Expression of Concern

Civilian Autonomous Carriers for Peaceful Services: Intelligent Vehicle Carries Enabled Future Transportation and Logistics

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This is a temporary expression of concern related to Fei-Yue Wang, Hailong Huang, “Civilian Autonomous Carriers for Peaceful Services: Intelligent Vehicle Carries Enabled Future Transportation and Logistics,” in IEEE Transactions on Intelligent Vehicles. After publication, IEEE learned this article may be in violation of IEEE's Publication Principles as it did not meet IEEE’s requirements for independent peer review prior to acceptance. The article is under investigation by a duly constituted expert committee and this note will remain appended to the article until the review process is complete.

Civilian Autonomous Carriers for Peaceful Services: Intelligent Vehicle Carries Enabled Future Transportation and Logistics

Dear All,

I would like to share the following news with you:

- In 2023, the CiteScore of IEEE TIV has reached 11.8, marking a 136% increase compared to 2022. Among all academic publications in the field of transportation technology, Our TIV journal is ranked 6th.
- Up to now, we have received a total of 3600 submissions this year, with the submission per day(SPD) averaging nearly 12 articles. There are currently 15 articles pending review due to overdue reviewer scores. It is anticipated that the number of submissions will surpass 4000 by the end of the year. [1], [2], [3], [4], [5].
- IEEE TIV has been an official SCIE publication since 2021. The initial Impact Factor (IF) in 2021 was 5.009, followed by 8.2 in 2022. The Tracking IF in 2023 for IEEE TIV has achieved a remarkable milestone at 9.42, establishing a new record for our periodical.
- The number of submissions to IEEE TIV increasing greatly, however, a few numbers of fake identities were found in the initial check of the submissions without biographies. Therefore, starting from this issue, our Transaction will enforce the inclusion of biographies of all co-authors in IEEE format for IEEE TIV submission.

This issue comprises 3 letters and 14 regular papers. The first letter reports on the first Decentralized and Hybrid Workshop (DHW) on autonomous services by autonomous systems such as Intelligent Vehicles(IVs), aiming to reduce the cost of human labor and improve the quality and efficiency of services while tackling the challenges posed by a shrinking workforce. The Second letter summarizes the discussions held at the Distributed/Decentralized Hybrid Workshop on Sustainability for Transportation and Logistics (DHW-STL) about the concepts of Social Vision for intelligent vehicles and their relationships in the context of autonomous driving and social interaction. The key concepts discussed in this letter include Foundation Vision, Knowledge Vision, Parallel Vision, and Social Vision.

Our letter on intelligent vehicle carriers [6], which explored the potential of various carrier types in different domains, including seabed, underwater, maritime, ground-based, aerial, high-altitude, and space applications, has attracted great attention of readers. To address some of the issues raised, I have invited the leading author of the letter, Prof. Hailong Huang to write this Editorial jointly.

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Our editorial focuses on intelligent vehicle carries-enabled future transportation and logistics, aiming at facilitating the realization of smart urban environments. Various promising applications can be expected ranging from low-altitude air parcel delivery to offshore aquaculture. Our goal is to attract more good ideas in this direction.

I. Scanning the Issue

Communication and Letters

Autonomous Services: The Evolution of Services Through Intelligent Vehicles

Z. Jing, L. Li, Y. Lyu, R. Wang, Y. Wang, D. Wang, and F.-Y. Wang

Social Vision for Intelligent Vehicles: From Computer Vision to Foundation Vision

H. Yu, Y. Wang, Y. Tian, H. Zhang, W. Zheng, F.-Y. Wan

Prescribed-Time Time-Varying Multi-Group Formation Tracking Control of NMSVs via Estimator-Based Hierarchical Control Algorithm

L.-J. Chen, T. Han, B. Xiao, and H. Yan

Regular Papers

Secure Operations of Connected and Autonomous Vehicles

J. Han, Z. Ju, X. Chen, M. Yang, H. Zhang and R. Huai

The development of CAVs provides imaginative space for transportation carrying capacity expansion, green and sustainable development, and safe and reliable operation. CAVs connect independent vehicle systems together through V2X technology and also extend the cybersecurity threat of the vehicle system to the transportation system where CAV exist. Our work summarizes the cybersecurity threats and countermeasures faced by CAVs. Moreover, we propose a Vehicle Security Operations Center (VSOC) based on a parallel security framework to coordinate the deployment of cybersecurity countermeasures.

