IEEE ICUS 2021

Invited Session Summary

Title of Session

Intelligent Decision-making, Planning and Control for Connected and Automated Vehicles

Name, Salutation, Affiliation and Email of Organizers

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Details of Session(including aim and scope)

Some of today's vehicles already have automated safety features that can help drivers avoid drifting into adjacent lanes or making unsafe lane changes, or that can brake automatically if a vehicle ahead of them stops or slows down suddenly, etc. However, there is still a long way toward a fully intelligent vehicles with automated driving systems that can handle the whole task of driving when we don't want to or can't do it ourselves. In particular, the next generation intelligent driving system requires more advanced automotive technology to deliver even greater safety and mobility benefits.

One of the key objectives of intelligent vehicles is to realize a high degree of autonomy under dynamic, complex environments. From multi-disciplinary perspectives including robotics, computer vision, artificial intelligence, control theory, et al, many research efforts have been devoted to improving the performance of autonomous sensing, planning, decision-making and control abilities for intelligent vehicles. Furthermore, due to the requirements of unknown complex environments, it is necessary for intelligent vehicles to

have improved learning ability such as online learning and driving skill learning from past experiences for sensing, decison-making, planning and motion control. In real-world traffic, there are various uncertainties and complexities in road and weather conditions, objects and obstacles are dynamic, etc. An autonomous vehicle has to deal with the following technical challenges: (1) to rapidly and accurately detect, recognize and track dynamic objects with complex backgrounds, (2) to implement motion planning and avoid dynamic obstacles with multiple goals such as safety, agility, and traffic efficiency, and (3) to learn from past experience and reuse the learned knowledge to continually improve driving performance. This workshop seeks to explore the areas related to these challenges.

The purpose of this workshop is to gather a group of active researchers in the areas of connected and automated vehicles, hybrid electric vehicles, vehicular cyber-physical systems, real-time object detection, recognition and tracking for intelligent vehicles, deep learning for real-time sensing of intelligent vehicles, reinforcement learning for autonomous control of intelligent vehicles, end to End Learning for intelligent vehicles , autonomous decision-making for intelligent vehicles, motion planning of autonomous vehicles, path tracking and motion control for intelligent vehicles, intelligence tests for autonomous vehicles intelligent vehicles in a same room and discuss their most recent research results. The research results can touch upon both advances in theory and applications. The proposed workshop will consist of several invited talks and regular talks.

Topics of the workshop interests and focuses include, but not limited to:

- Cooperative control of vehicles;
- Vehicular cyber-physical systems;
- Autonomous driving under limit working conditions;
- Driving assistance under low adhesion ground;
- Real-time object detection, recognition and tracking for intelligent vehicles
- Deep learning for real-time sensing of intelligent vehicles
- Reinforcement learning for autonomous control of intelligent vehicles
- Autonomous decision-making for intelligent vehicles
- End to End Learning for intelligent vehicles
- Motion planning of autonomous vehicles
- Path tracking and motion control for intelligent vehicles
- Intelligence tests for autonomous vehicles
- Other machine learning approaches with applications in autonomous vehicles