2020 IEEE New Zealand Vehicle Technology (VT) 1st Workshop

Thursday, 29 of October 2020

11:00-11:05: Opening

11:05:-12:00: Dr Haibo Zhang, Otago University

12: 00-12:30: Prof. Ljubo Vlacic, School of Engineering and Built Environment, Griffith University, Brisbane, Australia

12:30 – 13:00: Dr Eman Mousavinejad, Visiting Research Fellow, Griffith University

13:00-13:55: break time

14:00-14:55: Dr Sheikh Azid, School of Engineering and Physics, the University of the South Pacific. Suva, Fiji

15:00-15:30: Dr Chris Rapson, Auckland Transport

15:30-16:00: Open discussion and conclude

Workshop online Platform:

Join Zoom Meeting: https://aut.zoom.us/j/3668299160

Zoom Meeting ID: 3668299160

Title: Position and Orientation Estimation through Massive MIMO in 5G networks

Speaker: Dr Haibo Zhang, Otago University

Abstract:

Precise and real-time position estimation is of great importance for supporting new services such as location-based beamforming, unmanned aerial vehicles, autonomous driving, and many others. However, existing radio-based positioning techniques using GNSS, WiFi and Bluetooth suffer either low accuracy or the inability to provide ubiquitous positioning service. The emerging 5G networks offer not only high- rate and low-delay communication but also huge potentials in achieving precise positioning in both outdoor and indoor environments. The broad carrier bandwidth, the high carrier frequencies, the massive MIMO antennas, and the network densification together can significantly improve the positioning accuracy and shorten the positioning latency. In this talk, I will first illustrate the key principles of radio-based positioning and the advantages of 5G-based positioning. Then I will present our recent studies on position and orientation estimation based on massive MIMO and spherical wave propagation.

Bio:

Haibo Zhang is currently a Senior Lecturer with the Department of Computer Science, University of Otago, He received the Ph.D degree in Computer Science from the University of Adelaide, Australia. Before joining the University of Otago, he was a Postdoctoral Research Fellow with the Automatic Control Laboratory, School of Electrical Engineering, Royal Institute of Technology (KTH), Sweden. His current research interests include 5G networks, real-time industrial wireless communications, wireless sensor networks, RF-based localization, green computing, and distributed algorithms. He has published over 90 papers with many in leading international journal and conference proceedings including IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Wireless Communications, ACM Transactions on Embedded Computing Systems, INFOCOM, LCN, and WoWMoM. He has chaired or co-chaired several international conferences on computer networking and served as an associate editor for several international journals.

Title: Levels of Driving Automation Uncertainties

Speaker: Professor Emeritus Ljubo Vlacic, Griffith University

Abstract:

Although driverless (self-driving) vehicles research has achieved its prominence, many application-focused issues are yet to be addressed, in order for self-driving vehicles to bring a quality change to people's mobility and vehicle riding comfort. The talk is aimed at sharing with the audience the speaker's personal views on some uncertainties brought by the current "SAE 6 Levels of Driving Automation" standard.

Bio:

Professor Emeritus Ljubo Vlacic is with Griffith University's Institute for Integrated & Intelligent Systems. He is a control systems scientist and practitioner, renowned for his contributions to co-operative driverless vehicles and intelligent control systems research and development.

His research achievements made news headlines and were broadcast through media outlets throughout the world.

In recognitions of his achievements, he received 22 awards including the IEE Achievement Medal (World-wide), Sir Lionel Hooke Award, Queensland Professional Engineer of the Year Award and the

Gold Coast Business Events Ambassador Award. He hosted 12 national and international scientific conferences and chaired a number of IFAC, IEEE and Engineers Australia committees.

Currently, he is: (i) Editor-in-Chief, IEEE – Intelligent Transportation Systems Magazine; (ii) Chair, the IET Australia Forum; (iii) Chair, IET Network Queensland; (iv) General Chair of the 2020 Australian and New Zealand Control Conference and is (v) on the Board of Governors of the IEEE-ITS Society.

He also graduated from the Conservatorium of Music (Violin) and has played with professional philharmonic and symphony orchestras.

Title: Distributed Cyber Attacks Detection and Recovery Mechanism for Vehicle Platooning.

