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ABSTRACT

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Mo Jamshidi

Lutcher Brown Endowed Distinguished Professor

The University of Texas, San Antonio

mojamshidi4@gmail.com

acelab.wixsite.com/acelab

Intelligent Control of Autonomous Vehicles: UAVs and UGVs

In today's world, drones are playing a major role in our lives. The use of drones as autonomous systems offers several difficulties, primarily because of them being such highly unstable dynamic systems. In industrial applications, drones offer more versatility in motion. However, they have short battery life, instability, difficult to do research on them unless they have open architecture. Their adaptivity to new environments, complete autonomy, as well as their costs are all concerns about drones.

Artificial intelligence (AI) and machine learning (ML) have made an ever larger impact on our lives in 21st Century. One of the prominent impact of AI/ML is on autonomy and autonomous vehicles, such as driver-less cars and UGVs, in general

Models of UAVs and UGVs, being highly nonlinear, are commonly based on kinematic assumption or are data-based modeling or system identification. Once a model is obtained, simulation can be used to test and verify their accuracies for pose control and estimation purposes.

The aim of this presentation is two-folds: One is to solve some of these issues about UAVs to enable a drone to self-learn to fly employing trial and error with Reinforcement Learning. This also entails the ability to self-charge and hence also be aware of its position information, meaning having the ability to self-localize. This work shows the development of such a drone and a localization system which provides a self-charging ability to a drone to perform sampling for Reinforcement Learning methods. The other is to employ Reinforced Learning to plan and implement a secure navigation paradigm for ground autonomous vehicles (UGVs). The implementation needs to provide self-learning capabilities of such vehicles utilizing Robot Operating System (ROS) within the framework of Network Control Paradigms followed by performance test.

The presentation will also provide a summary of AI/ML research at the University of Texas (San Antonio) Autonomous Control Engineering (ACE) Laboratories. Videos of many implementations are shown.



Mo M. Jamshidi (Fellow IEEE, Fellow ASME, A. Fellow-AIAA, Fellow AAAS, A. Fellow TWAS, Fellow NYAS) received BS in EE, Oregon State University, Corvallis, OR, USA in June 1967, the MS and Ph.D. degrees in EE from the University of Illinois at Urbana-Champaign, IL, USA in June 1969 and February 1971, respectively. He holds honorary doctorate degrees from the University of Waterloo, Canada, 2004 and

Technical University of Crete, Greece, 2004. Currently, he is the Lutchter Brown Endowed Distinguished Chaired Professor at the University of Texas, San Antonio, TX, USA. He has been an advisor to NASA (including 1st MARS Mission), USAF, USDOE and EC/EU (Brussels). He has near 800 technical publications including 74 books (11 text books), research volumes, and edited volumes in English and a few foreign languages. He is the Founding Editor or co-founding editor or Editor-in-Chief or honorary editor of 6 journals including *IEEE Control Systems Magazine* and the *IEEE Systems Journal*. He is currently Special Issues Editor-in-Chief of *Intelligent Automation and Soft Computing* and honorary editor of *Int. Journal of Complex Systems*. He is an Honorary Professor at three Chinese Universities (Nanjing and Xi'an), Deakin University (Australia), Birmingham University and Loughbrough University (UK), and Obuda University (Hungary). He is a Foreign Member of the Hungarian Academy of Engineering and Russian Academy of Nonlinear Sciences. In October 2005 he was awarded the IEEE's Norbert Weiner Research Achievement Award. He is a member of the University of the Texas System Chancellor's Council since 2011. In his two research laboratories with 20 graduate students, he is currently involved in research on system of systems engineering with emphasis on cloud computing, robotics, UAVs, machine learning, bioinformatics and sustainable energy systems. He has over 10,631 citations on Scholar Google.