BEV-V2X: Cooperative Birds-Eye-View Fusion and Grid Occupancy Prediction via V2X-Based Data Sharing

C. Chang et al.

Regarding the problems of low accuracy and insufficient range of single vehicle perception, a data-driven model BEV-V2X is proposed. The roadside unit collects local BEV data from CAVs, then fuses and predicts the future global BEV occupancy grid

map. BEV-V2X achieves higher accuracy compared to single vehicle perception. Even in cases where not all vehicles are CAVs, the model can still comprehensively estimate global spatiotemporal changes. We also discuss the impact of CAV rate, vehicle perception ability, and grid size.

Integrated Decision Making and Planning Based on Feasible Region Construction for Autonomous Vehicles Considering Prediction Uncertainty

L. Xiong, Y. Zhang, Y. Liu, H. Xiao and C. Tang

An integrated decision-making and planning framework is proposed to consider the uncertainty of trajectory prediction based on Partially Observable Markov Decision Process. To generate smooth trajectories and bridge the gap between decision-making and planning modules, a feasible region construction based on fine-grained decision results is proposed to replace command-type decisions. The proposed framework is verified in both simulation and vehicle experiments to demonstrate safer and smoother trajectories compared to the baseline methods.

Event-Based Predefined-Time Second-Order Practical Consensus With Application to Connected Automated Vehicles

J. Liu, J. Shi, Y. Wu, X. Wang, J. Sun and C. Sun

This paper presents an event-based control strategy for second-order disturbed multi-agent systems to achieve predefined-time practical consensus. Herein, the global information of the system is not required to calculate the estimate of the convergence time, including the initial states and communication topology. Moreover, the developed event-based control strategy can effectively reduce the operating frequency and wear of actuator. The effectiveness of the proposed algorithm is validated by an example of connected automated vehicles.

Parallel Surface: Service-Oriented V2X Communications for Autonomous Vehicles

S. Han, F.-Y. Wang, G. Luo, L. Li and F. Qu

Parallel surface system is proposed to facilitate service-oriented V2X communications for autonomous vehicles. By harnessing artificial models of the physical RIS-assisted IoV system, conducting extensive computational experiments, and parallel execution, parallel surface enables real-time monitoring, predictive analysis, and optimization. Parallel intelligence empowers efficient and adaptable channel estimation, configuration, and energy management, thereby establishing a more intelligent and secure RIS-assisted IoV infrastructure.

Bird's-Eye-View Semantic Segmentation With Two-Stream Compact Depth Transformation and Feature Rectification

J. Liu, Z. Cao, J. Yang, X. Liu, Y. Yang and Z. Qu

A novel bird's-eye-view semantic segmentation method TCD-Seg is proposed to generate semantic mask through two-stream compact depth transformation and feature rectification. The proposed depth transformation decouples the joint depth estimation of original temporal frames, and features are then rectified for better perception. The effectiveness of the proposed method is verified on the datasets.

Network-Induced Asynchronous Fuzzy Control for Vehicle Steering Using Switching Event-Triggered Communication Mechanism

Z. Gao, D. Zhang and S. Zhu

A new switching event-triggered mechanism and an asynchronous fuzzy control design method are presented for networked vehicle steering. The event-triggered mechanism is designed by switching two triggering conditions based on state convergence and divergence, which provides larger release interval. A nonlinear design result of network-induced asynchronous fuzzy controller that can achieve better steering performance is developed by fully actuated system and parameterized system methods, which removes the common assumption that the bounds of asynchronous constraint on membership functions are available.

A Multi-Vehicle Game-Theoretic Framework for Decision Making and Planning of Autonomous Vehicles in Mixed Traffic

Y. Yan et al.

A game theoretic trajectory planning framework is proposed in this paper, including non-cooperative games between autonomous vehicles (AVs) and human-driven vehicles (HVs), as well as partial cooperative games between ego AV and other AVs. Human-in-the-loop experiment results demonstrate the effectiveness of the proposed framework in lane-changing scenarios involving HVs with different aggressiveness and response delays.

