)
- Associate Editor, 2018 Vienna International Conference on Mathematical Modelling (2017-2018)
- Invited Speaker at the 2016 NextProf for the University of Michigan Spring Engineering Workshop (2016)
- Invited Speaker at the 2016 External NextProf Future Faculty Workshop (2016)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2016)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2015)
- Local Arrangements Chair, 12th IFAC Workshop on Time Delay Systems (2015)
- Organizing Committee Volunteer, 2015 Dynamic Systems and Control Conference (2015)

- ARPA-E Reviewer (2015)
- Vice-Chair of the Model Identification and Intelligent Systems Technical Committee of the ASME Dynamic Systems and Control Division (Oct 2012 – Oct 2016)
- Associate Editor, ASME Dynamic Systems and Control Conference (2014)
- NSF Review Panelist (2014)
- Liaison Member, SAE (Society of Automotive Engineers) Dynamical Modeling and Simulation Committee for creating a basis for multi-disciplinary, math-based engineering and development of automotive systems by developing standards and recommended practices for making models reusable and sharable and results repeatable. (Sep 2011 – Dec 2013)
- International Program Committee Member of the International Conference on Integrated Modeling and Analysis in Applied Control and Automation (2011 – 2013)
- Program Committee Member of the 2009 ASME Dynamic Systems and Control Conference (2009)
- Modeling Session Organizer (together with Loucas S. Louca) for the Model Identification and Intelligent Systems Technical Committee of the ASME Dynamic Systems and Controls Division at the 2009 ASME Dynamic Systems and Control Conference (2009)
- International Program Committee Member of the 2009 European Conference on Modelling and Simulation (2009)
- Reviewer for the following journals:
  - Journal of Dynamic Systems Measurement and Control
  - IEEE/ASME Transactions on Mechatronics
  - Simulation Modeling Practice and Theory
  - Simulation: Transactions of the Society for Modeling and Simulation
  - Mathematical Problems in Engineering
  - IEEE Control Systems Magazine
  - Mechanism and Machine Theory
  - Journal of Aerospace Engineering
  - Building Simulation
  - International Journal of Powertrains
  - IEEE Intelligent Transportation Systems Magazine
  - IEEE Transactions on Intelligent Transportation Systems
  - Mathematical and Computer Modelling of Dynamical Systems
  - International Journal of Electrical Power and Energy Systems
  - International Journal of Vehicle Design
  - Journal of Mechanical Engineering Science
  - Journal of Systems and Control Engineering
  - World Journal of Modeling and Simulation
  - IEEE Transactions on Smart Grid
  - IEEE Transactions Industrial Informatics
  - International Journal of Simulation and Process Modelling
  - Acta of Bioengineering and Biomechanics
  - International Journal of Adaptive Control and Signal Processing
  - Automatica
  - Measurement
  - Applied Energy
  - Energies
  - Journal of Computational and Nonlinear Dynamics
  - IEEE Transactions on Control Systems Technology
  - Mechanics Research Communications
  - Mechatronics
  - IEEE Transactions on Neural Networks and Learning Systems
  - IET Intelligent Transport Systems
  - IET Generation, Transmission & Distribution
  - IEEE Transactions on Intelligent Vehicles
  - Software and Systems Modeling
  - IEEE Access
  - Advances in Mechanical Engineering
  - IEEE Transactions on Vehicular Technology
  - Journal of the Electrochemical Society

- Reviewer for the following conferences:
  - American Control Conference
  - ASME Dynamic Systems and Control Conference
  - ASME International Mechanical Engineering Congress and Exposition
  - SAE World Congress
  - IFAC World Congress
  - European Control Conference
  - International Conference on Integrated Modeling and Analysis in Applied Control and Automation
  - IEEE Conference on Decision and Control
  - International Symposium on Mechatronics and its Applications
  - IEEE Multi-conference on Systems and Control
  - IEEE Conference on Control Technology and Applications
  - IFAC Workshop on Engine and Powertrain Control, Simulation and Modeling
- Mentored 3rd to 5th graders for weekly science projects as part of the Reach Out! program at the Pattengill Elementary School, Ann Arbor, MI (2002- 2004)

