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ONLINE Virtual Mini-Seminar on Advance Control

DATE: Friday July 24th 2020, Times: **Brazil (9:00-10:30 AM), Houston (7:00-8:30 AM), Europe (2:0-3:30 PM), Japan (9:00-10:30 PM), UK (1:00-2:30 PM), and India (5:30-8:00 PM).**

TOPIC: “Robust Control Strategy Using Event-triggered approach for Networked Control System with Network Irregularities”

Speaker: Dr Dipesh Shah, Post-Doc Fellow, IIT, India

Scope: The field of Control Engineering has evolved from a basic ON-OFF controller to an advanced controller structure in the past 100 years. Internationally, the research direction is turning from the traditional centralized control to distributed control systems. The main reason behind this is the enormous progress in network technology over the past decade which brings an advancing trend in the control system, where point-to-point cables are replaced by wireless communication networks. When a traditional feedback control system is closed via a communication channel, it is defined as a Networked Control System (NCS). The communication network used in NCS for data transfer between the control system components such as sensor, controller, and actuator can be wired or wireless. In NCS when the information is exchanged using a wireless network among these control system components, it is defined as Wireless Networked Control Systems (WNCSs). The insertion of a communication network in the feedback control loop makes the analysis and design of NCS more complex. Recently, there is increased interest among the control researchers all over the world in the field of NCS. The NCS research lies at the intersection of two research areas namely, control systems and communication theories. The combination of these two frameworks is used to establish the model for the NCS system. NCS require novel design mechanisms to address the interaction between control and wired systems for maximum overall system performance and efficiency. The usage of wired networks in data transmission introduces non-zero delay and message error probability at all times. Transmission failures may result in the degradation of the control system performance, and even more serious economic losses or reduced human safety. Hence, control system design needs to include a mechanism to tolerate message loss and delay. Furthermore, removing cables for the data communication of sensors and actuators motivates the removal of the power supply to these nodes to achieve full flexibility. The limited stored battery or harvested energy of these components brings additional limitations on the energy consumption of the wired network. The main challenge in NCS is to jointly design the communication and control systems considering their strong interaction to improve the control performance and the network lifetime. This proposal mainly focuses on the development of a robust control strategy such as sliding mode control using the event-triggered approach with networked delay and packet loss compensation in the discrete domain that handles the critical interactive variables such as communication delay, packets loss, congestion, sampling period and network energy consumption in wired NCS. Further, the proposed controller is validated on a laboratory set up of serial flexible joint robotic manipulator. The simulation and experimental results show that the proposed controller outperforms the controller with reaching law approach. The NCSs have been finding applications in a broad range of areas such as intra-vehicle networks, industrial automation, industry 4.0, building automation, robotics, haptic surgery, and wireless avionics intra-communications.

Speaker: Dipesh Shah received his Bachelor’s degree in Instrumentation and Control and MS in Applied Instrumentation from Gujarat University and Ph.D. in Instrumentation and Control (2018) from Gujarat Technological University. Currently, he is working as a Post-Doctoral Fellow in the Department of Biological Engineering at the Indian Institute of Technology. For eight years he taught at Sardar Vallabhbhai Patel Institute of Technology (SVIT), as an Assistant Professor. In 2019, he was invited as a Visiting Researcher by the Department of Automatic Control at Lodz University of Technology, Lodz, Poland for joint research collaboration on event-triggered networked control system. This year, he was invited to collaborate as a Visiting Researcher by Department of Electronics at Federal University of Technology, Santa Prossa, Parana, Brazil on development of robust control strategy for network based active suspension system. He has authored a book with Springer, book chapters with Taylor and Francis, and has filed two Indian Patents and published various papers in peer reviewed journals which includes IEEE Transactions, Springer, and Elsevier. He has also presented and published various papers at IEEE international conferences and served as Conference Chair for one of the sessions in International Workshop on Recent Advances on Sliding Mode (RASM-2015), held at Istanbul, Turkey. He is a member of IEEE Control System, International Society for Automation (ISA) and IEEE Industrial Electronics. He is also a reviewer for IEEE Transaction on Mechatronics, IEEE Transactions on Cybernetics, IEEE Access, Journal of Control, International Journal of Non-linear systems and many more. His research area includes Sliding Mode Control, Networked Control System, Process Control and Industrial Communication Networks.

This complimentary Seminar is a global event hosted by IEEE Galveston Bay Section. Registration will be required in order to receive the login information.

PLEASE send your name, country, email for registration to Dr Zafar Taqvi at Z.Taqvi@IEEE.ORG by COB Wednesday July 22nd, 2020. All registrants will be provided ZOOM login information after the registration deadline.

Coordinator of Mini-Seminar -Jagdish Shukla, Member IMEKO TC17

Information is also available on host section website <https://site.ieee.org/gb/>