ACP-Based Parallel Railway Traffic Management for High-Speed Trains in Case of Emergencies

M. Zhou, W. Xu, X. Liu, Z. Zhang, H. Dong and D. Wen

This paper introduces a parallel railway traffic management system to address the rescheduling of high-speed trains during such emergencies. The design and implementation of the parallel system are detailed using the ACP methodology. The computational experimental results show that the hybrid strategy can reduce the average delay time compared with that of the FCFS strategy. The proposed method surpasses traditional approaches in managing train rescheduling during disruptions. It enhances the efficiency of emergency response and furnishes decision support for dispatchers.

A Review of Driving Style Recognition Methods From Short-Term and Long-Term Perspectives

H. Chu et al.

Related advances in driving style recognition are surveyed along short- and long-term pipelines. The review encompasses various essential aspects, including the definition of short- and long-term driving styles, methods for data acquisition and processing, driving style recognition algorithms, metrics for performance evaluation, and future applications in intelligent vehicles. This review can help researchers quickly implement short-term or long-term driving style recognition methods depending on their application purposes and application platforms.

A Survey on Self-Evolving Autonomous Driving: A Perspective on Data Closed-Loop Technology

X. Li, Z. Wang, Y. Huang and H. Chen

Current algorithms for autonomous driving still lack of self-evolving mechanisms and the capability of maintaining continuously performance-enhancing. Some recent studies turn to the data closed-loop (DCL) architecture to realize self evolution. This study analyzes some relevant technologies and then proposes a novel design mechanism to guarantee the self-evolving performance for autonomous driving systems. Moreover, we give some suggestions for its future directions for self-evolving autonomous driving, including some more cutting-edge technologies that can be incorporated into the DCL architecture.

Obstacle Avoidance Path Planning in Unstructured Environment With Narrow Passages

P. Guo, C. Sun and Q. Li

Starting from solving the problems of detection of narrow passages in unstructured environments, such as collision detection, time consuming and low sampling efficiency, the paper proposes a grid-bridge detection algorithm, and on the basis of which it designs a free-space roadmap construction method and a path adjustment strategy. Finally, its superiority in computation time, construction success rate and path optimization is verified through simulation experiments.

TVG-ReID: Transformer-Based Vehicle-Graph Re-Identification

Z. Li et al.

This work proposed a TVG-ReID network, which using a Transformer network to enhance features extracted from a CNN backbone network. A vehicle knowledge graph transfer method(Vehicle-Graph) is proposed, which treats each vehicle as a node in a graph, where simple information is transmitted through edges to constrain the distance of the nodes in a metric learning manner.

Vehicular Visualization: Enhancing Mobility Decisions With Human-Machine Interactions

X. Wang, X. Wang, S. Ma, W. Chen and F.-Y. Wang

This paper introduces the state-of-the-art techniques of vehicular visualizations and how can these techniques satisfy the decision-making requirements of humans in mobility scenarios, which include vehicle development, vehicle usage, and vehicle assessment. In addition, prospective application scenes and future directions of vehicular visualizations are discussed to inspire related scholars or developers.

II. Intelligent Vehicle Carries Enabled Future Transportation and Logistics

The concept of Smart City [7] has garnered significant attention in recent years, leading to the development of various technologies, including various and diversified digital infrastructures and intelligent vehicles [8], [9], aiming at facilitating the realization of smart urban environments.

Researchers and practitioners have designed and developed different kinds of intelligent vehicles, which is the interest of our journal, from underwater vehicles and surface vehicles to ground vehicles [10] and aerial vehicles [11]. From a perspective of mobility, these intelligent vehicles are the potential enablers of future transportation and logistics in smart cities [12]. To realize smart cities, many intelligent vehicles are expected to be unmanned, such as unmanned aerial vehicles (UAVs), unmanned ground vehicles (UGVs), unmanned surface vehicles (USVs), and unmanned underwater vehicles (UUVs). These unmanned vehicles can carry out diverse transportation and logistics missions in a low-cost and energy-efficient way [13]. For instance, some giant logistics companies, such as Amazon, UPS, DHL, and SF Express, have already invested a lot in the sector of parcel delivery by small UAVs, as the small UAVs can significantly reduce the delivery cost and delivery time [14]. Not only small UAVs but also other types of unmanned vehicles are mainly powered by onboard batteries, with the benefit of having low to no greenhouse gas emissions and low noise (compared to combustion engines) [15]. However, due to the constraint of the payload of small unmanned vehicles, the operating time is generally limited, which makes them not suitable for applications that require a long-duration operation.

