12th Workshop on Planning, Perception and Navigation for Intelligent Vehicles

IROS'20
Las Vegas, USA

PPNIV'20

[2020 IEEE/RSJ International Conference on Intelligent Robots and Systems](#)
Full Day Workshop
October 25th, Las Vegas, USA

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This workshop is organized in the framework of the [IEEE Robotics and Automation's Technical Committee on: Autonomous Ground Vehicles and Intelligent Transportation Systems](#)
TC-chairs: P. Martinet, C. Laugier, M.H. Ang, D. Wolf

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Self-Supervised Learning for Perception Tasks in Automated Driving
Keynote speaker: Wolfram Burgard (University of Frieburg, Germany)

Abstract: At the Toyota Research Institute we are following the one-system-two-modes approach to building truly automated cars. More precisely, we simultaneously aim for the L4/L5 chauffeur application and the the guardian system, which can be considered as a highly advanced driver assistance system of the future that prevents the driver from making any mistakes. TRI aims to equip more and more consumer vehicles with guardian technology and in this way to turn the entire Toyota fleet into a giant data collection system. To leverage the resulting data advantage, TRI performs substantial research in machine learning and, in addition to supervised methods, particularly focuses on unsupervised and self-supervised approaches. In this presentation, I will present three recent results regarding self-supervised methods for perception problems in the context of automated driving. I will present novel approaches to inferring depth from monocular images and a new approach to panoptic segmentation.

Biography: Wolfram Burgard is VP for Automated Driving Technology at the Toyota Research Institute. He is on leave from his professorship at the University of Freiburg where he heads the research group for Autonomous Intelligent Systems. Wolfram Burgard is known for his contributions to mobile robot navigation, localization and SLAM (simultaneous localization and mapping). He has published more than 350 papers in the overlapping area of robotics and artificial intelligence.

Decision Making Architectures for Safe Planning and Control of Agile Autonomous Vehicles

Keynote speaker: Evangelos Theodorou (Georgia Institute of Technology, USA)

Abstract: In this talk I will present novel algorithms and decision-making architectures for safe planning and control of terrestrial and aerial vehicles operating in dynamic environments. These algorithms incorporate different representations of robustness for high speed navigation and bring together concepts from stochastic contraction theory, robust adaptive control, and dynamic stochastic optimization using augmented importance sampling techniques. I will present demonstrations on simulated and real robotic systems and discuss future research directions.

Biography: Evangelos Theodorou is an Associate Professor with the School of Aerospace Engineering, Georgia Institute of Technology and is also the director of Autonomous Control and Decisions Systems (ACDS) laboratory. He is also affiliated with the Institute of Robotics and Intelligence Machines, and Center for Machine Learning Research at Georgia Tech. His interests are at the intersection stochastic control and optimization, machine learning, statistical physics and dynamic systems theory. Applications of his research include robotic and aerospace systems, applied physics, networked systems and bio-engineering.

Understanding Risk and Social Behavior Improves Decision Making for Autonomous Vehicles

Keynote speaker: Daniela Rus (MIT, USA)

Abstract: Deployment of autonomous vehicles on public roads promises increases in efficiency and safety, and requires evaluating risk, understanding the intent of human drivers, and adapting to different driving styles. Autonomous vehicles must also behave in safe and predictable ways without requiring explicit communication. This talk describes how to integrate risk and behavior analysis in the control look of an autonomous car. I will describe how Social Value Orientation (SVO), which captures how an agent's social preferences and cooperation affect their interactions with others by quantifying the degree of selfishness or altruism, can be integrsted in decision making and provide recent examples of developing and deploying self-driving vehicles with adaptation capabilities.

Biography: Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science, Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT, and Deputy Dean of Research in the Schwarzman College of Computing at MIT. She is also a visiting fellow at Mitre Corporation. Rus's research interests are in robotics and artificial intelligence. The key focus of her research is to develop the science and engineering of autonomy. Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering and of the American Academy of Arts and Sciences. She is the recipient of the Engelberger Award for robotics. She earned her PhD in Computer Science from Cornell University.

