Ziran Wang

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SUMMARY

Specializes in motion planning and control, vehicle-to-everything (V2X) communications, and driver behavior modeling of intelligent vehicles. Implemented the proposed methodologies in both simulation platforms (MATLAB, VISSIM/C++, Unity/C#) and real-world passenger vehicles. Published more than 20 research papers in peer-reviewed journals and conference proceedings, and filed more than 10 U.S. patents about intelligent vehicle technology.

EDUCATION

Ph.D. in Mechanical Engineering, University of California, Riverside   Sep. 2015 - Jun. 2019

Dissertation: Developing Agent-Based Distributed Cooperative Vehicle-Infrastructure Systems in the Connected and Automated Vehicle Environment (Advisor: Matthew J. Barth, Department of Electrical and Computer Engineering)

B.E. in Mechanical Engineering and Automation, Beijing University of Posts and Telecommunications   Sep. 2011 - Jun. 2015

PROFESSIONAL EXPERIENCE

Research Scientist, Toyota Motor North America, InfoTech Labs, Mountain View, CA   Jul. 2019 - Present
- Co-lead the "Digital Twin" project to build a vehicle-to-cloud platform for cooperative automation of intelligent vehicles
- Supervise research interns and collaborate with different universities to work on proofs-of-concept, research papers and patents

Research Intern, Toyota InfoTechnology Center, Mountain View, CA   Jun. 2018 - Sep. 2018
- Prototyped cooperative automated driving algorithms using game engine Unity with C# scripting API

Summer Intern, Changan Suzuki Co., Ltd., Chongqing, China   Jul. 2014 - Aug. 2014
- Conducted routine maintenance and testing work on the Suzuki vehicle production line

SELECTED PROJECTS

Evaluating Connected Vehicle Applications in a Mixed Traffic Environment using a "Digital Twin" Approach

Sponsor: Toyota Motor North America, InfoTech Labs (Oct. 2018 - Present)
- Proposed a feedforward/feedback motion controller for autonomous vehicles to cooperate at on-ramp merging
- Built a learning-based approach to modeling the driver behavior based on the historical data and compensating for the driver bias
- Designed an augmented reality (AR) based head-up display (HUD) for drivers on intelligent vehicles
- Developed a vehicle-to-cloud Digital Twin architecture based on 4G-LTE communication and a customized cloud server
- Implemented the proposed system in the Unity game engine (with C# API) and three real-world Toyota Corollas

Traffic Optimization for Signalized Corridors (TOSCo) Small Scale Test & Evaluation Project

Sponsor: Federal Highway Administration (FHWA), United States Department of Transportation (Apr. 2016 - Apr. 2019)
- Built the overall system architecture for the TOSCo application to improve the safety, mobility, and sustainability performances
- Proposed the eco-approach and departure algorithm and the cooperative adaptive cruise control (CACC) algorithm
- Compiled C++ code for external driver model API of PTV VISSIM to realize the proposed architecture and algorithms

Connected Eco-Driving for Heavy-Duty Conventional and Plug-In Hybrid Electric Trucks

Sponsor: Volvo Group North America (Sep. 2017 - Mar 2019)
- Integrated components in the system architecture including map matching, sensor fusion, speed planning and user interface
- Developed an eco-driving motion control algorithm and implemented it on the Volvo Truck's .NET framework
- Conducted a real-world demonstration on a Volvo truck using cellular-based vehicle-to-infrastructure communication

SELECTED PUBLICATIONS

Driver Behavior Modeling using Game Engine and Real Vehicle: A Learning-Based Approach
- Z. Wang, X. Liao, C. Wang, et al., *IEEE Transactions on Intelligent Vehicles,* Early Access

A Survey on Cooperative Longitudinal Motion Control of Multiple Connected Automated Vehicles

- Z. Wang, Y. Bian, S. E. Shladover, et al., *IEEE Intelligent Transportation Systems Magazine,* vol. 12, no. 1, Spring 2020, pp. 4–24

Cooperative Ramp Merging System: Agent-Based Modeling and Simulation Using Game Engine (*Best 2019 Paper Award)