To solve the aforementioned issue, the concept of intelligent vehicle carriers (IVCs) has been proposed, after multiple online and physical discussions between Prof. Wang (EiC of IEEE TIV), Dr Huang (AE of IEEE TIV), and some other researchers. Inspired by the idea of aircraft carriers, IVCs are envisioned to span the domains of the seabed, underwater, water surface, land, low-altitude air, and high-altitude air [16]. Diverse potential applications can be expected ranging from low-altitude air parcel delivery to offshore aquaculture. To attract more good ideas, below we elaborate on some promising usages of IVCs.

Example 1: Low-altitude Logistics. Conventional logistics in urban areas rely on ground vehicles, which is not only cost and time-inefficient but also worsens the ground traffic. An alternative way is to use small UAVs to deliver parcels in the low-altitude airspace. In this scenario, an IVC, which can be more powerful, can carry a fleet of small UAVs to reach some remote location first. The small UAVs then leave the IVC and fly towards their destinations. After completing the delivery tasks, they return to the IVC. Other missions such as search and rescue in natural disasters [17] can be conducted by the collaboration of IVCs and small UAVs in the same way.

Example 2: Wildlife Monitoring. Another interesting application lies in wildlife monitoring. IVCs can carry specialized UGVs equipped with advanced sensors and cameras to remote wilderness areas [18]. The UGVs are then dispatched to monitor and collect data on wildlife behavior and habitats, providing valuable insights for conservation efforts and scientific research.

Example 3: Offshore Aquaculture. In the domain of offshore aquaculture, IVCs can be employed for tasks like fish feeding and harvesting. USVs equipped with feeding mechanisms can be deployed to manage fish farms efficiently, improving production and sustainability [19].

Example 4: Underwater Ecosystem Monitoring. IVCs can also find usage in underwater ecosystem monitoring and analysis. IVCs can deploy UUVs equipped with various sensors to assess water quality, marine life, and underwater geological features. Such data contributes to environmental conservation and research initiatives [20], [21].

In each of these examples, IVCs deploy and retrieve small unmanned vehicles tailored to specific tasks. This modular approach enhances the versatility and scalability of intelligent vehicle applications, furthering the vision of smart cities. Moreover, many relevant techniques that can guarantee the security [22] and trustworthiness [23] of IVCs and their associated unmanned vehicles in wild environments are also in demand. Therefore, the IEEE TIV encourages researchers to investigate the techniques that can support the usage of IVCs in practice. Both letters with novel ideas and research articles with real-world experiments or applications to showcase the methodologies relevant to this topic are highly welcome.

III. Call for Participation: Decentralized Hybrid Workshops

At IEEE TIV we will continue to organize decentralized and hybrid workshops or symposia (DHW or DHS) on various issues in ITS and IVs.

Welcome to participate in our investigations online or off-line. Our discussions will be summarized and reported as perspectives, letters, or regular papers at IEEE TIV. The following DHWs have been organized so far:

1) Verification and Validation for IVs (V&V4IV)
2) Autonomous Mining (AM)
3) Ethics, Responsibility, and Sustainability (ERS)
4) Intelligent Vehicles for Education (IV4E)
5) Data Science for Intelligent Vehicles (DSiV)
6) Vehicle 5.0 (V5)
7) Scenarios Engineering for Smart Mobility (SE4SM)
8) CrowdSensing Intelligence (CSI)
9) Sustainability for Transportation and Logistics (STL)
10) Autonomous Services (AS)

Any suggestions or proposals for future topics of DHW/DHS are greatly appreciated. Looking forward to having you in IEEE TIV DHW/DHS.

IV. The "3323" Review Guideline

As reaffirmed in [24], our review guideline for EIC/SE/AE is "3323", specified as below:

- 3 weeks for the first decision
- 3 rounds of revision in maximum
- 2 weeks for minor revisions
- 3 weeks for major revisions

Under this guideline, we expect a maximum total 15-week review process for a submission.

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