Special Session Proposal

- Title:

    Global Advances and Future of Testbeds on Automated Connected & Electrical (ACE) Vehicles

- Modality:

    Half-day (e.g., 3 hours plus breaks)

- Scope (no longer than 4 pages), including the following sections:

    o Motivation and general scope
    Automated Connected & Electrical (ACE) vehicle technologies are expected to transform the transportation paradigm and play a key component in the future smart city. The recent rapid development of ACE vehicle technologies both in research and industry fields has proved its value and potential. A certain ACE vehicle technology's typical development may start from research labs, then go through computer simulation test, scaled road test, closed-environment road test, and open-environment road test to be verified and validated. Due to the enormous time and money costs of realistic road tests and government regulations, most ACE vehicle technologies' development faces high barriers from research to implementation. Fortunately, both public and private sectors notice the importance of the in-press need for the ACE vehicle testbed. Many testbeds have been built and are being built recently across the entire world.

    o Relevance to the ITS community
    In light of this, this special session aims at creating a global discussion platform for leading ACE vehicle testbed representatives across developing and developed countries, including the US, Europe, Asia, South America, and Africa. Through this special session, we hope to bridge the information gap among different testing methodologies and protocols and present unique features and services of various testbeds. To better verify and validate research outcomes, this special session will also discuss the effective way to facilitate collaboration between researchers and testbeds, such as through remote visit platforms or remote vehicle on-loop simulation. As more open-road ACE vehicle tests are the trend in the near future, different government regulations and liability will be discussed, focusing on the role of ACE vehicle testbeds, e.g., designing testing standards and safety certification. This special session will facilitate mutual learning and cooperation among attendees and benefit a large audience, including multi-disciplinary researchers, industry practitioners, and government agencies. This special session can also inspire future

ACE vehicle testbed developments and promote the forming of common community knowledge and industrial standards for ACE vehicle-related field experiment technologies.

- o Topics of interest for the special session
  The technical areas to be discussed include, but are not limited to the following:
  - Automated Connected & Electrical (ACE) vehicles
  - Copperative Driving Automation (CDA)
  - AI-empowered Edge-Computing for CAV Operations
  - CAV-Infrastructure Integration
  - V2X communications
  - 5G research and testing
  - Automated driving simulation and parameter development/validation
  - Methodologies for testing scenario generation
  - Hardware/vehicle in the loop simulation
  - Real-world case studies

- Organizers (names, affiliations, emails, and short bio):
  - o Tom Shi, University of Michigan, tomcee@umich.edu
    Bio:
    Dr. Tom Shi is a Research Fellow at the University of Michigan. His research aims to establish a set of methodologies to understand, predict and eventually improve future transportation systems via sensors, controllers, and design variables rendered by emerging technologies (e.g., connected, automated, modular, and electric vehicles). He has completed over 15 journal papers, most of which are published in top transportation journals, such as transportation science and TR part B. His main research approaches include optimization, statistics, data analysis, and system modeling. He serves as a reviewer for many top-tier journals in the transportation field, including TR Part B, Part C, Part D & Part E, IEEE Transactions on Intelligent Transportation System, IEEE-Intelligent Transportation Systems Magazine, IEEE Transactions on Intelligent Vehicles, etc.

  - o Yang Liu, Chalmers University of Technology, liuy@chalmers.se
    Bio:
    Dr. Yang Liu is a Marie Curie Fellow at Chalmers University of Technology. He serves as a Young Editor for two top-tier academic journals including, the Innovation (Cell Press' flagship general journal with an estimated impact factor = 30) and IEEE/CAA Journal of Automatica Sinica (Impact factor =7.847). In addition, he is an Associate Editor of Journal of Intelligent and Connected Vehicles. He is experienced in the practice of AI techniques and has won several world prizes in AI competitions organized by leading international AI conferences or research institutes (e.g., KDD, IJCAI, NeurIPS, CVPR, ICME, TRB), including the 1st place of KDD Cup, the most well-known algorithm competition in data mining. He has also gained a wealth of experience in the theory of interdisciplinary applications of machine learning techniques and has published 14 JCR Q1 journal papers (including one ESI highly cited paper) in the last three years.

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- Intended audience and expected attendance of the special session:

  This special session will facilitate mutual learning and cooperation among attendees and benefit a large audience, including multi-disciplinary researchers, industry practitioners, and government agencies.

- Materials and equipment needed for the special session:

  No certain materials and equipment are required.