## AWARDS AND HONORS

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- [1] ASME DSCD Automotive and Transportation Systems Technical Committee Best Paper Award Finalist (2020) (C. Huang, X. Zhang, R. Salehi, T. Ersal, and A. G. Stefanopoulou, "A Robust Energy and Emissions Conscious Speed Control Framework for Connected Vehicles with Privacy Considerations," American Control Conference, Denver, CO, USA, 2020.)
- [2] ASME DSCD Automotive and Transportation Systems Technical Committee Best Paper Award Finalist (2020) (S.-Y. Shieh, T. Ersal, and H. Peng, "Synchronization of Pulse-and-Glide Operation in Vehicle Platooning using Cooperative Adaptive Cruise Control," American Control Conference, Denver, CO, USA, 2020.)
- [3] Editor's Choice Paper (2020) (A. Goshtasbi, J. Chen, J. Waldecker, S. Hirano, and T. Ersal, "Effective parameterization of PEM fuel cell models - Part I: Sensitivity analysis and parameter identifiability," Journal of the Electrochemical Society, vol. 167, no. 4, pp. 044504, 2020.)
- [4] Ted Kennedy Family Faculty Team Excellence Award, College of Engineering, University of Michigan (2020)
- [5] Honor received by student James Dallas: 2019-2020 J. Robert Beyster Computational Innovation Graduate Fellowship, College of Engineering, University of Michigan (2019)
- [6] Kenneth M. Reese Outstanding Research Scientist Award, College of Engineering, University of Michigan (2019)
- [7] Keynote Speaker, Turkish Automatic Control Conference (2018)
- [8] ASME DSCD Automotive and Transportation Systems Technical Committee Best Paper Award (2018)
- [9] Honor received by student Yingshi Zheng: Best Poster Winner, Automotive Research Center Annual Review (2018)
- [10] ASME Energy Systems Best Paper Award (2017)
- [11] ASME Energy Systems Best Paper Award finalist (2016)
- [12] Honor received by student Xin Zhou: Best Student Paper Finalist, 2016 Dynamic Systems and Control Conference (2016)
- [13] Research Faculty Recognition Award, The University of Michigan Office of Research (2016)
- [14] Honor received by student Jiechao Liu: People's Choice Best Poster Award, Automotive Research Center Annual Review (2016)
- [15] Honor received by student Jiechao Liu: Best Student Paper Finalist, 2015 Dynamic Systems and Control Conference (2015)
- [16] Honor received by student Yingshi Zheng: Best Poster Winner, Automotive Research Center Annual Review (2015)
- [17] Honor received by student Jiechao Liu: Best Poster Winner, 2014 University of Michigan Engineering Graduate Symposium (2014)
- [18] Honor received by student Xin Zhou: Best Student Paper Finalist, 2014 Dynamic Systems and Control Conference (2014)
- [19] Honor received by student Xinyi Ge: Best Presentation in Session, 2014 American Control Conference (2014)
- [20] Honor received by student Jiechao Liu: Best Poster Finalist, Automotive Research Center Annual Review (2014)

- [21] Honor received by student Xin Zhou: Best Student Paper Finalist, 2013 Dynamic Systems and Control Conference (2013)
- [22] Semi-Plenary Paper Award at the 2012 Dynamic Systems and Control Conference (2012)
- [23] Best Presentation in Session Award, "Effect of Coupling Point Selection on Distortion in Internet-Distributed Hardware-in-the-Loop Simulation," 2011 American Control Conference, San Francisco, CA (2011)
- [24] Best Presentation in Session Award, 2008 ASME Dynamic Systems and Control Conference, Ann Arbor, MI (2008)
- [25] Departmental Merit Fellowship at the University of Michigan (2007)
- [26] Best Oral Presentation Award, 3rd place, Theoretical Dynamics, Systems, and Controls Session, Engineering Graduate Symposium, University of Michigan (2006)
- [27] Best Poster Award, 1st place, Dynamic Systems and Control Division, Graduate Student Symposium, University of Michigan (2005)
- [28] Departmental Merit Fellowship at the University of Michigan (2001-2002)
- [29] Ranked 1st among all 2001 graduates of the Istanbul Technical University (2001)
- [30] Siemens Excellence Award (2001)
- [31] President's Award at the Istanbul Technical University (2001)
- [32] Dean's Award at the Istanbul Technical University (2001)
- [33] 1st place in Dean's List every term at the Istanbul Technical University (1997-2001)
- [34] Merit Scholarship at the Istanbul Technical University (1997-1998)
- [35] Ranked among the top 500 in the national university entrance exams within about 1,5 million test takers (1997)
- [36] Ranked 2nd among the 1997 graduates of Deutsche Schule Istanbul (German High School Istanbul) (1997)
- [37] Ranked 2nd in the Abitur exam (Germany's final exam at the end of secondary education formally enabling students to gain admittance to German universities) (1997)
- [38] Honor Award every term at Deutsche Schule Istanbul (1989-1997)

## OTHER EXPERIENCE

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<b>United Nations Conference on Human Settlements: Habitat II City Summit</b>	Istanbul, Turkey
Communication Coordinator	Jun 1996
Coordinated the communication among and helped with the orientation of international conference participants	