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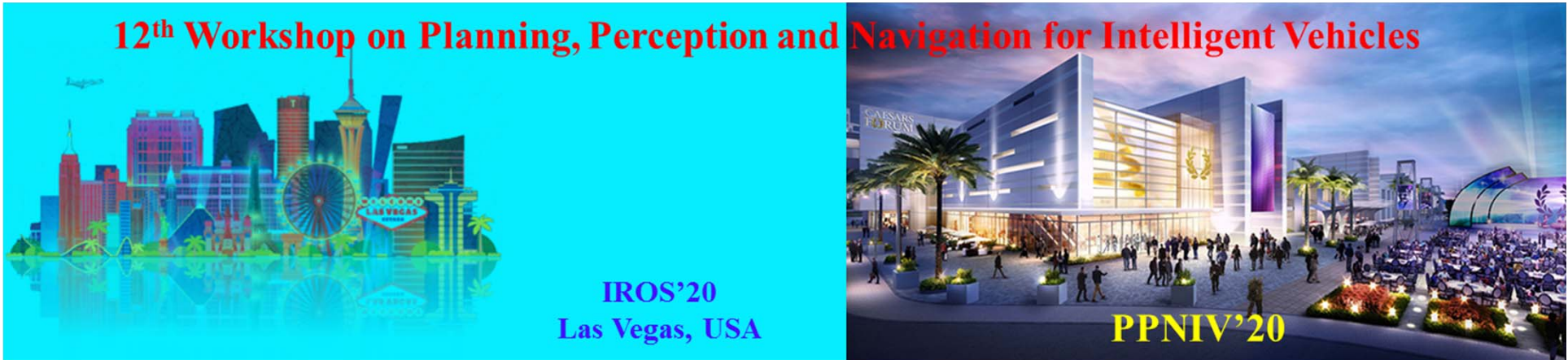
Safe Autonomous Driving and Humans: Perception and Transitions
Keynote speaker: Mohan M Trivedi (University of California, USA)

Abstract: These are truly exciting times especially for researchers and scholars active in robotics and intelligent systems fields. Fruits of their labor are enabling transformative changes in daily lives of general public. In this presentation we will focus on changes affecting our mobility on roads with highly automated intelligent vehicles. We specifically discuss issues related to the understanding of human agents interacting with the automated vehicle, either as occupants of such vehicles, or who are in the near vicinity of the vehicles, as pedestrians, cyclists, or inside surrounding vehicles. These issues require deeper examination and careful resolution to assure safety, reliability and robustness of these highly complex systems for operation on public roads. The presentation will highlight recent research dealing with understanding of activities, behavior, intentions of humans specifically in the context of autonomous driving and transition controls.

Biography: Mohan Trivedi is a Distinguished Professor of Engineering and founding director of the Computer Vision and Robotics Research Laboratory, as well as the Laboratory for Intelligent and Safe Automobiles (LISA) at the University of California San Diego. These labs have played significant roles in the development of human-centered safe autonomous driving, advanced driver assistance systems, vision systems for intelligent transportation, homeland security, assistive technologies and human-robot interaction fields. Trivedi has received the IEEE Intelligent Transportation Systems (ITS) Society's Outstanding Researcher Award and LEAD Institution Award, as well as the Meritorious Service Award of the IEEE Computer Society. He is a Fellow of IEEE, SPIE, and IAPR. He serves very regularly as a consultant to industry and government agencies in the USA and abroad. Trivedi frequently participates on panels dealing with technological, strategic, privacy, and ethical issues surrounding research areas he is involved in.

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Accepted papers

Title: *Marker-Based Mapping and Localization for Autonomous Valet Parking*
Authors: Zheng Fang, Yongnan Chen, <u>Ming Zhou</u>, Chao Lu

Title: *Parameter Optimization for Loop Closure Detection in Closed Environments*
Authors: <u>Nils Rottmann</u>, Ralf Bruder, Honghu Xue, Achim Schweikard, Elmar Rueckert

Title: *Radar-Camera Sensor Fusion for Joint Object Detection and Distance Estimation in Autonomous Vehicles*
Authors: <u>Ramin Nabati</u>, Hairong Qi

Title: *SalsaNext: Fast, Uncertainty-aware Semantic Segmentation of LiDAR Point Clouds for Autonomous Driving*
Authors: <u>Tiago Cortinhal</u>, George Tzelepis, Eren Erdal Aksoy

Title: *SDVTracker: Real-Time Multi-Sensor Association and Tracking for Self-Driving Vehicles*
Authors: <u>Shivam Gautam</u>, Gregory P. Meyer, Carlos Vallespi-Gonzalez, Brian C. Becker

Accepted papers

Title: *Situation Awareness at Autonomous Vehicle Handover: Preliminary Results of a Quantitative Analysis*
Authors: Tamas D. Nagy, Daniel A. Drexler, Nikita Ukhrenkov, <u>Arpad Takacs</u>, Tamas Haidegger

Title: *Towards Context-Aware Navigation for Long-Term Autonomy in Agricultural Environments*
Authors: M. Hollmann, <u>B. Kisliuk</u>, J.C. Krause, C. Tieben, A. Mocky, S. Putzy, F. Igelbrinky, T. Wiemanny, S. Focke Martinez, S. Stiene, J. Hertzberg

Title: *Exploiting Continuity of Rewards – Efficient Sampling in POMDPs with Lipschitz Bandits*
Authors: <u>Ömer Sahin Tas</u>, Felix Hauser, Martin Lauer