- Contact details of the proposers (email, postal address, etc):

  o Xin Wang, University of Wisconsin-Madison, 1513 University Avenue Madison, WI 53706, USA, xin.wang@wisc.edu
  Bio:
  Dr. Xin Wang is an assistant professor in the Department of Industrial and Systems Engineering, affiliated with the Department of Civil and Environmental Engineering at the University of Wisconsin-Madison. Dr. Wang's research expertise lies in developing mathematical models and solution methods for smart cities focusing on logistics and transportation systems. His research addresses many pressing challenges: connected and automated vehicles, electric vehicle sharing, smart parking, and sustainable logistics systems. He has led research projects (all as the PI) with a total budget of over $1.2 million, sponsored by NSF. He is the co-chair of the Emerging Transportation Technology Testing (ET3) Committee in the IEEE Intelligent Transportation Systems Society (ITSS). Dr. Wang received a B.S. (2010) degree in Automation Engineering from Tsinghua University, China, an M.S. degree, a Ph.D. (2015) degree in Civil and Environmental Engineering, and an M.S. degree in Applied Mathematics from the University of Illinois at Urban-Champaign.

  o Xiaobo Qu, Tsinghua University, China, xiaobo@tsinghua.edu.cn
  Bio:
  Dr. Xiaobo Qu is a chair professor at the School of Vehicle and Mobility, Tsinghua University, China. He is also an elected Member of Academia Europaea – the Academy of Europe since August 2020, and a Fellow of the Institution of Engineering and Technology (IET). His research is focused on enhancing urban mobility systems by incorporating emerging technologies, particularly for emergency services and connected automated vehicles. He has authored or co-authored over 120 journal articles published in top-tier journals, including 14 ESI highly cited papers. He serves as an editor for 10 journals, including the Editor in Chief of Communications in Transportation Research, and Executive Editor in Chief of Journal of Intelligent and Connected Vehicles. To date, Dr. Qu has secured research funding well above 10 million Euros from the Australian Research Council, Swedish Innovation Agency Vinnova, STINT, and the European Union. He has been invited to serve as a panel/assessor for prestigious funding scheme such as the Australian Research Council Centre of Excellence (35 million AUD each), Future Fellowship (career grant, 1 million AUD each), Netherlands NWO VICI (career grant, 2.5 million Euros each), Hong Kong Research Council theme based scheme (30 million HKD each), Singapore Ministry of Education Thematic Research Program (5 million SD each), and the European Research Council, etc.

o Xiaopeng (Shaw) Li, University of Wisconsin-Madison, 1415 Engineering Drive Madison, WI 53706, USA, xli2485@wisc.edu
Bios:

Dr. Xiaopeng (Shaw) Li is currently a Professor in the Department of Civil and Environmental Engineering at the University of Wisconsin-Madison. He serves as the director of a USDOT National University Transportation Center, National Institute for Congestion Reduction (https://nicr.usf.edu/). He also founded the Connected and Autonomous Transportation Systems (CATS) Lab featured with multiple in-house assembled cooperative driving automation (CDA) vehicles piloting tests of the USDOT CARMA ecosystem. His key research interests include technology developments, system modeling, and energy and equity impacts analysis of automated, connected, electrical and shared (ACES) transportation. He has published around 90 peer-reviewed journal papers, many in top-tier journals (e.g., TR Part B, Transportation Science, Annals of AAG, Operations Research). He has lead research projects (mostly as the lead PI) with a total budget around $20 million (in addition to around $12 million local matching), sponsored by agencies including NSF, US DOE, US DOT, National Labs, State DOTs, and industry companies. He is a recipient of a National Science Foundation (NSF) CAREER award. He serves as an associate editor or editorial board member for journals including TR Part B, Part C, & Part E, IEEE Transactions on Intelligent Transportation System, IEEE-Intelligent Transportation Systems Magazine, IISE Transactions, ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Communications in Transportation Research, and Cleaner Logistics and Supply Chain. He is the chair for the Emerging Transportation Technology Testing (ET3) Committee (founding chair) in the IEEE Intelligent Transportation Systems Society (ITSS), and the Special Interest Group Traffic Theory and Modelling in the World Conference for Transport Research Society. He is a member of the Transportation Network Modeling Committee (AEP40) and the Traffic Flow Theory and Characteristics Committee (ACP50) in Transportation Research Board.

o Guohui Zhang, University of Hawai'i at Manoa, Holmes Hall 338, Honolulu, HI 96822, guohui@hawaii.edu
Bios:

Dr. Guohui Zhang is a Professor in the Department of Civil and Environmental Engineering at the University of Hawai'i at Manoa (UHM). His primary research areas include transportation system resilience analysis; large-scale transportation systems modeling; sustainable traffic network infrastructure design, planning, and operation; traffic sensing and senor data analytics; artificial intelligence in transportation; connected and autonomous vehicle systems; traffic-impacted public health; cyber-transportation systems; and transportation safety and security. He has published more than 100 peer-reviewed journal articles, presented his research contributions at prestigious international and national conferences, written multiple technical reports, and is currently working on a $10M research program. He serves on the American Society of Civil Engineers (ASCE) Connected and Autonomous Vehicle (CAV) Impact Committee, the Transportation Research Board (TRB) Information Systems and Technology Committee, and as a panelist for multiple National Collaborative Highway Research Program (NCHRP) projects.