- Z. Wang, G. Wu, K. Boriboonsomsin, et al., *SAE International Journal of Connected and Automated Vehicles*, vol.2, no.2, May 2019

Cooperative Eco-Driving along Multiple Signalized Intersections in a Partially Connected and Automated Vehicle Environment

- Z. Wang, G. Wu, and M. J. Barth, *IEEE Transactions on Intelligent Transportation Systems*, DOI: 10.1109/TITS.2019.2911607

Cluster-Wise Cooperative Eco-Approach and Departure Application for Connected and Automated Vehicles along Signalized Arterials

- Z. Wang, G. Wu, and M. J. Barth, *IEEE Transactions on Intelligent Vehicles*, vol. 3, no. 4, Dec. 2018, pp. 404–413

Developing a Distributed Consensus-Based Cooperative Adaptive Cruise Control (CACC) System for Heterogeneous Vehicles with Predecessor Following Topology

- Z. Wang, G. Wu, and M. J. Barth, *Journal of Advanced Transportation*, vol. 2017, Article ID 1023654, Aug. 2017

A Digital Twin Paradigm: Vehicle-to-Cloud Based Advanced Driver Assistance Systems

- Z. Wang, X. Liao, X. Zhao, et al., *IEEE 91st Vehicular Technology Conference*, May 2020

Early Findings from Field Trials of Heavy-Duty Truck Connected Eco-Driving System

- Z. Wang, Y.-P. Hsu, A. Vu, et al., *IEEE 22nd International Conference on Intelligent Transportation Systems*, Oct. 2019

Lookup Table-Based Consensus Algorithm for Real-Time Longitudinal Motion Control of Connected and Automated Vehicles

- Z. Wang, K. Han, B. Kim, et al., *2019 American Control Conference*, Jul. 2019

A Review on Cooperative Adaptive Cruise Control (CACC) Systems: Architectures, Controls, and Applications

- Z. Wang, G. Wu, and M. J. Barth, *IEEE 21st International Conference on Intelligent Transportation Systems*, Nov. 2018

Developing a Platoon-Wide Eco-Cooperative Adaptive Cruise Control (CACC) System

- Z. Wang, G. Wu, P. Hao, et al., *2017 IEEE Intelligent Vehicles Symposium*, Jun. 2017

SOCIETY ACTIVITIES

- **Member** of Institute of Electrical and Electronics Engineers (IEEE), Society of Automotive Engineers (SAE), Transportation Research Board (TRB)
- **Reviewer** of 24 journals/conferences including *IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Intelligent Vehicles, SAE International Journal of Connected and Automated Vehicles, IEEE Intelligent Vehicles Symposium (IV), IEEE International Conference on Intelligent Transportation Systems (ITSC)*
- **Chair/Co-Chair** of *2020 IEEE IV "Internet of Things in Intelligent Transportation Systems" workshop, 23rd IEEE ITSC "Testing and Evaluating Connected and Automated Vehicles using Emerging Simulation Technologies" workshop*, and *4th IEEE CCTA "Automotive Control" invited sessions*

HONORS & AWARDS

SAE International, Vincent Bendix Automotive Electronics Engineering Award (Best Paper in 2019)   Apr. 2020

U.S. Department of Transportation, National Center for Sustainable Transportation Dissertation Award   Jun. 2018

Los Angeles Environmental Forum, Best Student Research Paper Award   Aug. 2017

University of California, Riverside, Dean's Distinguished Fellowship Award   Fall 2015 - Spring 2017

The Mathematical Contest in Modeling (MCM), The Honorable Mention   Feb. 2014

MEDIA EXPOSURES

"NCST Partner CE-CERT Takes Eco-Driving Simulator to CES", National Center for Sustainable Transportation, Jan. 2020

"Testing a Connected Eco-Driving System in Field Trials with Heavy-Duty Trucks", Featured News, Tech Xplore, Aug. 2019

"Steering into the Future of Connected and Automated Vehicles", UCR News, Jul. 2019