Title: *Impact of Traffic Lights on Trajectory Forecasting of Human-driven Vehicles Near Signalized Intersections*
Authors: <u>Geunseob Oh</u>, Huei Peng

Title: *Semantic Grid Map based LiDAR Localization in Highly Dynamic Urban Scenarios*
Authors: <u>Chenxi Yang</u>, Lei He, Hanyang Zhuang, Chunxiang Wang, Ming Yang

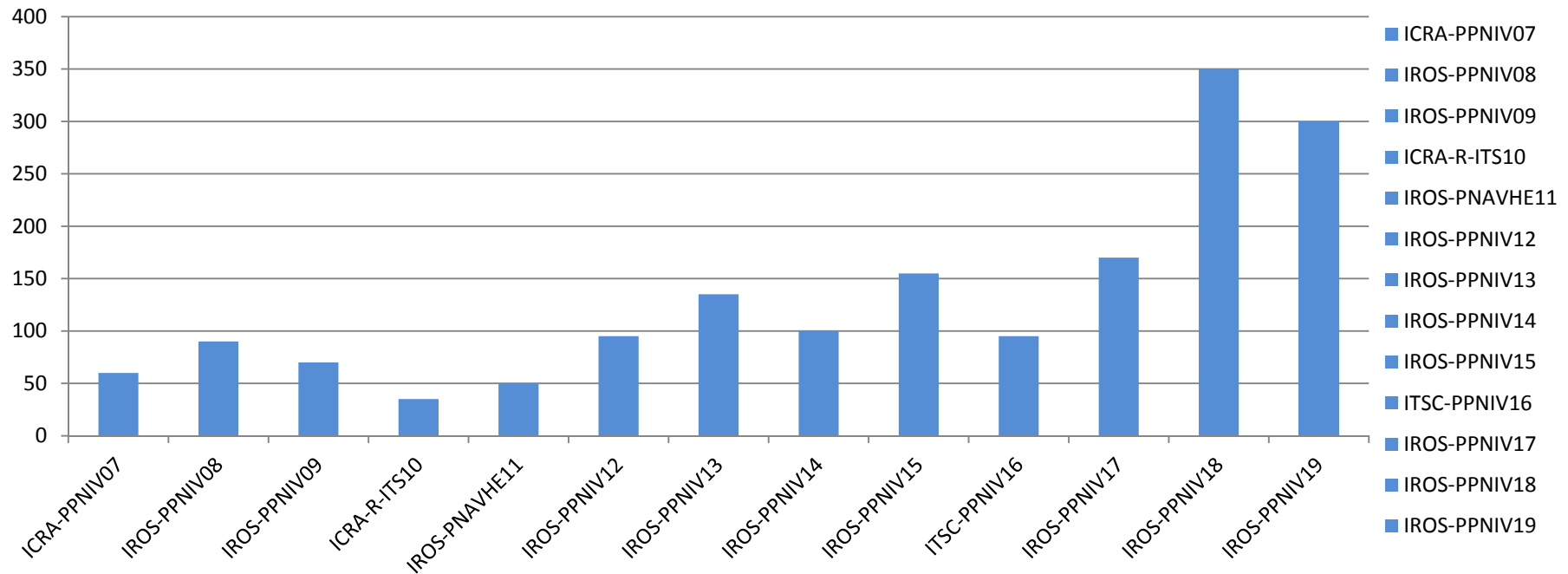12th Workshop on Planning, Perception and Navigation for Intelligent Vehicles

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Attendees

Legend:
- ICRA-PPNIV07
- IROS-PPNIV08
- IROS-PPNIV09
- ICRA-R-ITS10
- IROS-PNAVHE11
- IROS-PPNIV12
- IROS-PPNIV13
- IROS-PPNIV14
- IROS-PPNIV15
- ITSC-PPNIV16
- IROS-PPNIV17
- IROS-PPNIV18
- IROS-PPNIV19

PPNIV20

- ✓ **Experience in virtual meeting and on demand service within IROS20**
- ✓ **Wish many attendees ➔ Submit and share your work through PPNIV workshops**
- ✓ **Great Keynotes and Presentations**
- ✓ **Presentations, papers, and workshop proceedings will be on PPNIV20 webpage**

➔ https://project.inria.fr/ppniv20

Next events:

- ✓ **RAS Magazine Special issue on Autonomous Vehicle : Artificial Intelligence and Model based techniques in Decision and Control** (currently open, deadline january 2021)
- ✓ **New PPNIV'2021 will be submitted to IROS'21 (13th edition…)**

Announcements:

- ✓ **Join the Mailing list by using the website of the TC**

http://www.ieee-ras.org/autonomous-ground-vehicles-and-intelligent-transportation-systems