Speaker: Dr Eman Mousavinejad, Visiting Research Fellow, Griffith University

Abstract:

With the growing demand for mobility and development of urbanization, the number of vehicles has been significantly increased in recent years. As a result, there has been mounting concern about modern transportation systems due to traffic congestion, traffic accidents, energy waste, and pollution. To deal with these issues, developing Intelligent Transportation Systems (ITS) technologies for the driving pattern change from individual driving to platoon-based driving known as vehicle platooning is of utmost importance.

Vehicle platooning is aimed at steering a team of vehicles into a platoon on a road where all vehicles' speed can be automatically adjusted such that the inter-vehicle distance is reduced while not compromising safety. To fulfil this, vehicles are usually equipped with suitable on-board sensors, such as radar, camera, and lidar, enabling each of them to monitor its predecessor's behaviour. Moreover, vehicles are connected through a Vehicular Ad-hoc Network (VANET) and exchange their inter-vehicle data with their neighbours via a wireless communication technology, that is, Dedicated Short Range Communications (DSRC) so as to coordinate their behaviours.

Due to the openness of the wireless communication, an active adversary may launch malicious cyber attacks to compromise both sensor measurements and control command data exchanged among vehicles. Therefore, the ongoing research on vehicle platooning includes significant efforts to develop effective attacks detection and protection strategies.

The key goal of this presentation is to elaborate how to develop an attack detection strategy and its associated recovery mechanism so as to not only detect attacks that maliciously disrupt the performance of VANET but also recuperate the system from the detected attacks in a timely fashion.

Bio:

Eman Mousavinejad (member, IEEE) received the B.Sc. degree in mechanical engineering from Azad University, Tehran, Iran, in 2006, the M.Sc. degree in mechatronics engineering (control) from the Sharif University of Technology, Tehran, Iran, in 2009, the M.Phil. and Ph.D. degrees in mechatronics engineering (control) from Griffith University, Gold Coast, QLD, Australia, in 2016 and 2020, respectively.

Dr. Mousavinejad is currently a Research Associate with the School of Electrical and Information Engineering, the University of Sydney, NSW, Australia, and a Visiting Research Fellow with the Griffith School of Engineering and Built Environment, Griffith University, QLD, Australia. His current research interests include cyber security and privacy in intelligent transportation systems, networked control and filtering, multiagent systems, autonomous vehicles, and vehicle dynamics and control.

Topic: Adaptive Control Strategies Robust to External Disturbances for Multirotor UAVs.

Speaker: Dr Sheikh Izzal Azid, School of Engineering and Physics, The University of the South Pacific

Abstract:

Unmanned Aerial Vehicles (UAVs) are developed today to perform more and more demanding tasks. There are high needs of the UAVs for the Pacific Islands in several areas, such as disaster management, monitoring, aerial surveillance and security. In my talk, the special focus will be on the quadrotor typed UAVs and its application in the Pacific. The highly nonlinear models with the consideration of action of disturbances acting on the quadrotor will be discussed. Moreover, the robust control actions on the UAVs will be presented. The Gazebo software with ROS based system will be presented which is effective to test the robust control through software emulation before the experimentation in the fields.

Bio:

Dr. Sheikh Izzal Azid is Lecturer in the School of Engineering and Physics at the University of the South Pacific. His PhD studies in the area of Aerial Robotics and Robust Control from the University of the South Pacific in collaboration with University of Palermo, Italy. He attained his MSc in Engineering in 2010 in the area of Automation and Intelligent systems. His research interest includes Robotics, Controls, UAV's, Autonomous systems, State Observers and Microprocessor Applications. Azid also worked as a consultant for FP7 and H2020 European Projects which was on Science, Technology and Innovation in the Pacific from 2010 to 2016. Azid is currently the vice-president of IEEE VTS NZ North.

Topic: Computer Vision technology in Auckland Transport

Speaker: Dr Chris Rapson, Auckland Transport

Abstract:

Computer Vision technology has developed extremely fast over the last decade with the rise of AI. At Auckland Transport, we are now able to apply computer vision to a range of applications that improve safety, make sure people follow the rules, and provide valuable data for planning the future infrastructure of our city. This presentation will run through a selection of these applications and demonstrate some of the techniques that we use.

Bio:

Dr. Chris Rapson completed a PhD in plasma physics, and continued with the Max Planck Institute in Germany as a postdoc for 5 years researching nuclear fusion. He joined AUT in 2018 and 2019 researching connected autonomous vehicles. He is now working at Auckland in their Computer Vision team.